Air Quality Trading: Emissions offsets from Vehicles for Efficient Emissions Reductions

Ana Alvarez, Naresh Kumar, Eladio Knipping, Stephanie Shaw

Electric Power Research Institute (EPRI), Palo Alto, CA

Introduction

- We evaluate an emissions reduction strategy based on trading of pollution reduction credits in exchange of financing for the retirement of old and polluting vehicles off the roads.

Objectives

- Examine current knowledge on accelerated car retirement programs and other mobile emissions reduction strategies.
- Use regional air quality modeling to assess effectiveness of this approach versus the traditional approaches such as installing SCR controls to reduce NOx emission from coal-fired power plant units.

Methods

- ✓ Extensive literature search on the extent and effectiveness of current and past accelerated car retirement programs and other mobile emissions reduction strategies.
- ✓ Modeling regional air quality using the Texas Commission of Environmental Quality (TCEQ) emissions modeling platform for June 2012 with the CAMx model and focusing on the 4 km resolution domain covering the Dallas-Fort Worth ozone nonattainment area (Figure 1, modeling domain).
- ✓ Two NOx emissions reductions strategies were tested: retirement of 100,000 old or polluting cars and installation of SCR controls in a nearby coal-fired power plant unit.

Results

Literature Search:

- ✓ Accelerated car retirement programs found to be effective to reduce emissions in most studies.
- ✓ However, most studies focused on large programs aimed at economic incentives during recession times rather than to reduce pollution.
- ✓ Consequently, program cost versus effectiveness hotly discussed.
- ✓ Other mobile pollution reduction strategies involve fuel reformulation and inspection and maintenance programs.
- ✓ Fuel reformulation effective, but additional reductions not expected.
- ✓ Inspection and maintenance programs found to be generally ineffective due to cheating, ineffective mandated car repairs and measurement limitations. Programs often limited to nonattainment areas.
- ✓ Car Retirement Programs currently running do not keep records on program performance. Reports are based on number of cars retired and application of emission factors.

Modeling Results:

- ✓ Retiring 100,000 old or high polluting cars from Dallas-Fort Worth metropolitan area reduces NOx, VOC and CO_2 emissions by 15.5 tons/day, 10.9 tons/day and 91.4 short tons/day, respectively.
- ✓ Installing SCR controls reduces NOx emissions by 14 tons/day.
- ✓ Maximum 8 hour difference between sensitivity and base case (Figures 2 and 3) show similar ozone level reductions in DFW area from both strategies.
- ✓ Population exposure at the maximum 8 hour difference between base case and sensitivity (8 hour ozone base > 60 ppb) (Figures 4 and 5) also show similar results in the DFW area.
- ✓ Cumulative population exposure for 8 hour average ozone difference between sensitivity and base (ozone base > 75 ppb)e over modeling period (May 31 – June 30) show highest impact from accelerated car retirement strategy (Figures 6 and 7).

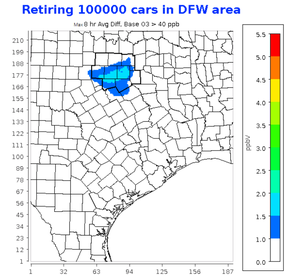

Figure 2

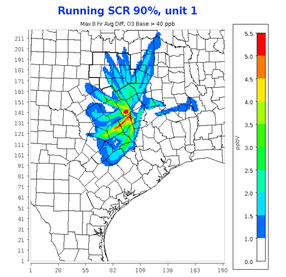

Figure 3

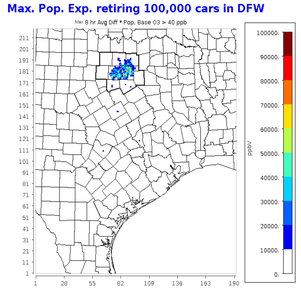

Figure 4

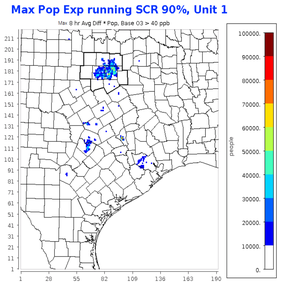

Figure 5

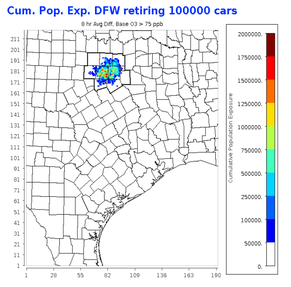

Figure 6

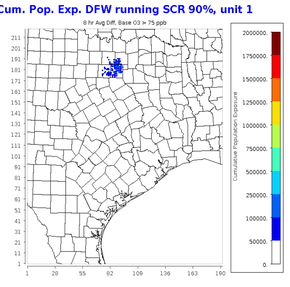

Figure 7

Figure 1: TCEQ Modeling Domain.

Conclusions and Future Work

- ✓ Accelerated car retirement strategy as effective as SCR controls to reduce peak ozone levels.
- ✓ Cumulative population exposure shows larger impact from car reduction strategy.
- ✓ Bonus reduction of CO_2.
- ✓ Program Cost: $100 million first year plus one million per year to maintain benefits.
- ✓ Cost of SCR installation >$300 million + loss of revenue while unit is being retrofitted.
- ➢ Future work to evaluate strategy in Baltimore nonattainment area.

Acknowledgments

We would like to thank Jim MacKay from TCEQ for providing the modeling platform and also to Wyat Appel and his team for providing emissions and other modeling inputs for our future modeling in Baltimore area.

EPRI ELECTRIC POWER RESEARCH INSTITUTE