

An Analysis of Pennsylvania's Clean Air Act Compliance Options

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1. Introduction

In late 1995, newly-elected Pennsylvania Governor Tom Ridge faced a critical choice. Under the previous Governor, the state had formulated a plan to reduce automobile emissions to meet the stricter requirements under the Federal Clean Air Act (CAA) Amendments of 1990.

Pennsylvania's plan called for the establishment of 86 new centralized emissions testing centers in areas where testing was required due to non-compliance with CAA standards (typically urban areas with high levels of air pollution).

The Clean Air Act Amendments (CAAA) of 1990 called for lower levels of air pollution and stricter policies to achieve it. In addition to stationary source regulation (e.g. factories), proposals for lowering the amount of air pollution in U.S. cities have often focused on making the fleet of passenger vehicles more environmentally friendly. The basic premise is that the total amount of air pollution generated by passenger vehicles depends primarily on two factors. First, the number of miles traveled by automobiles. If cars are driven less, less pollution will result. Second, the amount of pollution generated per mile of travel. This depends on the type of fuel used, energy efficiency, vehicle condition, and driving patterns. For example, heavy acceleration will decrease engine efficiency, and older or poorly maintained cars will generally contribute more pollution.

Given these primary factors contributing to increased air pollution levels, regulation calling for lower levels of pollution has led to several classes of solutions addressing each factor. First, stricter air pollutant emissions limits have continually been imposed on new vehicles. Second, programs were introduced to decrease vehicle miles traveled (VMT), although these have had limited success. Third, alternative fuels in vehicles have been promoted or required, such as bio-fuels, natural gases or reformulated gasoline. Finally, emissions testing to identify vehicles which are not operating within preset emissions levels have been required, and subsequent penalties or required repairs imposed to put them in compliance.

2. Key Issues in Auto Emissions Testing Policy

2.1 Background

When Governor Ridge took office, the proposed centralized system was not yet in effect, although the centers had already been built. Ridge saw little reason to change the decentralized system already in place— which required yearly safety and maintenance inspections on all automobiles, and emissions testing for vehicles in designated areas with high levels of air pollution. The testing was done during single visits at privately-owned neighborhood service stations (typically gas stations and auto repair businesses). At the time, only vehicles in parts of 11 counties were required to have exhaust emissions inspections. The inspection tested levels of hydrocarbons and NOx by placing a sensor in the tailpipe at idle speed at a cost of \$8. However, this system was known to lead to fraud, which is a two-part problem. First of all, there is incentive for station owners to fail vehicles to benefit from making the repairs on-site. In

addition, there is incentive for owners to pass vehicles owned by good customers or friends, who bring in knowingly polluting vehicles, but will take their business elsewhere if forced to make costly repairs. When the Federal Environmental Protection Agency (EPA) conducted covert audits of local testing stations in 12 states, 81% of the tests were improperly conducted.

2.2 Emission Testing Alternatives

The proposed centralized system was quite different, as suggested by CAAA 1990. The proposed system would be geared towards urban areas. For example, 16 of the testing centers were located in the greater Pittsburgh area alone, and only 25 counties (out of 67) in the state had centers. Overall, 5.9 million cars would need to be tested every other year (about 3 million per year). The centralized system set threshold maximum pollution levels for various gases emitted by automobiles and tested them periodically. Gross-polluting cars would be identified and either corrected or removed from service by stiffer penalties. So-called gross polluters, about 10% of the cars on the road, create 50% of all vehicular air pollution. The expected result of centralized testing was a 25% reduction in emissions of volatile organic compounds (VOC).

At the time Ridge was considering the issue, the centralized testing centers had already been built through a 7-year contract between the State and Envirotest Corporation at a cost of \$150 Million. The test done at these centers would be performed by placing the automobile on a dynamometer-- a treadmill-like device which accelerates the car to different speeds and measures the pollution generated. The car passes or fails this more difficult test depending on the pollution levels at the various speeds.

The penalty for failing the centralized test was that measures had to be taken to raise vehicle performance to a compliance level. This usually would mean making alterations to the engine, or adding pollution control devices. CAAA standards set a limit of \$450 spending per test on these alterations. After \$450 was spent trying to improve the car's emissions, a waiver could be received in lieu of passing the test. In addition, the centralized testing solution alleviated the incentive for fraud, since the test was done by Envirotest, which had no linkage to repair businesses and was essentially an agency of the state. Cars would be tested only every other year to lower the testing burden, and cost between \$17 and \$22. However, repairs would need to be done at service stations, not at the testing centers. The process of drivers making trips back and forth from repairs to testing centers until vehicles pass the test was known as the 'ping pong' effect.

As of October 1995, Governor Ridge decided that the centralized system would be overly inconvenient and costly to residents, and was considering killing the centralized program with the 86 centers already built. In its place he proposed a new decentralized plan, again relying on local service stations to perform the tests. An advantage of this was that it was similar to the existing system, where inspection and emissions tests could be performed during one visit every year, as opposed to making separate trips for maintenance inspection (at service stations) and emissions testing (at Envirotest centers). To counter the potential for consumer fraud, the plan would have stricter anti-fraud legislation attached to it. This new plan did rely on a stronger test, and new equipment would be needed to implement it. The testing method would be virtually unchanged from the current plan, with a sensor being placed in the tailpipe of the vehicle to measure air pollution levels. Ridge proposed that 3.4 million cars be tested every year under his plan. As an example, all residents of counties surrounding Pittsburgh's Allegheny County

(Beaver, Washington, and Westmoreland) would have to be tested, instead of the lower percentage mandated under the centralized plan. Finally, Ridge wanted to reduce the maximum repair bill to \$150 (from \$450 set by CAAA).

Vehicle tampering was also an issue. It is possible to adjust engine performance between either fuel economy or amount of emissions so that a vehicle can pass the once-a-year emissions test, but could be readjusted for better fuel economy (and thus fail the emissions test) after the test. Mechanics or knowledgeable motorists could perform such adjustments to pass the test temporarily.

2.3 The Role of Alternative Fuels: Reformulated Gasoline

An option which is outside the realm of testing, but which could help to meet CAA emissions levels is the introduction of Reformulated Gasoline (RFG). RFG is a cleaner burning alternative to normal gasoline. It is made generally by adding in oxygenates, leading to a 'cleaner' combustion process. The fuel produces 15% less emissions of volatile organic compounds (VOC) than conventional gasoline because it burns more cleanly and evaporates more slowly. VOC combines with NO_x to create ozone, so ozone could be reduced by reducing VOC. RFG also releases fewer toxic chemicals and carbon monoxide [\[1\]](#). Mobile sources emitted about 500,000 tons of VOC in 1995.

This savings is not without cost. Achieving a cleaner burning gasoline would cost 5 cents per gallon more (roughly a 4.5% increase above the \$1.15 per gallon price of gasoline in 1995). That price increase, noted the Clean Fuels Coalition, and the "possibility of a very tiny loss in fuel efficiency" estimated at about 2%, would be RFG's only negative effects.

3. Analysis of the Alternatives

3.1 Centralized Emissions Testing Plan

The primary cost in the centralized emissions testing plan was the \$150 Million cost of the already built testing centers. However, they were being privately run by Envirotest-- who was counting on testing revenues for each of the seven years in the contract to pay for the startup costs. The next major cost is seen to be the cost to consumers of testing motor vehicles. About 5.9 million vehicles from 25 counties, or approximately 75 percent of the registered vehicles weighing less than 9,000 pounds, would have to be tested every other year. Cars manufactured in 1977 or later would be subject to the enhanced 4-minute dynamometer test, while cars manufactured between 1968 and 1976 would still be required to pass the basic idle test. Motorcycles, diesel-powered vehicles, and pre-1968 cars would be exempt, but any car that is properly tuned will pollute less.

Drivers would pay \$17 if they have their vehicles inspected within the first 21 days of the month and \$22 if done afterwards. Since inspections expire at the end of a month, it is likely that many drivers would not go to the centers until the end of the month. The Pennsylvania Department of Transportation estimated that 30 percent of all tested vehicles would fail the centralized test. The expected cost of compliance (repairs) ranged from \$25 to \$450-- from a simple tune-up to the maximum, with the average being between \$80 and \$125.

Opponents of centralized testing often cited the potentially long lines which would result from the volume of cars requiring testing having only a handful of local centers to choose from. To avoid long lines, Envirotest was required to inspect 85% of all vehicles within 15 minutes of their arrival at the station, 95% within 20 minutes and all vehicles within 25 minutes. If the firm failed to comply, the state could impose fines of up to \$600 a day.

Other costs would be associated with driving back and forth to testing centers. Federal mandates required at least one inspection station to be within 5 miles of 80 percent of the population of an urban area and may be no longer than 10 miles away from 80 percent of the population in rural areas. Centers had been located to comply with this requirement. Owners would incur additional costs of time, gas, and increased pollution since the separate trip to the testing center would not otherwise be made by owners.

Two primary benefits come from this plan. First of all, Envirotest expected 2,000 full- and part-time employees to operate the centers. Also, they expected to pay about \$4 million in real estate taxes during the seven year initial contract. It is assumed that no residents lose jobs by emissions testing not being done at service centers.

3.2 Decentralized Emissions Testing Plan

There is one significant initial cost if the state 'backs out' of the centralized plan. Since Envirotest had already built centralized test sites, Pennsylvania would have to compensate them for changing the plan, at a cost of \$150 million to the state. Another cost is the testing, expected to cost \$12 every year. There will be an additional \$2 surcharge per test given to the state. This less-intensive test had an expected failure rate of only 10%, with the cost of compliance being between \$25 and \$150. In addition, service centers would need to purchase updated equipment, certification, and training costing \$45,000 per site. There are currently 3,550 testing centers in the state. In general, service stations are on average only a 5 mile round trip from home.

3.3 Reformulated Gasoline (RFG)

While CAAA did not offer RFG as a 'substitute' to emissions testing, it is useful to compare it to the others to determine the comparative cost and efficiency of reducing emissions. Assume that RFG legislation would still apply to the same 5.9 million cars targeted under the centralized testing plans, since they are obviously the vehicles considered as being in areas which need pollution reduction. On average, a car in Pennsylvania is driven 11,500 miles per year, with a fuel economy of 20 miles per gallon. You could compare RFG as a separate option, or in addition to the above testing plans.

3.4 Hybrid Plan

In a hybrid emissions testing program, the state concedes that 100% centralized testing of designated vehicles is too costly to consumers, but the \$150 million cost of canceling Envirotest's contract is also large. Thus, they require a percentage of vehicles to be tested at centralized places, the rest at decentralized sites. Although Pennsylvania has not currently considered this form of testing, other states such as California have considered it. In this option, assume again that the same 5.9 million vehicles required under the centralized plan are tested.

4. In-class Case Study Assignment:

Note that more information was given than is needed to complete the analysis (i.e. there is information which can be excluded from your analysis).

(a) Develop a cash flow analysis for Envirotest given the implementation of a centralized emissions testing system. Assume common values for all necessary components of your analysis (e.g. discount rates, depreciation, and taxes). Do you expect Envirotest to be profitable under a completely centralized system?

(b) If Pennsylvania were to consider a 'hybrid' plan, what is the minimum percentage of tested vehicles that Envirotest would need to remain profitable?

(c) Develop a model to analyze the centralized and decentralized systems described above. Start by drawing a 'flow diagram' to show how vehicles pass through each system, and where costs occur. Consider all relevant costs, including costs to consumers from driving to testing sites and making repairs. Assume all cars that are repaired will pass the test. Given these costs, what is the level of environmental benefit (decreased VOC emissions) needed by the proposed decentralized system to be superior to the centralized system? Could this level of environmental benefit for decentralized systems be reasonably expected given the design of the system?

(d) Also compare the hybrid system and the incorporation of RFG (alone or in combination with the other options) to show the costs and benefits of all options. Which of the options is the best?

(e) Create a model that analyzes test failures and repairs in a more detailed fashion than presented above. For example, how do the results above change if the amount of cars failing emissions tests varies from 10% to 60%, and if only 30-70% of cars can pass emissions tests after the maximum repair cost is reached? What do your results imply about the effect of the maximum repair cost policies?

(f) Assume that you are a staff policy analyst in the Ridge administration, and you are asked which option should be enacted in response to the need for reduced vehicle emissions.

5. Footnotes

1 Clean Fuels Development Coalition, Derrick, Oil City, PA December 1993, p.1