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# The Impact of the Clean Air Act's Ozone Non-Attainment Areas on Texas: Major Problems and Suggested Solutions

Joseph R. Dancy

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# THE IMPACT OF THE CLEAN AIR ACT'S OZONE NON-ATTAINMENT AREAS ON TEXAS: MAJOR PROBLEMS AND SUGGESTED SOLUTIONS

*Joseph R. Dancy\**

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**O**VER one billion dollars will be spent in Texas over the next few years on emission controls mandated by the 1990 Clean Air Act Amendments. Failure of these emission controls to meet air quality standards could result in substantial federal penalties and restrictions on economic development. In Texas, natural gas powered vehicles could play a major role in meeting the Clean Air Act Amendments' air quality standards while promoting economic growth and business development.

## I. INTRODUCTION

Some experts have classified the 1990 Clean Air Act Amendments as "the most sweeping and expensive environmental legislation in this country's history."<sup>1</sup> Almost every business, household, and individual in Texas is directly or indirectly affected by the implementation of these amendments. Although the 1990 Clean Air Act Amendments address many different air quality issues, one of the most pressing issues for Texans will be those provisions applicable to areas that do not meet federal air quality standards for tropospheric ozone.<sup>2</sup>

In those areas where air quality does not meet federally established standards, significant compliance costs will be incurred by businesses and consumers.<sup>3</sup> Some estimate that the costs of meeting federal ozone air quality standards will exceed one billion dollars, and possibly run into the multiple billions.<sup>4</sup> Many small businesses unable to cope with the costs of compliance may have to close or relocate.<sup>5</sup> Because of the staggering costs, alternative means of compliance should be closely examined to insure that federal air standards are met with the least disruption to the Texas economy.

In those areas of Texas that currently do not meet federal air quality standards, strict vehicle inspection and maintenance programs will be imple-

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1. Texas Air Control Board Chairman Kirk Watson, Presentation to the Texas Association of Business (Aug. 19, 1993).

2. The Clean Air Act Amendments of 1990, Pub. L. No. 101-549, § 103, 104 Stat. 2399, 2423 (1990) [hereinafter Clean Air Act Amendments]. Tropospheric ozone occurs from ground level through the first several kilometers of the atmosphere and, in excess quantities, forms "smog."

3. Air quality does not meet federal standards for ozone in the El Paso, Dallas/Fort Worth, Houston/Galveston, and Beaumont/Port Arthur areas. See *infra* text accompanying notes 65-67.

4. In Dallas/Fort Worth alone, costs of complying with only the initial regulations will run over \$500 million according to the Texas Natural Resource Conservation Commission; costs in the Houston area will be greater. See Jennifer Files, *Endangered Species: Costs to Comply with Clean-Air Rules Threaten Small Firms*, DALLAS MORNING NEWS, July 19, 1993, at D1; John Williams, *City to Charge Fee for Small Air Polluters, Increase Inspections*, HOUSTON CHRON., Feb. 20, 1992, at A18; see also TEXAS AIR CONTROL BOARD REPORT FOR THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION VI, MARKETABLE PERMITS FEASIBILITY STUDY (1993) [hereinafter MARKETABLE PERMITS].

5. Files, *supra* note 4, at D1. Even though the economic viability of a business may be impaired, most courts have held that air control regulations do not constitute a taking of property without due process. See *Sierra Club v. EPA*, 540 F.2d 1114, 1128 (D.C. Cir. 1976); *Loeterman v. Brockline*, 524 F. Supp. 1325, 1328 (D. Mass. 1981); *Bortz Coal Co. v. Air Pollution Comm'n*, 279 A.2d 388, 398 (Pa. 1971).

mented, along with transportation control measures, strict controls on emissions from new and existing sources, restrictions on increases in emissions from expanding facilities, and reformulated gasolines. It is expected that the current level of emission controls will only partially address the tropospheric ozone air quality problem and that further, more costly and more intrusive controls will be necessary in the future to meet air quality goals.<sup>6</sup>

In addition to the cost of meeting federal ozone air quality standards, other air quality programs contained in the 1990 Clean Air Act Amendments impose further burdens on businesses and consumers.<sup>7</sup> Studies indicate that the Clean Air Act Amendments will increase environmental expenditures made by U.S. industries and consumers by twenty percent or more above current levels.<sup>8</sup>

If Texas fails to adopt control measures to address the ozone air quality problem or fails to meet the federally established air quality standards, severe restrictions on industrial or business expansion could be imposed. In addition, cuts could be made in federal matching highway funds, stringent technology-based emission reduction requirements could be imposed on existing businesses, more intrusive transportation control measures could be required, or other sanctions applied. In an era of increasing competition for business, any such restrictions on new business or business expansion could have immediate consequences on economic growth.<sup>9</sup>

The purpose of this article is to highlight the effect of the 1990 Clean Air Act Amendments on areas of Texas that do not meet the federal air quality standards for ozone and to suggest solutions that will allow the state to meet federal air quality standards economically and timely while promoting economic growth and business development.

## II. HISTORY & DEVELOPMENT OF THE CLEAN AIR ACT

The Clean Air Act, as amended, is extremely complex and multifaceted.

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6. See MARKETABLE PERMITS, *supra* note 4; ENVIRONMENTAL STRATEGIES, OZONE POLLUTION IN THE HOUSTON-GALVESTON NON-ATTAINMENT REGION (1992) [hereinafter ENVIRONMENTAL STRATEGIES] (consultants' report to the Houston-Galveston Area Council). In non-attainment areas air quality problems may restrict business expansion or make it uneconomical for new facilities to locate in these areas.

7. The 1990 Clean Air Act includes provisions dealing with acid rain, operating permits, enforcement, mobile sources, hazardous air pollutants, attainment and maintenance of air quality standards, among other provisions. Clean Air Act Amendments, *supra* note 2.

8. Dale W. Jorgenson & Peter J. Wilcoxon, *The Economic Impact of the Clean Air Act Amendments of 1990*, 14 ENERGY J. 159, 176 (1993). It has been estimated that by 1995 annualized pollution abatement costs for water, air, and land based controls will reach \$132.5 billion or 2.56% of the gross national product. Control of air pollutants is estimated to be 28% of this total. See Alan Carlin et al., *Environmental Investments: The Cost of Cleaning Up*, ENV'T MAG., Mar. 1992, at 12, 17.

9. Major cities in adjoining states, such as Oklahoma City, Tulsa, and Wichita, currently meet federal air quality standards with regard to ozone and thus will not be immediately affected by the Clean Air Act's ozone non-attainment provisions. In addition, due to the proximity of the Mexican border, the North American Free Trade Agreement could also put some facilities located in areas with air quality problems at a disadvantage due to the cost of emission reduction controls.

Some compare it to an intricate, three dimensional geological formation.<sup>10</sup> The complexity arises from the Act's numerous amendments, the non-uniform state implementation of its air quality provisions, and the technical nature of the subject matter. A brief review of the development of the Clean Air Act will assist in focusing on the unique Texas air quality problems.

The initial "Clean Air Act" granting federal regulatory authority over air emissions was enacted in 1963.<sup>11</sup> This Act aimed to control air pollution by the use of monetary grants to state air pollution control agencies, the use of interstate compacts to create and enforce air quality standards, and expanded federal funding of research on air quality issues. Congress amended the Act in 1965 to authorize federal emission standards for new motor vehicles<sup>12</sup> and again in 1967, at which time federal authority was extended to stationary emission sources.<sup>13</sup> While the Act, as amended in 1967, created federal authority over certain air pollution issues, most air quality problems continued to be addressed on a state and local basis.

The regulatory response of the states to the federal initiatives contained in the 1963 Clean Air Act and subsequent amendments was disappointing.<sup>14</sup> After extensive congressional debate on the role of the federal government in air quality issues and continuing scrutiny of the effectiveness (or lack thereof) of state and local air quality regulations, Congress amended the Act once again in 1970.<sup>15</sup>

The 1970 amendments extensively reshaped the relationship of the state and federal government with regard to air quality and sharply increased federal responsibility and authority. The 1970 amendments allowed the federal government to establish national standards for air quality that the state and local governments were required to meet within a specified period of time. State and local governments retained the power to meet federal air quality goals, subject to federal enforcement authority and oversight.

Congress provided that the newly created Environmental Protection Agency (EPA) would administer the provisions of the 1970 amendments. The EPA was delegated the power to establish local rules and regulations when necessary to achieve national air quality goals.<sup>16</sup> Where the states did

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10. See Russell V. Randle & Mary E. Bosco, *Air Pollution Control*, in ENVIRONMENTAL LAW HANDBOOK 524, 525 (11th ed. 1991).

11. Pub. L. No. 88-206, 77 Stat. 393 (1963). The Air Pollution Research and Technical Assistance Act of 1955, Pub. L. No. 84-159, 69 Stat. 322, was passed prior to that date, but contained no federal regulatory authority. The purpose of the 1955 Act was to fund research on air quality issues.

12. Pub. L. No. 89-272, 79 Stat. 992 (1965).

13. Pub. L. No. 90-148, 81 Stat. 485 (1967).

14. See *Train v. Natural Resources Defense Council*, 421 U.S. 60, 64 (1975). In *Train* the court noted that "Congress reacted [to the lack of clean air initiatives] by taking a stick to the States in the form of the Clean Air Act Amendments of 1970." *Id.*

15. Pub. L. No. 91-604, 84 Stat. 1676 (1970).

16. 42 U.S.C. § 7407(d)(2) (1988); see *South Terminal Corp. v. EPA*, 504 F.2d 646, 656 (1st Cir. 1974). Courts have recognized that air pollution can have a substantial effect on interstate commerce. Therefore, stationary and mobile emission sources can be regulated by the federal government under the Commerce Clause of the U.S. Constitution. *Sierra Club v. EPA*, 540 F.2d 1114, 1139 (D.C. Cir. 1976), *vacated on other grounds*, 434 U.S. 809 (1977).

not meet the federally mandated air quality standards, the EPA could take regulatory actions to assist or force the state to meet such goals. The 1970 amendments are the foundation of the current federal and state regulatory relationship with regard to air quality matters.<sup>17</sup>

In 1977 the Act was amended further, addressing air quality standards that were adopted in the 1970 amendments and the states' attempts to bring areas not meeting such standards into compliance.<sup>18</sup> The 1977 amendments required the states to identify areas that did not meet federal air quality standards and to take action to ensure those areas would meet federal air quality standards. In addition, areas that met federal air quality standards were to set guidelines to avoid deterioration of air quality.<sup>19</sup>

When compared to other environmental programs regulating water pollution and solid wastes, a concern arose that the Clean Air Act, as amended in 1977, was not effectively regulating the nation's air quality. The Clean Air Act focused emission standards on new emission sources and on facilities that had been modified so as to increase the volume of emissions.<sup>20</sup> In many cases, existing emission sources were not subject to federal emission limitations or oversight.<sup>21</sup> The Clean Water Act, by comparison, took a different approach. It regulated the point discharges of all pollutants into navigable water regardless of the age of the source or the nature of the pollutant. All discharges required a permit that contained specific emission limitations, monitoring schedules, and testing requirements.<sup>22</sup> Solid wastes, regulated by the Resource Conservation and Recovery Act (RCRA), were also subject to an extensive "cradle to grave" system that regulated all hazardous waste transporters, generators, and disposal facilities regardless of the vintage of the waste or the age of the facilities.<sup>23</sup>

In response to the perception that the Clean Air Act did not effectively regulate air quality, Congress dramatically altered the Act by adopting the

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17. Due to this fact, some commentators date the Clean Air Act as of 1970 instead of 1963. See Randle & Bosco, *supra* note 10, at 524.

18. Pub. L. No. 95-95, § 108, 91 Stat. 685 (1977); see also *Ohio v. Ruckelshaus*, 776 F.2d 1333, 1338 (6th Cir. 1985), *cert. denied*, 476 U.S. 1169 (1986).

19. In areas that met federal air quality standards, new and modified sources were required to meet prevention of significant deterioration (PSD) standards. PSD requirements were enacted to prevent emission sources from locating in non-regulated areas that met air quality standards, effectively creating "pollution havens" for industry.

20. The Act generally requires the EPA to impose more stringent requirements on new or modified sources than on existing sources. See 42 U.S.C. § 7411(d), (f) (1988).

21. Facilities not subject to emission limitations have been referred to as "grandfathered sources" and were not subject to permitting requirements under federal law. Some states required permits where no federal permit was required. In Texas, where the construction of such facilities had begun before September 1, 1971, and the facility had not been modified since, no permit was required because the facility was "grandfathered." TEX. HEALTH & SAFETY CODE ANN. § 382.0518 (Vernon 1992).

22. The main tool that is used by the Clean Water Act to regulate the discharge of pollutants into surface waters is the National Pollution Discharge Elimination System (NPDES) permit. The NPDES permit is required for discharges of any pollutant from a point source into the navigable waters of the United States. See 33 U.S.C. § 1342 (1988). The 1990 Clean Air Act Amendments adopted many of the NPDES concepts into its air operating permit program.

23. See 42 U.S.C. §§ 6901-6992k (1988).

Clean Air Act Amendments of 1990.<sup>24</sup> The Clean Air Act Amendments of 1990 expanded existing features of the Clean Air Act, added new features, and shifted more responsibilities for air quality from the states to the federal government.<sup>25</sup> Unlike the previous regulatory structure, the Clean Air Act Amendments regulate all major emission sources, including existing sources previously not subject to federal oversight. The 1990 amendments added provisions to address a broad range of issues such as mobile source emissions, hazardous air pollutants, acid rain, stratospheric ozone depletion, enforcement, non-attainment of national air quality standards, and permitting issues. This article focuses on the non-attainment and national air quality provisions included in the Clean Air Act Amendments of 1990.

### III. NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)

The 1970 amendments to the Clean Air Act required the EPA to identify and publish a list of common air pollutants that could endanger public health or welfare.<sup>26</sup> These commonly encountered pollutants, referred to as "criteria pollutants" or "Section 108" pollutants, are required to be listed by the EPA along with the results of studies documenting the health effects of various concentrations of that pollutant.<sup>27</sup> For each criteria pollutant, the EPA must establish a national ambient air quality standard (NAAQS). The NAAQS designates a concentration level for that pollutant above which the pollutant would endanger the public's health or welfare. Two NAAQS standards are required: a primary standard and a secondary standard.<sup>28</sup> Primary and secondary NAAQS concentrations are national standards that are not to be exceeded anywhere in the United States. Primary NAAQS standards are designed to protect the public health and must incorporate an adequate margin of safety.<sup>29</sup> Primary air quality standards are set at levels that will protect both the healthy population and segments of the population who may be sensitive to excessive concentrations of the criteria pollutant.<sup>30</sup> As such, primary standards must be set at levels low enough to protect persons with pre-existing illnesses, the young, or persons with conditions that would be aggravated by such pollutants.<sup>31</sup> Further, primary NAAQS levels are to be based solely on the need to protect the health of our most sensitive citizens. The cost and technical feasibility of attaining such levels are not to be

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24. Pub. L. No. 101-549, 104 Stat. 2399 (1990).

25. See John B. Turney, *An Overview of the Clean Air Act*, Address at the Workshop on Environmental and Safety Law for the Oil & Gas Lawyer, Southwest Legal Foundation (Jan. 15, 1992).

26. 42 U.S.C. § 7408(a)(1) (1988). The listed air pollutants are those that are emitted from numerous or diverse sources. Other less common air pollutants are regulated under provisions that address hazardous air pollutants or ozone depletion.

27. 42 U.S.C. § 7409(d) (1988).

28. 42 U.S.C. § 7410 (1988).

29. See *Lead Indus. Ass'n v. EPA*, 647 F.2d 1130, 1137 (D.C. Cir.), *cert. denied*, 449 U.S. 1042 (1980).

30. 42 U.S.C. § 7409(b)(1) (1988).

31. 42 U.S.C. § 7409 (1988). The primary NAAQS standard is to be set using criteria documenting health effects of that pollutant.



considered.<sup>32</sup>

Secondary NAAQS standards are designed to protect the public welfare from any known or anticipated adverse effects of the criteria pollutant on the soil, water, crops, animals, structures, or other property.<sup>33</sup> In general, since secondary standards deal with any adverse effect of air pollution, it would be expected that the standards should be more stringent than primary standards. This is not always the case, however. The EPA has set many secondary NAAQS standards at levels identical to the primary standards.<sup>34</sup> The secondary and primary standards for each criteria pollutant are to be reviewed by the EPA at least every five years and adjusted or revised to reflect the latest scientific evidence on the effect of that pollutant.<sup>35</sup> Although numerous health studies have been conducted on criteria pollutants, the EPA has not made any recent revisions to the primary or secondary standards.

Many of the standards for criteria pollutants were initially adopted in 1971. In the ensuing years, some of these standards were modified in various ways.<sup>36</sup> Presently the EPA has identified six criteria pollutants: carbon monoxide, lead, nitrogen oxides, particulate matter less than ten microns in size (PM<sub>10</sub>), ozone, and sulfur dioxide. Primary and secondary standards have been established for each of these criteria pollutants.<sup>37</sup>

The development of the primary and secondary standards for ozone is of special interest since several areas in Texas do not meet this national air quality standard. In 1971, the EPA established primary and secondary standards of 0.08 parts per million (ppm) of total photochemical oxidants, not to be exceeded more than one hour per year.<sup>38</sup> The EPA reviewed and updated these levels in 1979, at which time the EPA changed the chemical designation of the criteria pollutant from photochemical oxidants to ozone and increased the NAAQS primary and secondary standards from 0.08 ppm to their current level of 0.12 ppm.<sup>39</sup> In an attempt to control ozone formation,

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32. See *Natural Resources Defense Council v. EPA*, 902 F.2d 962, 973 (D.C. Cir. 1990).

33. 42 U.S.C. §§ 7409(b)(2), 7602(h) (1988).

34. Primary and secondary standards are identical for lead, nitrogen oxides, particulate matter and ozone; no secondary standard exists for carbon monoxide. See 40 C.F.R. pt. 50 (1992).

35. 42 U.S.C. § 7409(d) (1988). Most recently, the EPA has reviewed and reaffirmed the primary and secondary NAAQS levels that have been set for ozone, and the secondary NAAQS standard for sulfur dioxide. See 58 Fed. Reg. 13,008 (1993) (to be codified at 40 C.F.R. pt. 50); 58 Fed. Reg. 21,351 (1993) (to be codified at 40 C.F.R. pt. 50).

36. Initially the EPA promulgated standards for six pollutants, including sulfur dioxide, particulate matter, carbon monoxide, hydrocarbons, nitrogen dioxide, and photochemical oxidants. See G. William Frick, *Air Pollution Control*, in *ENVIRONMENTAL LAW HANDBOOK* 143, 146 (7th ed., Government Institutes, Inc., 1983).

37. See 58 Fed. Reg. 13,008 (1993) (to be codified at 40 C.F.R. pt. 50). The particulate standard as originally promulgated in 1971 measured total suspended particulates ("TSP"). Later studies indicated that most of the adverse health effects from particulates were caused by the fine particles that were inhaled. As such, the particulate standard was revised to measure particulate matter less than ten microns in size or smaller. The new particulate standards are known as PM<sub>10</sub>. See Randle & Bosco, *supra* note 10, at 528.

38. See 58 Fed. Reg. 13,008 (1993) (to be codified at 40 C.F.R. pt. 50).

39. See Randle & Bosco, *supra* note 10, at 528. Hourly average ambient ozone levels range from 0.03 ppm in remote rural areas to 0.30 and higher in heavily polluted urban areas. 58 Fed. Reg. 13,008, 13,009 (1993).

the EPA also designated hydrocarbons (HCs) as a criteria pollutant in 1971, but revoked that designation in 1983.<sup>40</sup> While no federal standard now exists for hydrocarbons, many states still regulate hydrocarbons or the heavier hydrocarbon elements known as volatile organic compounds (VOCs) or non-methane hydrocarbons (NMHCs)<sup>41</sup> in an attempt to control the formation of ozone.<sup>42</sup>

The NAAQS lead standard, adopted in 1971, also has had an indirect effect on ozone air quality issues. A major source of lead emissions was from gasoline containing lead additives.<sup>43</sup> Lead has been used in gasoline to increase octane and to reduce engine knock. Beginning in 1975, lead was phased out as catalytic converters were introduced in motor vehicles.<sup>44</sup> To replace the octane formerly contributed by lead additives, increased catalytic cracking was used to increase high octane hydrocarbons, and blending agents were added to the crude oil feedstock.<sup>45</sup> Unfortunately, these high octane hydrocarbons were also very reactive in producing ozone, and while unleaded gasoline significantly reduced ambient air concentrations of lead, it aggravated the ozone problem.<sup>46</sup>

In establishing the health effect of a criteria pollutant, one variable that must be considered is the amount of time the public is exposed to various concentrations of that pollutant. Because concentration levels of certain pollutants vary with time and the health effect may vary with various exposure periods, primary and secondary standards established by the EPA take into account the time period over which the criteria pollutant concentrations are to be measured. Because pollutant concentrations tend to peak during certain periods of the day and air pollutants tend to dissipate with time, the

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40. See 48 Fed. Reg. 628 (1983).

41. On a simplified basis, the difference between HCs, NMHCs, and VOCs can be explained as follows: HCs include all vapors that are emitted from liquid hydrocarbons; NMHCs include all hydrocarbon elements that have vaporized except methane; and VOCs have been defined as all hydrocarbon vapors excluding methane, ethane, and several other less common hydrocarbon compounds. See 40 C.F.R. § 51.100(s) (1992); 31 TEX. ADMIN. CODE § 115.10 (West Supp. 1993). Most states that regulate hydrocarbon emissions regulate VOCs or NMHCs.

42. Texas regulates VOCs under Texas Natural Resource Conservation Commission Regulation V. See 31 TEX. ADMIN. CODE § 115.10-936 (West Supp. 1993).

43. EPA, NATIONAL AIR QUALITY AND EMISSIONS TRENDS REPORT 1989, at 3-31 (1991) [hereinafter TRENDS REPORT 1989].

44. First generation catalytic converters were introduced in 1975 and reduced carbon monoxide and hydrocarbon (VOC) emissions. Second generation or three way catalytic converters were introduced in 1980. These systems reduced carbon monoxide, VOC, and nitrogen oxide emissions. In both first and second generation systems, lead inactivates the catalyst; therefore, unleaded fuels are required. EPA, AUTOMOBILE EMISSIONS: AN OVERVIEW 3 (1993) [hereinafter AUTOMOBILE EMISSIONS]; SEAN H. WEAVER & CHRISTOPHER S. TURNER, PROSPECTS FOR MEETING LOW EMISSION VEHICLE STANDARDS 17 (1993) (report prepared for the Policy and Analysis Group of the American Gas Association).

45. EPA DRAFT REPORT, MOTOR VEHICLE RELATED AIR TOXICS STUDY, ch. 11 (1993) [hereinafter AIR TOXICS STUDY]. Blending agents, such as tert-butyl alcohol, methyl tert-butyl ether (MTBE), and other alcohols and ethers are used in unleaded gasoline as replacements for organometallic anti-knock agents such as tetraethyl lead.

46. WEAVER & TURNER, *supra* note 44, at 32. Unleaded gasoline sales accounted for 89% of the total gasoline market in 1989. Air quality with regard to lead has been steadily improving since the early 1980s. TRENDS REPORT 1989, *supra* note 43, at 3-34.

shorter the sample averaging time, the more stringent the standard. Under the present regulations, only the criteria pollutants carbon monoxide, particulate matter, and sulfur dioxide have multiple averaging times.

Primary and secondary NAAQS standards established by the EPA are as follows:<sup>47</sup>

<u>Criteria Pollutant</u>	<u>Primary Standard</u>	<u>Secondary Standard</u>	<u>Averaging Time</u>
Carbon Monoxide	9 ppm	None	8-Hour
	35 ppm	None	1-Hour
Lead	1.5 g/m <sup>3</sup>	Same	Quarterly
Nitrogen Oxide	0.53 ppm	Same	Annual
			Arithmetic Mean
Particulate Matter (PM <sub>10</sub> )	50 g/m <sup>3</sup>	Same	Annual
			Arithmetic Mean
Ozone	0.12 ppm	Same	24-Hour
			1-Hour
Sulfur Dioxide	0.03 ppm	None	Annual
			Arithmetic Mean
			24-Hour
	0.14 ppm	None	24-Hour
	None	0.5 ppm	3-Hour

For ozone, the number of times a specific monitoring station exceeds the 0.12 ppm NAAQS level is averaged over a three year period. If any specific ozone monitoring station exceeds this NAAQS standard four or more times in a three-year period, the area will be designated as non-attainment.<sup>48</sup>

Primary and secondary NAAQS standards are not directly enforceable, but each state is responsible for submitting a State Implementation Plan (SIP) to the EPA that specifies how the primary and secondary standards will be achieved and maintained.<sup>49</sup> Under the Clean Air Act, the states have the primary responsibility for ensuring that the air quality in that state does not violate federally established NAAQS standards.<sup>50</sup>

Unhealthy ozone levels are a problem across the United States. Approximately 100 cities exceed NAAQS primary and secondary standards. Nine cities, containing fifty-seven million people, are considered severely polluted with peak ozone levels that exceed the primary and secondary standards by fifty percent or more.<sup>51</sup> In Texas, the Houston/Galveston area is one of those nine cities considered "severely" polluted by the EPA.

Ozone concentrations in excess of NAAQS standards at ground level create visibility problems or smog and may affect the health of certain portions of the population. Ozone acts as an irritant and may reduce the function of the lungs, especially in young people, people with pre-existing respiratory

47. 40 C.F.R. pt. 50 (1992); EPA, ARARS FACT SHEET 7 (1992) [hereinafter ARARS FACT SHEET]. "Ppm" are parts per million, and "g/m<sup>3</sup>" are grams per cubic meter.

48. See 40 C.F.R. pt. 50 app. H (1992).

49. 42 U.S.C. § 7407(a) (1988).

50. *Id.*; see also National Steel Corp. v. Gorsuch, 700 F.2d 314, 316 (6th Cir. 1983).

51. EPA, AUTOMOBILES AND OZONE 1 (1993) [hereinafter AUTOMOBILES AND OZONE].

disease, and people who exercise or conduct strenuous activity outdoors.<sup>52</sup> Ozone has a beneficial effect, however, when it exists at higher levels of the atmosphere, acting as a filter by screening out ultraviolet radiation.<sup>53</sup> The NAAQS addresses the health effects created by elevated levels of ozone concentration at ground level and does not apply to upper level ozone depletion.

Most of the lower level ozone is created by products of internal combustion or industrial processes, while upper level depletion is caused by the release of certain man-made compounds containing chlorine. As such, the causes of lower and upper level ozone problems are completely separate in nature, as are the resultant environmental problems.<sup>54</sup> Due to concerns about upper level ozone depletion by man-made substances, Congress adopted separate Clean Air Act provisions to address this issue.<sup>55</sup>

#### IV. DESIGNATION OF OZONE NON-ATTAINMENT AREAS

To measure ground level concentrations of criteria air pollutants, the Clean Air Act required the establishment of a network of ambient air quality monitoring stations.<sup>56</sup> Detailed methodology has been adopted for air quality monitoring network design, probe siting, sampling, and quality assurance.<sup>57</sup> Where a NAAQS primary or secondary standard is exceeded, the area will be designated as a non-attainment area for that pollutant.<sup>58</sup> Areas that meet NAAQS air quality standards are designated as attainment areas.<sup>59</sup> Designation of an area as an attainment or non-attainment area will determine what actions the EPA or state agency must take to regulate emissions from new and existing sources in that area.

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52. AMERICAN LUNG ASSOCIATION, AIR POLLUTION FACT SHEET, OZONE AIR POLLUTION (1989); see also 58 Fed. Reg. 13,008, 13,009 (1993) (to be codified at 40 C.F.R. pt. 50).

53. Ozone found in the upper levels of the atmosphere is referred to as stratospheric ozone.

54. This article deals with ground level or tropospheric ozone issues and does not address stratospheric ozone issues.

55. 42 U.S.C. §§ 7671-7671g (Supp. III 1991). The Clean Air Act Amendments require the phasing out of certain refrigerants that may damage the stratospheric ozone, including chlorofluorocarbons (freon). Substitute refrigerants are being developed and will be used in residential and automotive air conditioning applications in the future.

56. 42 U.S.C. § 7619 (1988); 40 C.F.R. § 58.20 (1992). The network of state and local air monitoring stations are referred to as "SLAMS." A network of national air monitoring stations (NAMS) must also be established by the EPA using portions of the SLAMS monitoring system. In addition, in ozone non-attainment areas, the Clean Air Act Amendments of 1990 require the states to develop a network of photochemical assessment monitoring stations (PAMS) to be in place by 1998.

57. See 40 C.F.R. pt. 58 apps. A-G (1992).

58. 42 U.S.C. § 7407(d) (1988). It is not uncommon for an area to be a non-attainment area for more than one criteria pollutant. For example El Paso is a non-attainment area for ozone, carbon monoxide, and particulate matter (PM<sub>10</sub>). See TEXAS AIR CONTROL BOARD, NON-ATTAINMENT NEW SOURCE REVIEW MANUAL 3 (1993) [hereinafter NON-ATTAINMENT NEW SOURCE REVIEW MANUAL].

59. 42 U.S.C. § 7407(d). Certain regulations are applicable to emission sources in attainment areas in an attempt to maintain air quality. Such sources are subject to prevention of significant deterioration new source review (PSD/NSR) and new source performance standards (NSPS).

The 1990 Clean Air Act Amendments expanded the physical size of the non-attainment areas by increasing the number of counties that are designated as non-attainment. Perimeter counties that can contribute to ozone non-attainment problems can now be included in the non-attainment areas. As such, in some cases the non-attainment area has been expanded to include an entire metropolitan statistical area (MSA) or consolidated metropolitan statistical area (CMSA) as defined by the Bureau of Census.<sup>60</sup> The 1990 amendments require the classification of these ozone non-attainment areas as marginal, moderate, serious, severe, or extreme depending on the severity of the pollution problem.<sup>61</sup> Once an area has been classified, a timetable is mandated during which such air quality issues must be addressed and regulations implemented.<sup>62</sup>

In Texas, there are four ozone non-attainment areas where NAAQS primary and secondary standards are exceeded. These areas include the El Paso, Dallas/Fort Worth, Houston/Galveston, and the Beaumont/Port Arthur areas.<sup>63</sup> Nationwide, around 100 metropolitan areas have been classified as ozone non-attainment areas.<sup>64</sup> Based on ozone concentrations, Dallas/Fort Worth has been classified as a moderate non-attainment area.<sup>65</sup> Beaumont/Port Arthur and El Paso have higher ozone concentrations than Dallas/Fort Worth and are classified as serious non-attainment areas.<sup>66</sup> Houston/Galveston has the highest ozone concentrations in Texas and is classified as a severe non-attainment area.<sup>67</sup>

## V. OZONE FORMATION

Unlike other criteria pollutants, ozone is not emitted directly from mobile or stationary sources, but is the product of a complex photochemical process. Research indicates that ozone is formed by the combination of two

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60. See *id.* § 7407(d)(4). In Texas, this new definition expanded the number of non-attainment counties from eight to seventeen. Karen Olsen, Texas Air Control Board, Speech to the North Texas Gas Processors Association Meeting (Sept. 20, 1992).

61. Section 7511(a)(1) classifies ozone non-attainment areas as follows: marginal (concentrations of ozone between .121 and .137 ppm), moderate (concentrations of ozone between .138 and .159 ppm), serious (concentrations of ozone between .160 and .179 ppm), severe (concentrations of ozone between .180 and .279 ppm) and extreme (concentrations of ozone between .280 ppm and above). 42 U.S.C. § 7511(a) (Supp. III 1991). Attainment areas have ozone concentrations below 0.12 ppm.

62. Moderate areas must reach attainment by November 15, 1996, serious by November 15, 1999, severe by November 15, 2007, and extreme by November 15, 2010. 42 U.S.C. § 7511(a)(1). Once monitoring indicates that ambient air quality standards are met, the area can petition for redesignation as an attainment area. 42 U.S.C. § 7407(e) (1988).

63. Air quality does not meet federal ozone NAAQS standards at the present time in parts or all of 17 counties around these metropolitan areas. See NON-ATTAINMENT NEW SOURCE REVIEW MANUAL, *supra* note 58, at 61.

64. EPA, OFFICE OF AIR QUALITY PLANNING AND STANDARDS, THE ROLE OF OZONE PRECURSORS IN TROPOSPHERIC OZONE FORMATION AND CONTROL 2-1 (1993) (report to Congress).

65. TEXAS AIR CONTROL BOARD, REVISIONS TO THE STATE IMPLEMENTATION PLAN (SIP) FOR THE CONTROL OF OZONE POLLUTION, RATE OF PROGRESS SIP 15 (1993) [hereinafter REVISIONS TO SIP].

66. *Id.*

67. *Id.*

separate pollutants: volatile organic compounds (VOCs) and nitrogen oxides (NO<sub>x</sub>).<sup>68</sup> As such, VOCs and NO<sub>x</sub> are commonly referred to as ozone precursors. Texas regulates emissions of both of these compounds in an attempt to control ozone formation.<sup>69</sup>

Nitrogen oxide is a major emissions by-product of internal combustion engines and the burning of hydrocarbon fuels. High concentrations of NO<sub>x</sub> can cause eye and respiratory irritation, but its most important role under the Clean Air Act Amendments is that of an ozone precursor.<sup>70</sup> Nitrogen oxide formation is strongly temperature dependent; therefore, the more efficient an engine runs, the more NO<sub>x</sub> it emits.<sup>71</sup> Nitrogen oxide emission levels can be reduced by making an engine run on a leaner or richer mixture or by retarding ignition, though such measures may adversely affect emissions of other pollutants from the engine and may make the engine run less efficiently.

VOCs have been generally defined by regulation to include ozone reactive hydrocarbon compounds heavier than methane and ethane.<sup>72</sup> Hydrocarbon vapors from evaporative emissions and engine exhaust, vapors from gasoline and fuel oil storage, and emissions from solvent use are generally the largest sources of VOCs in urban areas.<sup>73</sup> The photochemical reactivity of VOCs varies considerably depending on the specific compound that has been emitted. Emissions from gasoline powered vehicles tend to contain highly ozone reactive VOCs, and catalytic convertors or other technology has been employed since the mid-1970s to reduce such emissions.<sup>74</sup> The catalytic convertor assists in lowering both VOC and NO<sub>x</sub> levels in exhaust by converting NO<sub>x</sub> to nitrogen and oxygen and by increasing the rate of reaction between the unburned VOCs and oxygen.<sup>75</sup>

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68. In some cases VOCs are referred to or regulated as non-methane hydrocarbons (NMHCs). While the definition of VOCs and NMHCs are not identical, in both cases the emissions being regulated are the more reactive and heavier hydrocarbon compounds.

69. In Texas, Regulation VII has been adopted by the Texas Natural Resource Conservation Commission to deal with controlling NO<sub>x</sub> emissions. 31 TEX. ADMIN. CODE § 117.1-.4 (West 1989). Regulation V has been adopted to deal with rules regulating VOC emissions. 31 TEX. ADMIN. CODE § 115.10-936 (West Supp. 1993). The role of VOCs and NO<sub>x</sub> in ozone formation is still being debated in the scientific community.

70. The number of cities that do not meet nitrogen oxide NAAQS standards is much smaller than those not meeting ozone standards. G.M. Beshouri, Successful Field Emissions Testing of Reciprocating Engines, Speech at the 7th Annual Reciprocating Machinery Conference (Sept. 22, 1992).

71. Engines running at stoichiometric (the ideal air/fuel ratio) emit maximum levels of NO<sub>x</sub> emissions. See *id.*

72. See 31 TEX. ADMIN. CODE §§ 101.1, 115.10 (West Supp. 1993). VOCs have been defined as all hydrocarbon vapors excluding methane, ethane, and several other less common hydrocarbon compounds. *Id.* § 115.10. VOCs are also defined to exclude carbon monoxide and carbon dioxide emissions. *Id.*

73. See EPA, DRAFT REPORT, THE ROLE OF OZONE PRECURSORS IN TROPOSPHERIC OZONE FORMATION & CONTROL § 3.4.3 (1993) [hereinafter EPA DRAFT REPORT]; WEAVER & TURNER, *supra* note 44, at 2.

74. While catalytic convertors are found on almost all on-road vehicles, off-road mobile sources such as boats, lawn mowers, and construction equipment, generally do not have such devices. WEAVER & TURNER, *supra* note 44, at 17.

75. *Id.*

One of the major benefits of using alternative fuels such as methanol or natural gas is that they emit fewer VOCs or heavier hydrocarbons. Moreover, the VOCs that are emitted have lower photochemical or ozone creating reactivity.<sup>76</sup> Pipeline quality natural gas is composed primarily of non-ozone reactive methane and, to a lesser extent, ethane. By definition, these elements are not considered VOC emissions.<sup>77</sup>

The rate of ozone formation depends on many factors, including the presence of sunlight and warm temperatures, stagnant air, the absence of precipitation, the reactivity of the VOCs, and the ratio of the VOCs to NO<sub>x</sub>.<sup>78</sup> Due to the requirement of warm temperatures, most of the problems with air quality occur during the "ozone season" from May through September.

Initially, regulatory controls on hydrocarbon vapors such as VOCs were emphasized in the attempt to control ozone formation. Studies indicate that VOC reductions in ambient air generally reduce ozone levels, although the degree of reduction can be minimal. Unlike VOC reductions, in some cases a slight reduction in NO<sub>x</sub> emissions may actually accelerate ozone formation, although substantial reductions in NO<sub>x</sub> emissions will always reduce ozone concentrations.<sup>79</sup> Regulators have recently focused on the role nitrogen oxides play in ozone creation in many areas.<sup>80</sup>

Recent studies indicate that the ratio of VOC to NO<sub>x</sub> in the ambient air may determine the most effective control measures that can be implemented to address the air quality problem in non-attainment areas.<sup>81</sup> In areas where the VOC/NO<sub>x</sub> ratios are relatively large, models indicate that ozone formation is NO<sub>x</sub> limited; therefore, NO<sub>x</sub> controls are more effective in controlling ozone.<sup>82</sup> In non-attainment areas where the VOC/NO<sub>x</sub> ratios are relatively low, VOC controls are generally believed to be more effective.<sup>83</sup>

In Texas, the VOC/NO<sub>x</sub> ratios in Houston/Galveston, El Paso, and Beaumont/Port Arthur are relatively high. This indicates that NO<sub>x</sub> controls will be most effective in these areas. In Dallas/Fort Worth, on the other hand, the ratio is relatively low. This ratio tends to indicate that regulation of VOC emissions will be more effective in reducing ozone concentrations in that area.<sup>84</sup> Because the VOC/NO<sub>x</sub> ratio varies from area to area, the vari-

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76. *Id.* at 13. Gasoline powered vehicles emit reactive VOCs including benzene, toluene, xylene, ethylene, and butadiene. All are at least 100 times more ozone reactive than methane, the main constituent of natural gas.

77. Pipeline quality natural gas is usually 90% or more methane, with a small fraction (five percent or less) ethane, although gas composition can vary widely. DESHAZO, STAREK & TANG, INC., ENERGY AND ENVIRONMENT IMMEDIATE ACTION PLAN FOR ALTERNATIVE FUELS FOR THE DALLAS/FORT WORTH NON-ATTAINMENT AREA (1993) (draft report prepared for the North Central Texas Council of Governments).

78. See EPA DRAFT REPORT, *supra* note 73, § 2.2.2.

79. *Id.*

80. *Id.* § 3.8.3.

81. *Id.* § 2.2.2.

82. ENVIRONMENTAL STRATEGIES, *supra* note 6, at 14.

83. *Id.*

84. The EPA noted in a recent report that Urban Airshed Modeling of air quality indicates that VOC controls may be effective in controlling ozone formation in Dallas/Fort Worth and stringent NO<sub>x</sub> regulations may not be necessary. EPA DRAFT REPORT, *supra* note 73, § 3.8.3. The Texas Natural Resource Conservation Commission recently adopted strict NO<sub>x</sub>

ous controls that are adopted reflect the most efficient means to control ozone levels.

## VI. OZONE EMISSION SOURCES

In determining what regulatory controls will be effective in reducing ozone formation, it is necessary to estimate the VOC and NO<sub>x</sub> emission levels from various sources in non-attainment areas. Once these emission levels are established, controls can be applied to those sources that are the major contributors of ozone precursors. Five separate categories of VOC and NO<sub>x</sub> emission sources have been identified.<sup>85</sup>

Point sources have been defined as stationary commercial, institutional, or industrial sources that emit significant amounts of NO<sub>x</sub> or VOCs.<sup>86</sup> In ozone non-attainment areas, the owner or operator of a point source must submit an annual emission inventory. These inventories are used to establish emission estimates.<sup>87</sup> Failure to submit point source emissions inventory data can result in formal enforcement action and possible criminal penalties.<sup>88</sup>

Area sources are typically non-stack commercial or public facilities where the pollutant is released from the facility as a byproduct of product manufacturing or through the storage, transfer, or application of products. These emission levels are generally below point source levels and are relatively small and numerous making them difficult to identify individually.<sup>89</sup> To quantify the amount of emissions from area sources, an estimated emission factor for specific facilities is multiplied by the frequency of activity in the area.<sup>90</sup> For example, to estimate the quantity of emissions from dry cleaners, the number of dry cleaners in an ozone non-attainment area is multiplied by the estimated emission factor for dry cleaners. Emissions from point and area sources are sometimes jointly referred to as emissions from stationary sources.<sup>91</sup>

The third major source, on-road mobile source emissions, originates from internal combustion engines used in automobiles, trucks, motorcycles, and other forms of transportation on public highways.<sup>92</sup> To estimate emissions

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controls for the Houston/Galveston and the Beaumont/Port Arthur areas. See 18 Tex. Reg. 3409 (1993) (to be codified at 31 TEX. ADMIN. CODE § 117.1-.4).

85. REVISIONS TO SIP, *supra* note 65, at 20.

86. *Id.* Many times point source emissions will be from a stack or fixed exhaust vent.

87. 31 TEX. ADMIN. CODE § 101.10 (West Supp. 1993). The operator must certify that the information contained in the emission inventory is true and correct. Recent studies, however, indicate that emission inventories may significantly underestimate actual emission rates. See, e.g., EPA DRAFT REPORT, *supra* note 73, § 3.4.1.

88. 31 TEX. ADMIN. CODE § 101.10(f) (West Supp. 1993).

89. Examples of area sources include gasoline stations, printers, and dry cleaners. Application of oil based house paints or industrial coatings also constitutes an area source.

90. REVISIONS TO SIP, *supra* note 65, at 22.

91. The term stationary source can be interpreted narrowly or broadly by the EPA depending on the policy objective being pursued. In some cases, a stationary source may be defined to include all equipment located at a facility and, in others, it may be defined as a discrete piece of equipment. See *Chevron U.S.A. v. Natural Resources Defense Council*, 467 U.S. 837, 851 (1984); see also 42 U.S.C. § 7602(z) (Supp. III 1991).

92. REVISIONS TO SIP, *supra* note 65, at 22.



from these sources, various factors such as vehicle speeds, miles traveled, road types, vehicle types, and cold start percentages are fed into the EPA's current mobile emission model.<sup>93</sup>

The fourth major source is off-road mobile source emissions. This includes military, commercial and general aircraft, railroad locomotives, lawn mowers, chain saws, construction equipment, and other non-road engines. Aircraft emissions are estimated from takeoff and landing data. Emissions for other off-road sources are estimated by engine population and use estimates developed from area surveys.<sup>94</sup>

Last, biogenic emission sources include all types of plant life that emit VOCs. Satellite imaging is used to map vegetative types, then emission factors are applied for those plants in a computer model to estimate emission factors from this source.<sup>95</sup> Historically, the consensus was that biogenic emissions did not play a significant role in ozone formation. More recent studies indicate, however, that emissions from this source may reduce the effectiveness of controls in some situations.<sup>96</sup>

## VII. STATE IMPLEMENTATION PLANS (SIPs)

While the EPA sets national air quality standards for criteria pollutants such as ozone and requires certain regulatory actions under the Clean Air Act Amendments, each state is responsible for adopting rules and regulations to achieve and maintain federal air quality standards.<sup>97</sup> The state's plan for achieving compliance with these standards is known as the state implementation plan (SIP).<sup>98</sup> To maintain air quality, the SIP must anticipate and offset any new increases in criteria pollutants that may occur due to population growth, motor vehicle activity, or industrial activity.<sup>99</sup> When national NAAQS standards are revised, advances are made with regard to technical emission controls or when it is determined that the SIP is not maintaining or attaining air quality standards, the state's SIP plan must be revised.<sup>100</sup>

The state must demonstrate that the measures, rules, and regulations contained in the SIP are adequate to meet and maintain NAAQS standards.<sup>101</sup> In non-attainment areas the SIP must provide for reasonable further progress (RFP) in achieving annual incremental reductions in relevant air pollu-

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93. *Id.* at 22-23. The EPA's model has been designated "MOBILE5a." *Id.* at 22.

94. *Id.* at 23-24.

95. *Id.* at 24.

96. See EPA DRAFT REPORT, *supra* note 73, § 3.5.3.

97. 42 U.S.C. § 7407(a) (1988). In Texas, the Texas Air Control Board historically has been responsible for regulating and maintaining air quality. On September 1, 1993, the Texas Air Control Board was abolished and its responsibility assumed by the Texas Natural Resource Conservation Commission. TEX. HEALTH & SAFETY CODE ANN. § 381.002 (Vernon 1992).

98. 42 U.S.C. § 7407(a) (1988). The Texas SIP is located at 40 C.F.R. § 52.2270 (1992).

99. 40 C.F.R. § 51.110 (1992) (emission control strategies).

100. 42 U.S.C. § 7410(a)(2)(H), (k)(5) (Supp. III 1991); 40 C.F.R. § 51.104 (1992).

101. 40 C.F.R. § 51.112(a) (1992); *Environmental Resources v. United States*, 932 F.2d 269, 272 (3d Cir. 1991).

tants.<sup>102</sup> In addition, the SIP should provide for an accurate inventory of actual emissions of the criteria pollutant in the non-attainment area. By statute, the SIP must contain enforceable emission limitations, control measures, methods of monitoring ambient air quality, air quality modeling or analysis, enforcement for non-compliance, permit programs for stationary sources, local government participation, and sufficient staff and funding to implement the SIP provisions.<sup>103</sup>

While the state is primarily responsible for drafting the SIP, local governments and regional agencies or planning organizations should also be consulted regarding the SIP provisions.<sup>104</sup> Local health departments in non-attainment areas assist in air quality monitoring in Texas. Additionally, regional planning agencies have been delegated much of the responsibility for planning and implementing actions dealing with transportation control measures.<sup>105</sup>

To a large extent states have the power to determine which sources will be burdened by emission restrictions and the regulatory mix it deems best suited to the particular situation.<sup>106</sup> The ultimate effect of the SIP, regardless of the regulatory plan, must be to meet NAAQS.<sup>107</sup> Emission controls can be imposed on mobile, stationary, or area sources, depending on the nature and severity of the air quality problems.<sup>108</sup>

Prior to submitting or revising a SIP the state must have a hearing on the merits of the proposed SIP provisions or revisions.<sup>109</sup> These state hearings are generally considered rule making hearings and are not adjudicatory in nature. As such, they require adequate notice of the proposed action to all interested parties.<sup>110</sup>

The EPA Administrator has the authority to approve or disapprove the SIP in whole or in part.<sup>111</sup> The EPA is not bound by a state's conclusion that a SIP will timely meet federal air quality standards, but the EPA cannot

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102. 42 U.S.C. § 7502(a) (1988).

103. 42 U.S.C. §§ 7410-7502 (1988).

104. 42 U.S.C. § 7504(a) (1988).

105. REVISIONS TO SIP, *supra* note 65, at 17. In Dallas/Fort Worth the North Central Council of Governments and in Houston/Galveston the Houston-Galveston Area Council have compiled data and conducted computer modeling to evaluate the effectiveness of various transportation control measures.

106. *Union Elec. Co. v. EPA*, 427 U.S. 246, 252 (1976); *Hancock v. Train*, 426 U.S. 167, 170 (1976).

107. *Train v. Natural Resources Defense Council*, 421 U.S. 60, 78 (1975).

108. Because motor vehicles move in interstate commerce and emissions affect national air quality levels, the EPA has authority to regulate local transportation activities. See *South Terminal Corp. v. EPA*, 504 F.2d 646, 676-77 (1st Cir. 1974); 61A AM. JUR. 2D *Pollution Control* § 75 (1981).

109. 42 U.S.C. § 7410(a)(1), (l) (Supp. III 1991); 40 C.F.R. § 51.102 (1992).

110. 42 U.S.C. § 7410(a)(1); *Appalachian Power Co. v. EPA*, 579 F.2d 846, 850 (4th Cir. 1978).

111. 42 U.S.C. § 7410 (1988 & Supp. III 1991). In some cases the EPA Administrator can partially approve a SIP or modification to a SIP. See 42 U.S.C. § 7410(k)(3) (Supp. III 1991); *Public Serv. Co. v. EPA*, 682 F.2d 626, 632 (7th Cir. 1982), *cert. denied*, 459 U.S. 1127 (1983); *Seabrook v. EPA*, 659 F.2d 1349, 1357 (5th Cir. 1981), *cert. denied*, 459 U.S. 822 (1982).

arbitrarily reject the state's SIP.<sup>112</sup> After the EPA approves the plan, the regulations are published in the Federal Register.<sup>113</sup>

The courts have recognized that compliance requirements contained in the Act may require the development of pollution control devices that may, at the time of the preparation of the SIP, appear economically or technologically infeasible. Therefore, the EPA cannot reject a SIP because of these factors.<sup>114</sup> States that do not timely submit a SIP, or states whose SIPs are not approved by the EPA, may be subject to federal regulation under a federal implementation plan (FIP).<sup>115</sup>

### VIII. THE ROLE OF AIR QUALITY MODELING ON SIP PROVISIONS

Until a SIP is implemented, the actual effect of its rules and regulations on air quality is unknown. To address the uncertainty inherent in rule making, air quality models are used to assess the impact of potential regulations. In most cases, computer dispersion models predict what air quality levels will exist after emission controls have been implemented.<sup>116</sup> Such models are complex mathematical equations that simulate emission sources, terrain, meteorology, and other factors to predict pollutant concentrations.<sup>117</sup> Results from the model can be used to assess the relative benefits of various control measures, perform exposure analysis, assess the impact on other pollutants, and evaluate the costs and benefits of alternative regulatory programs. The 1990 amendments require that the state demonstrate that provisions contained in a proposed SIP will effectively address air quality issues. SIP demonstrations require that air quality modeling be performed as prescribed by the EPA, with details of such modeling provided to the EPA upon request.<sup>118</sup> Upon application to the EPA, the states can use equivalent modeling procedures for the purpose of demonstrating reasonable further progress in achieving air quality goals in non-attainment areas unless these techniques are proven to be less effective than the methods specified by the EPA.<sup>119</sup>

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112. *Kennecott Copper Corp. v. Costle*, 572 F.2d 1349, 1354 (9th Cir. 1978); *South Terminal Corp. v. EPA*, 504 F.2d 646 (1st Cir. 1974).

113. 42 U.S.C. § 7410(h) (1988).

114. *Union Elec. Co. v. EPA*, 427 U.S. 246, 258 (1976). A source may be exempted or may obtain a variance from some conditions under the provisions of the Act, or otherwise receive special treatment under the plan. *National Steel Corp. v. Gorsuch*, 700 F.2d 314, 324 (6th Cir. 1983).

115. 42 U.S.C. § 7410(c) (1988 & Supp. III 1991). Once a state's SIP is rejected, the EPA is under an obligation to prepare a federal plan within two years unless the state corrects the deficiency. See 42 U.S.C. § 7410(c); *Wisconsin v. Thomas*, 19 *Env'tl. L. Rep. (Env'tl. L. Inst.)* 20,964 (E.D. Wis. 1989).

116. 42 U.S.C. § 7410(a)(2)(k) (Supp. III 1991). To assure the model is as accurate as possible, it is important to insure that air quality data being used as an input by the model is detailed and correct. Input data for the models originates from emission inventory data submitted periodically to the Texas Natural Resource Conservation Commission, estimated emission rates, and testing and monitoring data.

117. Section 7620 provides that periodic conferences are to be held with the goal of standardizing air quality modeling. 42 U.S.C. § 7620 (1988).

118. 42 U.S.C. § 7410(a)(2)(k) (Supp. III 1991).

119. 42 U.S.C. § 7502(c)(8) (Supp. III 1991).

Generally, in matters of technical complexity or specialization the courts defer to an agency's expertise in making such decisions.<sup>120</sup> Due to the complexity of modeling, and the fact that the EPA relies on such information when drafting or approving regulations, numerous lawsuits have challenged modeling methods and the EPA's reliance on these models. When using models, the EPA must demonstrate that the use and results of such modeling is not arbitrary and capricious. Case law is split, however, on whether the model has to be verified by comparing modeling predictions with actual air quality.<sup>121</sup> At least one case states that instead of deferring to the EPA's decisions on modeling, the legislative history of the Clean Air Act of 1970 requires a review of modeling and testing procedures, meteorological and topographic factors, empirical testing, and general validation of the model.<sup>122</sup>

With regard to ozone air quality monitoring, the EPA requires the use of the Urban Airshed Model (UAM) photochemical grid dispersion model, or similar models to demonstrate SIP effectiveness.<sup>123</sup> The Texas Natural Resource Conservation Commission is currently utilizing the EPA's UAM in ozone non-attainment areas to predict air quality changes in response to emission controls.<sup>124</sup> The UAM is a quantitative, state-of-the-art computer model that will enable the agency to evaluate the effects of various combinations of control measures on ozone concentrations.<sup>125</sup> By using the UAM, analysts can predict air quality in a given non-attainment area under a number of regulatory scenarios. The results of such modeling can give the agency some idea of which controls will most effectively reduce ozone formation.

#### IX. THE REGULATORY IMPACT OF THE OZONE NON-ATTAINMENT DESIGNATION

When an area has been designated as an ozone non-attainment area, the Clean Air Act imposes a timetable during which regulatory actions must be taken in an attempt to address the air quality issues.<sup>126</sup> These requirements

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120. See *Vermont Yankee Nuclear Power Corp. v. Natural Resources Defense Council*, 435 U.S. 519, 525 (1978).

121. *Ohio v. EPA*, 784 F.2d 224, 230 (holding that use of model results was arbitrary), *aff'd on reh'g*, 798 F.2d 880 (6th Cir. 1986); *Cincinnati Gas & Elec. Co. v. EPA*, 578 F.2d 660 (6th Cir. 1978) (holding use of model arbitrary), *cert. denied*, 439 U.S. 1114 (1979).

122. *Ohio*, 784 F.2d at 231.

123. See 42 U.S.C. § 7511a(c)(2)(A) (Supp. III 1991); 18 Tex. Reg. 3410 (1993). A photochemical grid model such as the UAM (or other analytical methods approved by the EPA) is required by the EPA in order to demonstrate attainment of the ozone NAAQS in areas classified as serious, severe, and extreme non-attainment areas. The EPA is currently conducting studies to improve the UAM.

124. For a discussion of the use of computer models to predict air quality, see William B. Johnson, Annotation, *Application of Air Quality Modeling to Decision Making Under Clean Air Act*, 84 A.L.R. FED. 710 (1987).

125. See 18 Tex. Reg. 4449 (1993) (prop. to be codified at 31 TEX. ADMIN. CODE § 101.1) (Tex. Nat. Resource Conservation Comm'n); 18 Tex. Reg. 3409-10 (1993) (discussion of UAM in rule preamble).

126. Since passage of the 1970 Clean Air Act Amendments, efforts to control ozone have failed to meet legislated deadlines three times. Congress set 1975 as the first deadline, but two

include mandated VOC reductions, technology-based emission standards, offsets to new emissions in a non-attainment area, and inspection and maintenance programs for mobile sources.<sup>127</sup> Regulatory controls adopted to address air quality problems in a given non-attainment area are contained in the state's SIP. In Texas, many of the following controls will be required in the non-attainment areas. Texas's SIP will be revised to include these programs.

#### A. RACT CONTROLS FOR EXISTING SOURCES

All major stationary emission sources now located in ozone non-attainment areas must meet technology based emission levels defined as reasonably available control technology (RACT) standards.<sup>128</sup> These standards are defined as the lowest emission limit that a particular source can meet by application of control technology that is reasonably available considering the technological and economic feasibility of such equipment.<sup>129</sup>

RACT controls are to be applied to both VOC and to NO<sub>x</sub> emissions. In determining the appropriate RACT standards, the costs of emission controls can be considered in deciding what is reasonable. Historically, when reviewing RACT control technology, a cost of emission reduction of between \$300 and \$3000 per ton was considered reasonable.<sup>130</sup>

Rules imposing RACT standards for sources emitting nitrogen oxide have recently been issued for the Houston/Galveston and the Beaumont/Port Arthur ozone non-attainment areas.<sup>131</sup> RACT standards for nitrogen oxide emissions in Dallas/Fort Worth are expected to be adopted in 1994.

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years after this deadline, many areas were still in violation. The 1977 amendments to the Clean Air Act extended the deadline for compliance to 1982 and allowed certain areas that could not meet the 1982 deadline to have until 1987 to comply. In 1987, however, more than 60 areas still exceeded the NAAQS. At the time of the 1990 amendments, which set new attainment dates depending on the severity of the ozone air quality problem, 98 areas were in violation of air quality standards.

127. The severity of the non-attainment area's classification determines which controls are mandated. *See* 42 U.S.C. § 7511a (Supp. III 1991).

128. 42 U.S.C. § 7502(c)(1) (Supp. III 1991). A source is designated as major if its emissions exceed certain levels. The state has the responsibility of establishing RACT guidelines, which are subject to EPA review. *See* National Steel Corp. v. Gorsuch, 700 F.2d 314, 322 (6th Cir. 1983).

129. *See* ARARs FACT SHEET, *supra* note 47, at 13. With regard to meeting secondary NAAQS standards, 40 C.F.R. § 51.100(o) (1992) defines RACT as "devices, systems process modifications, or other apparatus or techniques that are reasonably available taking into account (1) the necessity of imposing such controls in order to attain and maintain [NAAQS], (2) the social, environmental, and economic impact of such controls, and (3) alternative means of providing for attainment and maintenance of such standards." *Id.*

130. Interview with Dr. Parnell, Texas Air Control Board member (Aug. 1993); *see also* 45 Fed. Reg. 59,329, 59,331 (1980) (codified at 40 C.F.R. pt. 52). Depending on the site specific conditions, RACT can differ for similar sources.

131. *See* 18 Tex. Reg. 3409 (1993). Industry sources and the Texas Natural Resource Conservation Commission expect that compliance with the RACT standards will be quite costly. Rules for the Dallas/Fort Worth ozone non-attainment area will be prepared after a study of that area is completed. The Texas Natural Resource Conservation Commission is using the EPA's UAM.

## B. LAER CONTROLS FOR NEW OR MODIFIED SOURCES AND NEW SOURCE REVIEW (NSR)

New stationary emission sources to be built in non-attainment areas, or stationary sources that undergo a major modification, will be subject to a permit review process known as New Source Review (NSR) if the emission increases exceed certain levels. In Houston/Galveston, El Paso, and Beaumont/Port Arthur, a major modification of an existing source requiring NSR occurs if emissions from the source are increased more than twenty-five tons per year. In Dallas/Forth Worth, a major modification occurs if emissions increase more than forty tons per year.<sup>132</sup> When determining whether an emission increase from a modified source qualifies as a major modification, all increases and decreases in emissions during the five year period prior to the modification until the start of operation of the modified facility are included in the calculation.<sup>133</sup> The summation of all of the emission increases and decreases from the source over this time period to determine if NSR is required is referred to as emissions "netting."

The NSR standards require that the new or modified source must meet the lowest achievable emissions rate (LAER), as defined by the Act.<sup>134</sup> LAER is a technology-based standard that is defined as the most stringent emission limitation contained in regulations applicable to that source, or the most stringent limitation that is achieved in practice for such source.<sup>135</sup> LAER is generally reviewed on a case-by-case basis during preconstruction permit review.<sup>136</sup> The applicant must demonstrate compliance with LAER. Cost/benefit analysis is not considered in establishing these controls. As such, cost cannot be a basis for determining that an emission limitation is not achievable.<sup>137</sup>

If a new or modified emission source is subject to NSR, it will be required to implement LAER technical standards and will be subject to the extensive NSR process and permitting requirements. As such, an existing source can take advantage of decreases in emissions from portions of a facility to offset any new emissions in the netting calculations so as to avoid NSR.

## C. OFFSET REQUIREMENTS

If NSR is required due to increased emissions from a facility, any new emissions from new or modified sources in a non-attainment area must be offset with decreases in emissions from existing sources in that non-attain-

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132. The amount of emission increase to be considered a major modification and thus trigger NSR will vary depending on the severity of the ozone non-attainment area classification. See NON-ATTAINMENT NEW SOURCE REVIEW MANUAL, *supra* note 58, at 5.

133. The period during which all increases and decreases in emissions are calculated is referred to as the contemporaneous period. The requirement that all emissions be included during this period prevents sources from increasing emissions in small increments, thereby avoiding NSR provisions. See *id.* at 8.

134. 42 U.S.C. § 7503(a)(2) (1988); 40 C.F.R. § 52.21 (1992).

135. 42 U.S.C. § 7501(3) (1988).

136. ARARS FACT SHEET, *supra* note 47, at 11.

137. See NON-ATTAINMENT NEW SOURCE REVIEW MANUAL, *supra* note 58, at 15.

ment area.<sup>138</sup> When an offset is required in a non-attainment area, the offsetting decrease in emissions must exceed the expected increased emissions by a certain percentage.<sup>139</sup> For example, when a new source intends to locate in the Houston/Galveston area and predicts it will emit 100 tons per year of nitrogen oxide, that source must find 130 tons per year of nitrogen oxide emission decreases in that area before a permit will be issued. The net effect of the offset will be to decrease emissions in that area. If federal air quality levels are not timely met, the offset requirement can be increased substantially.<sup>140</sup>

#### D. FEDERAL OPERATING PERMITS FOR MAJOR SOURCES

Classification of the non-attainment area as moderate, serious, or severe will also determine the amount of pollutants that can be emitted before a facility becomes classified as a major source and is required to obtain a federal operating permit.<sup>141</sup> The operating permit program also applies to sources in attainment areas, but much smaller emission sources will be regulated in non-attainment areas.

A major source will be required to pay annual emission fees on criteria pollutants and will be required to obtain a federal operating permit.<sup>142</sup> The operating permit will require emissions monitoring, reporting, and record keeping.<sup>143</sup> The higher the concentration of ozone and the more serious the classification of the non-attainment area, the smaller the level of emissions will be before an emission source is defined as major and therefore subjected to the rigorous permitting procedure. Major sources are defined as those sources with the potential to emit more than 10 tons per year (tpy) in extreme non-attainment areas, 25 tpy in severe areas (e.g., Houston/Galveston), 50 tpy in serious areas (e.g., Beaumont/Port Arthur and El Paso), and 100 tpy in marginal or moderate areas (e.g., Dallas/Fort Worth). Proposed Texas rules provide that the potential to emit may be reduced by maintaining a certified registration of emissions document at the emission site.<sup>144</sup>

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138. See 42 U.S.C. § 7503(c) (1988) (providing general offset requirements in ozone non-attainment areas); 42 U.S.C. § 7511a (Supp. III 1991) (stating specific offset requirements in ozone non-attainment areas).

139. The percentage of offset will depend on the area's ozone non-attainment classification. In Houston/Galveston the offset ratio is 1.3:1; in El Paso and Beaumont/Port Arthur the offset ratio is 1.2:1; and in Dallas/Fort Worth the offset ratio is 1.15:1. See NON-ATTAINMENT NEW SOURCE REVIEW MANUAL, *supra* note 58, at 32.

140. 42 U.S.C. § 7509(b) (Supp. III 1991).

141. 42 U.S.C. § 7511(a) (Supp. III 1991).

142. Under the 1990 Amendments, the emission fee per ton per year must be at least \$25. See 42 U.S.C. § 7661a(b)(3)(B) (Supp. III 1991). As recently as 1993, these fees were only five dollars per ton per year in Texas. See 18 Tex. Reg. 2935 (1993). Revenues generated by the emission fees will be used to fund the federal operating permit program.

143. Borrowing from the permitting procedure and requirements used by the Clean Water Act, the 1990 Amendments will limit emission levels in the operating permit and will also require the owner/operator to submit operating reports at least twice yearly. These reports can serve as an enforcement instrument for the Texas Natural Resource Conservation Commission, the EPA, or private parties pursuing enforcement actions.

144. The registration of emissions is for sources that have no other federally enforceable

The operating permit for a major source may require, as a condition of the permit, that the emissions be monitored. Any malfunction of the monitoring equipment may require the source to be shut down. Two types of emission monitoring can be required: (1) continuous emission monitoring (CEM) or (2) parametric emissions monitoring (PEM). CEM takes frequent samples of gas emissions and physically measures stack/exhaust emissions. PEM monitors ambient conditions and engine control systems and calculates emissions.<sup>145</sup> The operating reports must certify that the facility is in compliance with the operating permit and must be signed by a responsible corporate official. A permit will be valid for a period not to exceed five years. Such operating reports will be available under the Freedom of Information Act to any interested party. It is expected that the operating permit program will be complex, and the ease with which an agency could cancel or deny an operating permit will exert a strong influence on a source to comply.

#### E. INSPECTION/MAINTENANCE PROGRAM

In moderate to extreme ozone non-attainment areas, the EPA requires that a vehicle emission inspection and maintenance (I/M) program be implemented.<sup>146</sup> Moderate non-attainment areas must implement a basic I/M program. In more severe areas with populations in excess of 200,000, an enhanced I/M program will be required. Standards have been established for basic and enhanced I/M programs which may require centralized testing, extensive automation, extensive oversight, and enforcement provisions.<sup>147</sup> At a minimum, the I/M program will require an inspection to determine whether a catalytic convertor is in place, and will require tailpipe exhaust testing with the engine running at idle.<sup>148</sup>

#### F. CLEAN FUEL FLEETS PROGRAM

In serious, severe, or extreme ozone non-attainment areas, the SIP should be revised to establish a clean fuel fleet program.<sup>149</sup> The purchase requirements of the program will begin in 1998 and will apply to those fleets that contain any combination of ten or more covered light-duty vehicles, light-duty trucks, or light- or medium-heavy-duty vehicles. Beginning in 1998, thirty percent of new vehicles purchased by centrally-fueled fleets in certain cities will be required to use clean fuels and meet tailpipe standards that are

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emission limit. An emission source that is running only at part capacity and is considered a major source because of its potential to emit can use this registration to exempt itself from the operating permit requirement.

145. CEM generally is more accurate since it actually measures the exhaust gasses, but has higher capital and operating costs, may be unreliable, complex, and prone to failure or downtime. PEM, on the other hand, has lower capital and operating costs and is more reliable, but the data may not be as accurate. The EPA will issue rules on emission monitoring requirements under the operating permit in the near future.

146. 42 U.S.C. § 7511a(b)-(d) (Supp. III 1991); REVISIONS TO SIP, *supra* note 65, at 87.

147. 47 Fed. Reg. 52,987 (1992) (to be codified at 40 C.F.R. § 51.350-.373).

148. *Id.*

149. 42 U.S.C. § 7511a (Supp. III 1991).



lower than those in place for general passenger cars.<sup>150</sup> The purchase requirement will grow to seventy percent by the year 2000. The program is intended to stimulate development of new, low-polluting fuel/vehicle combinations.

#### G. EMPLOYEE TRIP REDUCTIONS

In severe and extreme ozone non-attainment areas, employers of more than 100 persons at any one site must implement an employee trip reduction program.<sup>151</sup> In Texas, the only area subject to these provisions is Houston/Galveston. This program is aimed at increasing occupancy per vehicle by encouraging carpooling, vanpooling, and the use of public transportation.

#### H. FEDERAL MOTOR VEHICLE CONTROL PROGRAM

The emission standards for conventional vehicles will be tightened, with the new emissions standards to be phased in between 1994 and 1996.<sup>152</sup> The EPA is required to study whether even tighter standards are needed, technologically feasible, and economical. If the EPA determines by 1999 that lower standards are warranted, the standards will be cut in half beginning with 2004 model year vehicles.

#### I. VOC MANDATED REDUCTION

In moderate to extreme ozone non-attainment areas, the 1990 Clean Air Act Amendments require states to implement regulations to achieve a fifteen percent reduction in VOC emissions.<sup>153</sup> Emission levels must be reduced below the VOC emission levels that existed in the area during the 1990 calendar year. These VOC reductions are to occur by November 15, 1996. In serious and severe non-attainment areas, VOC and/or NO<sub>x</sub> emissions must also be reduced by three percent per year after 1996 until the attainment deadline.<sup>154</sup>

Since VOC emission levels generally grow with the population and level of economic activity, the 1990 Clean Air Act Amendments' mandated fifteen percent reduction from 1990 levels by 1996 must account for growth.<sup>155</sup> Be-

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150. The new on-road mobile source emissions standards for clean fuel vehicles are 0.075 gram per mile (gpm) hydrocarbons, 3.4 gpm carbon monoxide, and 0.2 gpm nitrogen oxides. EPA, *MOTOR VEHICLES AND THE 1990 CLEAN AIR ACT* 4 (1993).

151. See 42 U.S.C. § 7511a(d)(1)(A) (Supp. III 1991).

152. Current tailpipe standards for cars are 0.41 gram per mile (gpm) total hydrocarbons, 3.4 gpm carbon monoxide, and 1.0 gpm nitrogen oxides. Lower standards of 0.25 gpm non-methane hydrocarbons and 0.4 gpm nitrogen oxides (the 3.4 gpm standard for carbon monoxide does not change) will be phased in beginning in 1994. EPA, *MILESTONES IN AUTO EMISSIONS CONTROL* (1993).

153. 42 U.S.C. § 7511a(b)-(e) (Supp. III 1991). The 1990 Clean Air Act Amendments did not mandate any specific percentage reduction in NO<sub>x</sub> emissions. The percentage reduction for VOCs is required only from anthropogenic (man-made) emission sources (point, area, on-road, and off-road). Biogenic (naturally occurring) sources are not included.

154. The attainment deadline is the year 2007 for severe areas such as Houston/Galveston, 1999 for serious areas such as El Paso and Beaumont/Port Arthur, and 1996 for Dallas/Fort Worth. REVISIONS TO SIP, *supra* note 65, at 6.

155. *Id.*

cause VOC emissions have increased since 1990 in the Texas' four ozone non-attainment areas, it has been estimated that the actual emission reductions required to meet the statutory mandate exceed twenty-seven percent from current levels in Dallas/Fort Worth,<sup>156</sup> twenty-six percent in El Paso,<sup>157</sup> twenty-two percent in Houston/Galveston,<sup>158</sup> and seventeen percent in Beaumont/Port Arthur.<sup>159</sup>

Texas plans to submit proposed SIP revisions to the EPA in two phases. Phase I will consist of a core set of rules, which comprise at least seventy percent of the required VOC emission reductions.<sup>160</sup> Phase II will consist of rules to obtain any additional required reductions, as well as additional contingency measures.<sup>161</sup> Although numerous regulations to reduce VOC emissions will be adopted under the revised Texas SIP, a select few discussed below will result in the majority of the emission reductions.

### 1. Inspection and Maintenance Programs to Reduce VOC Emissions

Substantial enhancements to the existing I/M programs for on-road mobile sources in ozone non-attainment areas will be required under the revised Texas SIP.<sup>162</sup> Under the 1990 Amendments, El Paso and Houston/Galveston must implement an enhanced I/M program, while Dallas/Fort Worth and Beaumont/Port Arthur must implement only a "basic" program. Because elements of an enhanced I/M program will assist the Dallas/Fort Worth area in meeting air quality standards, some elements of the enhanced program will be adopted in that area. In the Dallas/Fort Worth and El Paso areas, the I/M program will be the largest contributor to the reductions in VOCs required under the 1990 Clean Air Act Amendments.<sup>163</sup> The large impact of the I/M program in these areas stems from the fact that a relatively large portion of emissions of ozone precursors comes from on-road mobile sources.<sup>164</sup>

The enhanced I/M program utilizes at least three distinct test elements.<sup>165</sup>

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156. *Id.* at 106.

157. *Id.* at 120.

158. *Id.* at 147.

159. *Id.* at 135.

160. *Id.* at 6. Phase I will be submitted to the EPA for its approval by November 15, 1993.

161. Phase II will be submitted to the EPA by November 15, 1994. Proposed rules to reduce VOCs include regulations on vent gas emissions, industrial wastewaters, municipal solid waste landfills, gasoline transfer operations, gasoline storage vessels, gasoline marketing, vehicle refueling operations, petroleum refining, solvent using processes, and gas utility engines (small bore). See 18 Tex. Reg. 4452 (1993) (prop. to be codified at 31 TEX. ADMIN. CODE § 115.10) (Tex. Nat. Resource Conservation Comm'n).

162. See 40 C.F.R. § 51.350 (1992) (discussing the I/M program).

163. In Dallas/Fort Worth, the I/M program is projected to account for around 35.2% of the VOC reductions required by the 1990 Clean Air Act Amendments, and in El Paso the I/M program is projected to account for 25.3% of such reductions. REVISIONS TO SIP, *supra* note 65, at 106, 120. In Houston/Galveston, the I/M program will contribute only 11.9% of the required reductions, and in Beaumont/Port Arthur only 8%. *Id.* at 135, 147.

164. *Id.* In Dallas/Fort Worth it is estimated that mobile source emissions account for 56.1% of ozone precursor emissions, and in El Paso such sources account for an estimated 49.4%. *Id.* at 106, 120. Mobile sources in Houston/Galveston (30.8%) and Beaumont/Port Arthur (15.2%) are much lower. *Id.* at 135, 147.

165. EPA, HIGH-TECH INSPECTION AND MAINTENANCE TESTS 1 (1993).

First, a tailpipe emission test is conducted on the vehicle. This test, designated as I/M240, differs from traditional I/M tests in that the vehicle is driven on a treadmill-like device called a dynamometer.<sup>166</sup> Most of the current I/M programs test emissions only while the vehicle is stationary and idling. During the I/M240 test, the vehicle accelerates and decelerates according to a pre-set schedule, and the dynamometer utilizes inertia flywheels to simulate a load on the engine that approximates normal driving conditions.<sup>167</sup> Unlike current I/M tests, the entire exhaust stream is captured and analyzed for VOCs, NO<sub>x</sub>, and carbon monoxide.

In addition to the I/M240 test, the enhanced I/M will include a purge test. Since 1971, fuel tanks on cars have been designed as a closed system so that vapors that evaporate from gasoline in the tank do not vent into the atmosphere. A canister collects such vapors, and they are drawn into the engine and burned in properly working systems. The purge test insures that vapors can move from the canister to the engine.<sup>168</sup> Lastly, a pressure test is conducted to insure that the fuel tanks and system are properly sealed so that vapors are not released into the atmosphere. Nitrogen or some other gas is injected into the fuel system at a low pressure, and the vehicle must maintain the pressure for two minutes to demonstrate system integrity.<sup>169</sup>

Both the basic and the enhanced program recommend centralized I/M testing. The programs also recommend that facilities conducting the testing be separated from facilities conducting the necessary repairs to failing vehicles.<sup>170</sup> In Texas, vehicles will be required to be tested every other year — even year models on even year dates and odd year models on odd year dates.<sup>171</sup> All vehicles registered in the ozone non-attainment area must be tested for emissions. Registration will be denied those vehicles that do not demonstrate that they have passed such inspections.<sup>172</sup> If the vehicle does not pass the emissions test, it must be retested after a specified period to insure that emission problems have been corrected, or a waiver can be requested.<sup>173</sup>

A minimum expense waiver can be granted if the vehicle fails a retest after the emission repair has been made. In Dallas/Fort Worth, at least \$200 must be spent on the emission repair work, the work must be done by a Texas Natural Resource Conservation Commission certified technician, and emissions must be reduced to some extent. Owners in Houston/Galveston

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166. *Id.* The "240" references the amount of time in seconds that the vehicle will be operated over a driving cycle.

167. *Id.* at 3. Certain older models will only be subject to a two-speed dynamometer test with emissions sampled at a simulated speed of 30 miles per hour and at idle. REVISIONS TO SIP, *supra* note 65, at 89.

168. EPA, HIGH-TECH INSPECTION AND MAINTENANCE TESTS 4 (1993).

169. *Id.* at 5.

170. 57 Fed. Reg. 52,987, 52,988-90 (1992) (to be codified at 40 C.F.R. § 51.351-.352).

171. REVISIONS TO SIP, *supra* note 65, at 87.

172. *Id.* The emissions test will be much like the insurance requirement; before registration of a vehicle proof of compliance will need to be shown.

173. 18 Tex. Reg. 4934 (1993) (prop. to be codified at 31 TEX. ADMIN. CODE § 114.3) (Tex. Nat. Resource Conservation Comm'n).

must spend at least \$450. A hardship waiver is available if the owner is below the poverty level, on food stamps, has an income of not more than forty percent of the median income in the area, and if at least \$150 was spent and the vehicle failed the retest. Last, a time extension waiver can also be obtained if the motorist can document that emission related repairs cannot be completed in a timely manner.<sup>174</sup>

### 2. Vapor Recovery Systems to Reduce VOC Emissions

Another mandatory regulation under the 1990 Clean Air Act Amendments requires the installation of vapor recovery systems at public and private fuel stations that dispense more than 10,000 gallons of gasoline per month in areas classified as moderate, serious, severe, or extreme non-attainment areas.<sup>175</sup> These systems, commonly referred to as Stage II vapor recovery systems, consist of vapor recovery tubes that surround the gas pump hose. The tubes collect the vapors emitted from the refueling activities and, when in correct working order, reduce emissions of ozone precursors by about ninety percent.<sup>176</sup>

Around 6000 refueling stations in Texas will be required to install Stage II systems.<sup>177</sup> The cost of such systems are borne by the owner of the refueling station. Estimates of the cost to install a Stage II recovery system per facility range anywhere from \$15,000 to around \$40,000.<sup>178</sup> Vapor recovery from refueling stations will play a major role in meeting the fifteen percent mandated VOC reduction requirement in the El Paso and Dallas/Fort Worth non-attainment areas.<sup>179</sup>

### 3. Reformulated Gasolines to Reduce VOC Emissions

The phase out of leaded gasoline that began in 1975 had a major impact on the formulation of gasolines.<sup>180</sup> To replace the octane that lead had contributed, refiners increased the concentration of high-octane hydrocarbons such as benzene, toluene, xylene, and other light hydrocarbons in the gasoline. Such substances increased the octane of the fuel, but created special environmental problems because these elements were much more reactive in

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174. *Id.* Dallas/Fort Worth will implement the inspection and maintenance plan by July 1, 1994, and Houston/Galveston will implement it by July 1, 1995.

175. Certain compliance extensions have been proposed for independent small business marketers of gasoline whose throughput is less than 50,000 gallons per month. REVISIONS TO SIP, *supra* note 65, at 80.

176. *Id.* at 82.

177. TEXAS AIR CONTROL BOARD BULLETIN 1 (No. 3 1993). Houston/Galveston will require systems on approximately 2955 facilities, Dallas/Fort Worth on 2038, and El Paso on about 400 facilities.

178. *Id.* at 6; Files, *supra* note 4, at D1. Failure to install or operate a Phase II system can result in a fine of \$25,000 per day and can result in the closing of the facility until compliance is achieved. REVISIONS TO SIP, *supra* note 65, at 82.

179. In El Paso, Stage II will account for 12.2% of the required reductions, and in Dallas/Fort Worth 8.7%. REVISIONS TO SIP, *supra* note 65, at 120 n.106. Houston/Galveston (5.2%) and Beaumont/Port Arthur (2.4%) are much lower. *Id.* at 136, 145.

180. WEAVER & TURNER, *supra* note 44, at 32. Leaded gasolines were phased out because lead inactivated the catalytic converters that were added to vehicles beginning that model year.

the formation of ozone.<sup>181</sup>

To address this problem, the 1990 Clean Air Act Amendments require that reformulated gasolines be utilized in certain severe or extreme ozone non-attainment areas by 1995.<sup>182</sup> These gasolines must contain a certain percentage of oxygen by weight and limited concentrations of benzene and heavy metals.<sup>183</sup> In addition fuel volatility, the tendency of fuel to evaporate, will be limited to certain levels in order to reduce emissions.<sup>184</sup>

Reformulated gasolines should emit at least twenty-five percent fewer VOCs than regular gasoline or comply with a strict formula limiting the constituents contained in the gasoline.<sup>185</sup> Although in some cases the cost of changing the refining process will be significant, reformulated gasolines will make a relatively significant contribution to VOC reductions in Dallas/Fort Worth, El Paso, and Houston/Galveston.<sup>186</sup>

#### 4. Fugitive VOC Emission Reductions

In some cases, emissions of ozone precursors occur indirectly as part of the industrial or commercial process, even though they are not emitted from a stack or vent. These indirect emissions are referred to as fugitive emissions and include releases from valves, pumps, storage tanks, and other equipment.<sup>187</sup> Because of the difficulty involved in actually measuring fugitive emissions, in most cases these emissions are estimated using accepted engineering formulas.<sup>188</sup> Reductions of fugitive emissions will play a major role in reducing VOC emissions in the Houston/Galveston and Beaumont/Port Arthur areas.<sup>189</sup>

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181. *Id.* Many of these substances are also considered air toxics and can contribute to health problems.

182. 42 U.S.C. § 7545(k)(6) (Supp. III 1991).

183. *Id.* § 7545(k)(3)(A)(i)-(v).

184. *Id.* § 7545(h). Volatility is measured by the Reid Vapor Pressure test — the higher the Reid Vapor Pressure, the more likely the hydrocarbons will evaporate. VOC emissions have dropped in many areas because the Reid Vapor Pressure has been decreased from 10.4 psi about 7.8 psi in warmer areas of the country. ENVIRONMENTAL STRATEGIES, *supra* note 6, at 29.

185. 42 U.S.C. § 7545(k)(3)(B)(i).

186. Reformulated gasoline will contribute 18.3% of the VOC reductions in Dallas/Fort Worth, in El Paso, 18.3%, and in Houston/Galveston, 10.0%. REVISIONS TO SIP, *supra* note 65, at 106, 120, 145.

187. The definition of fugitive emission found in the Texas Natural Resource Conservation Commission's rules is "[a]ny gaseous or particulate contaminant entering the atmosphere not passing through a stack, chimney, vent or other opening" designed to direct or control its flow. 31 TEX. ADMIN. CODE § 101.1 (West Supp. 1993).

188. Methodology contained in models referred to as OMISC, AP-42, and others are used to estimate fugitive emissions. TEXAS AIR CONTROL BOARD EMISSIONS INVENTORY WORKSHOP 4-40 (1993) (course materials).

189. In Houston/Galveston, reduction of fugitive emissions will contribute approximately 26% of the required VOC reductions and approximately 34% in Beaumont/Port Arthur. Emissions from gasoline storage vessels, petroleum refining, solvent using processes, and other activities will be affected by the rules. See 18 Tex. Reg. 4452 (1993) (prop. amend. to 31 TEX. ADMIN. CODE § 115.10) (Tex. Nat. Resource Conservation Comm'n).

### 5. *Catch-Up Controls on VOC Emissions*

Under the 1990 Clean Air Act Amendments, certain rural non-attainment areas that were exempt from RACT measures must now catch-up to those areas subject to these standards. In Texas, these catch-up controls will be most significant in Beaumont/Port Arthur, where they will meet around forty percent of the required VOC reductions.<sup>190</sup>

### 6. *Other Controls*

Various other control measures will assist in VOC reduction, including new regulations on vehicle exhaust emissions,<sup>191</sup> transportation control measures (TCMs),<sup>192</sup> industrial waste waters, landfills, auto refinishing shops, vessel loading, refineries, small gas utility engines, and employer trip reduction programs.<sup>193</sup> Additional rules will be implemented if necessary to reach the requirement that VOCs be reduced by fifteen percent. If required, the regulations will likely be more intrusive. Such rules may affect dry cleaners, bakeries, and landfills and may require more stringent transportation control measures such as car pooling and mass transit, among other things.

The fifteen percent reduction in VOCs in the state's four non-attainment areas as required by the 1990 Clean Air Act Amendments will not guarantee that ambient air quality will meet primary or secondary standards.<sup>194</sup> In Houston/Galveston, for example, the VOC/NO<sub>x</sub> ratio is very high, and the required reductions in VOCs are expected to have little impact on ozone formation. Ozone formation in high VOC/NO<sub>x</sub> areas is more NO<sub>x</sub> dependent; therefore, stricter emission limitations on NO<sub>x</sub> will be a more appropriate course of action by which to address air quality issues for that area.

## X. DRIVING AIR QUALITY ISSUES FOR THE STATE AND INDUSTRY IN TEXAS

The citizens and industry located in ozone non-attainment areas in Texas face major challenges in the next few years. First, as discussed in detail above, the state will be required to amend its SIP for non-attainment areas to

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190. Catch-ups will account for 7.4% of the VOC reductions in Houston/Galveston and less in the other non-attainment areas. See REVISIONS TO SIP, *supra* note 65, at 106, 120, 147.

191. Under the Federal Motor Vehicle Control Program (FMVCP) contained in the 1990 Clean Air Act Amendments, more stringent vehicle emission limitations are due to be phased in between 1994 and 1996. The EPA will determine by 1999 if such FMVCP standards should be reduced further.

192. TCMs must be studied in serious, severe, and extreme ozone non-attainment areas to reduce overall pollution from vehicle traffic. TCMs can include regulations such as restrictions on parking structures, mandatory rideshare programs, transit improvements, high occupancy vehicle facilities, and traffic signalization programs designed to eliminate congestion, improve traffic flow, and encourage non-automobile travel.

193. See 18 Tex. Reg. 4452 (1993) (prop. amend. to 31 TEX. ADMIN. CODE § 115.10) (Tex. Nat. Resource Conservation Comm'n).

194. See MARKETABLE PERMITS, *supra* note 4, at 2; ENVIRONMENTAL STRATEGIES, *supra* note 6, at 15; James Dodds, Texas Air Control Board, Speech at the ERC Emissions Workshop (Sept. 23, 1993).

insure VOC emissions are reduced fifteen percent below 1990 levels. In reality, such reductions will be much larger since they must account for economic growth.

Second, the state will have to adopt controls on emission sources to meet NAAQS for the four ozone non-attainment areas. These controls will, by necessity, go far beyond the controls now in place or the controls which have been proposed. For example, to control ozone formation in the Houston/Galveston area, some parties estimate that NO<sub>x</sub> emissions will need to be reduced fifty to ninety percent.<sup>195</sup>

Third, the state will have an interest in promoting economic growth in ozone non-attainment areas. Such growth will be impaired by offset requirements, strict and costly technology-based emission restrictions, permitting limitations and delays, traffic control measures, and other regulatory programs that are not required in areas meeting NAAQS. Because the cost of achieving NAAQS standards will be significant,<sup>196</sup> it is critical that air quality be achieved in the most cost effective manner. Emissions from many of the "easy" sources have already been regulated, and future controls are expected to be more intrusive and costly for both consumers and industry.

For industry located in non-attainment areas, there are also a number of major concerns. First, as discussed above, should a facility desire to locate or expand its operations in a non-attainment area such that emissions will be significantly increased, that facility will be required to obtain offset credits from sources whose emissions have decreased before a permit will be issued. These credits may be difficult to obtain, especially for industry new to the non-attainment area.

Second, minor modifications to facilities that in the past would not have subjected a source to the NSR process will now require the source to complete this review. Such a review will require the implementation of LAER technology<sup>197</sup> and will require offsets for emission increases. To the extent that industry must meet the offset requirements and the requirement for costly control mechanisms, the expansion of current facilities will be discouraged.

Third, an operating permit may be required for relatively small emission sources in non-attainment areas and will in some cases present these sources with compliance issues and costs that would not be faced in attainment areas. An additional compliance issue arises with regard to the RACT technology-based emission limitations that will be imposed on existing sources in non-attainment areas.<sup>198</sup>

Meeting the needs of the state, its citizens, and industry while complying with the requirements of the 1990 Clean Air Act Amendments will not be easy or inexpensive. Regulations should encourage those technologies that

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195. MARKETABLE PERMITS, *supra* note 4, at 2. Controls recently adopted for NO<sub>x</sub> in the Houston/Galveston area are expected to reduce emissions by only 15% to 20%. *Id.*

196. *Id.*

197. *See supra* notes 132-37 and accompanying text.

198. *See supra* notes 128-31 and accompanying text.

protect the environment while minimizing the intrusion into the lifestyle and livelihood of the state's inhabitants.

## XI. THE ENVIRONMENTAL CASE FOR COMPRESSED NATURAL GAS POWERED VEHICLES IN OZONE NON-ATTAINMENT AREAS

Motor vehicle emissions account for roughly thirty-five percent of all man-made VOC and NO<sub>x</sub> emissions nationwide. The EPA has noted that efforts toward reducing the emissions of reactive VOCs from this major group of emission sources "should yield air quality benefits" with regard to ozone.<sup>199</sup> In Dallas/Fort Worth, mobile sources account for over fifty-six percent of VOC emissions, and in El Paso, for over forty-nine percent.<sup>200</sup> Recent studies also indicate that VOC emissions from mobile sources have historically been underestimated, possibly by a factor of two or more.<sup>201</sup> Presently, gasoline and diesel fuel power ninety-nine percent of this country's motor vehicle fleet. Both fuels are produced from crude oil. In the United States, there are around 190 million motor vehicles, only 30,000 of which run on compressed natural gas.<sup>202</sup>

Emissions of ozone precursors from motor vehicles are generally recognized as originating from two main sources. First, both NO<sub>x</sub> and unburned hydrocarbons, or VOCs, are emitted with engine exhaust. Advanced emission control systems with catalytic convertors have significantly lowered emissions of these ozone precursors in recent years.

The second major source of emissions from motor vehicles is evaporative losses. Since evaporative emissions do not originate from combustion, they consist almost entirely of VOCs. Evaporative emissions commonly occur during refueling, when the engine cools after it is turned off (hot soak emissions), during engine operation (running loss emissions), and from evaporation as the temperature of the liquids in the fuel tank rise during the day (diurnal emissions).<sup>203</sup> Due to the nature of compressed natural gas fuel systems, evaporative emissions from vehicles that burn only natural gas are inherently very low.

Emissions from an individual gasoline or diesel powered car are generally low relative to many stationary sources, but emissions from millions of vehicles on the road add up.<sup>204</sup> According to the EPA, in numerous cities across the country the personal automobile is the single greatest emission

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199. See EPA DRAFT REPORT, *supra* note 73, § 3.9.3.

200. REVISIONS TO SIP, *supra* note 65, at 98, 112.

201. EPA DRAFT REPORT, *supra* note 73, § 3.4.3.

202. In contrast, Italy has over 300,000 natural gas powered vehicles, Russia 250,000, Canada 40,000, and New Zealand 125,000. See T. Boone Pickens, Jump Starting the Market For Natural Gas, Speech to the Interstate Oil and Gas Compact Commission Mid-Year Meeting (June 21, 1992).

203. AUTOMOBILE EMISSIONS, *supra* note 44, at 3.

204. The vehicle population is estimated to be around 2.81 million in Houston/Galveston, 2.83 million in Dallas/Fort Worth, 245,000 in Beaumont/Port Arthur, and 363,000 in El Paso. REVISIONS TO SIP, *supra* note 65, at 106, 120, 135, 147.



source of criteria pollutants.<sup>205</sup> In addition, automobile use is increasing in metropolitan areas. Some estimate that mileage driven has doubled between 1970 and 1990.<sup>206</sup>

If a significant number of registered vehicles in non-attainment areas could be converted to a clean burning alternative fuel such as compressed natural gas, and if such conversions made sense economically, it has been recognized that such a program could have a positive effect on air quality.<sup>207</sup> Compressed natural gas vehicles offer the opportunity to economically reduce both VOC emissions and NO<sub>x</sub> in ozone non-attainment areas.

#### A. GASOLINE & DIESEL FUELS

Gasoline and diesel fuels are refined products of crude oil and are composed of a complex mixture of hydrocarbons, additives, and blending agents. This mixture of hydrocarbons is distilled in a refinery at elevated temperatures.<sup>208</sup> Compounds containing sulfur, nitrogen, and oxygen are also present in the gasoline refinery streams. Additives and blending agents are added to improve the performance and stability of gasoline.<sup>209</sup>

Where gasoline or diesel fuels are utilized, emissions of gasoline and diesel vapors to the atmosphere occur throughout the entire process of fuel processing, handling, and marketing. This process begins at the wellhead, continues through the processing, refining, bulk loading, transport, and unloading operations, and finally through to the service stations where vehicle refueling occurs. Gasoline or diesel vapors are also released from the vehicle itself through evaporative and tailpipe emissions.

Because of the differences in the partial pressure of various hydrocarbons, gasoline vapors emitted in the manner described above consist mainly of the lighter and more ozone reactive compounds.<sup>210</sup> Past efforts to reduce hydrocarbon emissions focused on the development of sophisticated engine and vehicle emission control systems involving catalytic converters, charcoal canisters to collect vapors, exhaust gas recirculation valves, on-board computers, and other hardware for gasoline or diesel powered vehicles. Efforts also focused on stationary source controls at refineries and service stations. While the focus in the past has been on emission controls on gasoline vehicles, Congress has mandated several programs that will make the use of alternative fuels, such as natural gas, a critical factor in achieving air quality standards in the future.

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205. AUTOMOBILE EMISSIONS, *supra* note 44.

206. *Id.* at 4.

207. See EPA DRAFT REPORT, *supra* note 73, § 3.9.3; WEAVER & TURNER, *supra* note 44, at 44.

208. AIR TOXICS STUDY, *supra* note 45, ch. 11. Generally, hydrocarbons are comprised of paraffins (alkanes), olefins (alkenes), and aromatics.

209. *Id.* Blending agents, such as tert-butyl alcohol, methyl tert-butyl ether (MTBE), and other alcohols and ethers are used in unleaded gasoline as replacements for organometallic anti-knock agents such as tetraethyl lead.

210. WEAVER & TURNER, *supra* note 44, at 32; ENVIRONMENTAL STRATEGIES, *supra* note 6, at 31.

## B. NATURAL GAS FUELS

The energy density of natural gas is much lower than that of gasoline. As a result, in order for natural gas to be used as an automotive fuel, it must be compressed to achieve storage volumes necessary to provide acceptable vehicle range.<sup>211</sup> Compressed natural gas (CNG) fueled vehicles are further classified as either dedicated vehicles or bi-fueled vehicles. Dedicated vehicles are those that have been modified to operate on only one fuel such as CNG. Bi-fueled vehicles can operate on two fuels, but the vehicle does not burn them simultaneously. A common example of a bi-fueled vehicle is one that has been retrofitted to burn natural gas, with the option to burn gasoline when the natural gas tank empties.<sup>212</sup> Most bi-fueled vehicles have a switch in the cab to allow the driver to automatically switch between fuels, even while the vehicle is being driven.

Natural gas is composed primarily of methane, though the methane content can vary considerably from pipeline to pipeline and season to season.<sup>213</sup> During the summer ozone season methane content usually exceeds eighty percent, with ethane, propane, and butane usually composing the remaining constituents.<sup>214</sup> Currently, the natural gas vehicles operating in the United States often utilize pipeline quality natural gas, which is publicly available through the local distribution pipeline network. Unlike heavier hydrocarbon elements, pipeline quality natural gas is relatively non-reactive with NO<sub>x</sub>. As such, ozone formation is generally retarded when it is used as a fuel as compared to gasoline.

## C. NATURAL GAS VEHICLE EMISSIONS

Where natural gas is used as a motor fuel, it is expected to displace gasoline or diesel fueled vehicles. As such, any incremental improvement in air quality will occur due to emission differences between the two fuel sources. A number of studies have suggested that natural gas fueled vehicles may

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211. Compressed natural gas vehicles utilize gas that has been compressed to around 3000 pounds per square inch. In some cases natural gas is liquified for use in vehicles by being cooled to minus 270 degrees fahrenheit. Its use as an alternative fuel is limited, however, due to safety concerns and other factors. See DESHAZO, STAREK & TANG, INC., *supra* note 77, at 11.

212. See 18 Tex. Reg. 6426 (1993) (prop. additions to 31 TEX. ADMIN. CODE. ch. 655) (Tex. Alternative Fuels Council). In addition, a third classification exists but is not common. These vehicles, classified as dual fuel vehicles, operate on two different fuels simultaneously. For example, an engine that burns a mixture of fuel oil and natural gas would be a dual fuel vehicle. Unfortunately, the EPA and industry sometimes use the terms bi-fueled and dual fuel interchangeably. See 57 Fed. Reg. 52,912, 52,921 (1992) (to be codified at 40 C.F.R. pts. 85, 86, 600) (proposed Nov. 5, 1992).

213. 57 Fed. Reg. 52,912. Methane concentrations can be reduced in some pipeline systems during peakshaving periods. During these periods of peak demand, which usually occur during the winter months when gas is needed for heating purposes, pipelines may inject a mixture of propane and air to increase heating value.

214. 1 OFFICE OF MOBILE SOURCES, EPA, ANALYSIS OF THE ECONOMIC AND ENVIRONMENTAL EFFECTS OF COMPRESSED NATURAL GAS AS A VEHICLE FUEL 25 (1990) (special report) [hereinafter OFFICE OF MOBILE SOURCES]. Some estimate that methane content usually exceeds 90%. See DESHAZO, STAREK & TANG, INC., *supra* note 77, at 7.

provide significant emission benefits over gasoline powered vehicles.<sup>215</sup> Natural gas is a relatively simple compound and is inherently cleaner than gasoline because on combustion, it emits less ozone reactive hydrocarbons or VOCs. The small amounts of VOCs or hydrocarbons that natural gas vehicles do emit are less likely to react in the atmosphere to form ozone than are the emissions that may originate in gasoline powered vehicles.

Since use of CNG as a fuel requires a closed delivery system, evaporative emissions from dedicated CNG vehicles are usually very low. Bi-fueled vehicles will have some evaporative emissions from the alternative gasoline fuel system, but total emissions are usually well below those of conventional vehicles. Dedicated natural gas vehicles have the potential to emit eighty-five to ninety-five percent less reactive hydrocarbons or VOCs than advanced-technology gasoline vehicles. Bi-fueled vehicles have also shown significant reductions.<sup>216</sup>

The second area where potential emission benefits may exist for gaseous-fueled vehicles is in the area of air toxics.<sup>217</sup> Gasoline naturally contains certain elements that contribute to air toxic emissions, including benzene, toluene, and xylenes. With the introduction of catalytic convertors and the phase out of octane boosting lead additives, carcinogenic aromatics have purposely been added to gasoline in the refining process to boost its octane rating.<sup>218</sup> Many of these "air toxics" are also classified as VOCs or non-methane hydrocarbons, so that a reduction in VOC emissions will also reduce air toxic emissions. Analyses conducted by the EPA to date indicate that air toxics associated with natural gas vehicles could be reduced ninety percent or more overall relative to gasoline vehicles.<sup>219</sup>

Natural gas is inherently cleaner than conventional gasoline because it does not contain toxics such as benzene and because it contains simpler compounds that do not yield complex combustion by-products. It is expected that even with the current level of controls, with more cars driving more miles, overall emissions of air toxics will begin to increase, along with hydrocarbon emissions, by the beginning of the next century.<sup>220</sup>

Third, until recently almost all of the natural gas fuel systems relied on mechanical air-fuel mixers, devices that are analogous to carburetors on gasoline engines. Because of their mechanical nature, mixers were sensitive to changes in temperature, gas composition, air pressure, and other environmental conditions. Consequently, mixers had difficulty in maintaining the

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215. 1 OFFICE OF MOBILE SOURCES, *supra* note 214, at 41; DESHAZO, STAREK & TANG, INC., *supra* note 77, at 9; WEAVER & TURNER, *supra* note 44, at 44.

216. AUTOMOBILES AND OZONE, *supra* note 51, at 3; 1 OFFICE OF MOBILE SOURCES, *supra* note 214, at 28.

217. The 1990 Clean Air Act Amendments direct the EPA to complete a study of the need for, and feasibility of, controlling emissions of toxic air pollutants that are unregulated under the Act and that are associated with motor vehicles and motor vehicle fuels.

218. Such octane boosting substances are not added to natural gas. WEAVER & TURNER, *supra* note 44, at 32.

219. EPA, AUTOMOBILES AND AIR TOXICS 1 (1993).

220. *Id.*

correct air-fuel ratio to minimize NO<sub>x</sub> emissions.<sup>221</sup> As a result, tests on retrofitted natural gas powered vehicles revealed that NO<sub>x</sub> emissions could increase and even exceed conventionally fueled vehicles.<sup>222</sup>

Just as electronic fuel injection has replaced the carburetor, electronically controlled high-speed solenoid valve injectors have been used by Chrysler and General Motors in their California certified natural gas powered vehicles.<sup>223</sup> These valves insure the air-fuel ratio is controlled to minimize NO<sub>x</sub> formation. When such equipment is used, NO<sub>x</sub> emissions from natural gas powered vehicles are less than one-fifth of those from conventional gasoline powered vehicles.<sup>224</sup>

Fourth, while not related to the ozone non-attainment issue, carbon monoxide emissions are lower from natural gas vehicles. Given the simple molecular structure of natural gas, its combustion in internal combustion engines tends to be relatively soot-free.<sup>225</sup> Both carbon monoxide and particulates are criteria pollutants under the Clean Air Act's NAAQS.<sup>226</sup>

Passenger cars coming off today's production lines that burn gasoline are capable of emitting ninety percent less carbon monoxide over their lifetimes than their uncontrolled counterparts of the 1960s. As a result, ambient carbon monoxide levels have dropped despite large increases in the number of vehicles on the road and the number of miles they travel. With continued increases in vehicle travel, however, carbon monoxide levels will eventually begin to climb again unless even more effective emission controls are employed.

Last, natural gas is less likely than gasoline to pose a threat to ecological systems as a result of accidents or leaks associated with fuel transport and storage. In 1990, there were over 15,000 reported oil spills in the United States.<sup>227</sup> Natural gas is less dense than air and disperses rapidly upon accidental or fugitive release. Therefore, it does not pose a problem to soil or water resources.<sup>228</sup> In addition, natural gas is readily available through an existing pipeline distribution network.

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221. WEAVER & TURNER, *supra* note 44, at 45. Due to the inability to control emissions on gasoline powered vehicles equipped with mechanical carburetors, electronic fuel injection was introduced to better control air-fuel ratios.

222. 1 OFFICE OF MOBILE SOURCES, *supra* note 214, at 31.

223. WEAVER & TURNER, *supra* note 44, at 45.

224. *Id.* With regard to the emission certification for the Chrysler vehicle, NO<sub>x</sub> emissions were less than one-twentieth of a conventional Chrysler gasoline powered vehicle. Due to the remarkable emission decreases, it is expected that high-speed solenoid injectors, or similar equipment, will be utilized on all natural gas powered vehicles.

225. Carbon monoxide emissions are a product of incomplete combustion, usually due to insufficient air to completely oxidize the fuel to carbon dioxide (CO<sub>2</sub>). Carbon monoxide is toxic due to the blood's affinity to absorb it over oxygen. See EPA, AUTOMOBILES AND CARBON MONOXIDE 1 (1993).

226. See *supra* text accompanying note 37.

227. See Pickens, *supra* note 202.

228. It has been estimated that around 20% of underground storage tanks were non-tight prior to the adoption of strict monitoring and construction provisions adopted by the EPA. See 53 Fed. Reg. 37,082 (1988) (to be codified at 40 C.F.R. pt. 280).

## XII. RETROFITTING GASOLINE POWERED VEHICLES FOR COMPRESSED NATURAL GAS

Almost all of the gaseous-fueled vehicles currently in use in the United States are vehicles that were not originally designed or produced to operate on gaseous fuels, but rather, are gasoline or petroleum diesel vehicles that were converted to gaseous-fueled operation. Most commonly, a gasoline powered vehicle will be converted so that it can operate as a bi-fueled vehicle with CNG. Once converted, the vehicle can be run on either CNG or gasoline, but not both simultaneously.

There are three significant costs of converting gasoline powered vehicles to bi-fueled usage with CNG. First, there is the cost of the mechanical components that must be added to the engine to allow it to use natural gas. Second, labor costs of conversion can be relatively significant. Third, a pressurized storage vessel must be purchased to store the CNG on board the vehicle.<sup>229</sup>

Retrofitting a gasoline-powered vehicle to CNG generally requires no internal engine modification and no changes to the existing fuel system. The vehicle will keep its gasoline tank and its original fuel delivery and exhaust systems. The steps involved in the actual retrofit process vary depending on which of several aftermarket conversion kits is used and the particular type of vehicle. First, it must be confirmed that the vehicle's suspension system is capable of carrying the additional weight of the CNG cylinders. Otherwise, the suspension system must be modified to allow for such additional weight.

Second, one or more fuel cylinders are installed, typically in the trunk of a passenger car, either in or under the bed of a pickup truck, in the cargo area of a van, or otherwise. CNG fuel tanks have a standard service pressure of 3000 psi and come in various sizes. The cylinders are mounted in a location that provides protection from collision while assuring shut-off valve accessibility. A safety valve protects against over-pressurization. The brackets holding the cylinders are fastened securely to the vehicle body, frame, or bed. The number of cylinders installed depends on their size and the desired mileage range. Where the cylinders are installed in an enclosed space such as a trunk, a vent bag is attached as a safety device to collect any vapors that may escape.

Third, the CNG fuel line is secured to the vehicle's body, usually by running it along the underside. The fuel line connects the cylinder(s) to the regulator. The regulator reduces the CNG pressure from 3000 psi to operating pressure for the gas/air mixer, a component that blends the CNG with outside air. The mixer performs the same function as a carburetor or fuel injector. In some cases, an onboard computer is used to ensure a perfect air-fuel ratio. For bi-fueled vehicles, a fuel injector relay/gasoline fuel lock interrupts the flow of gasoline during CNG operation, and a switch inside the vehicle allows the motor vehicle operator to select either gasoline or CNG

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229. 1 OFFICE OF MOBILE SOURCES, *supra* note 214, at 9.

operation. An hour meter can be installed to record cumulative time for CNG operation much like an odometer records mileage.

The final step usually involves dynamometer performance verification and gas emission tests to verify emission reductions.<sup>230</sup> Thus, to ensure that such conversions result in environmentally sound vehicles, it is necessary to have some form of emissions testing and certification program for aftermarket conversions.

This relatively simple conversion will allow a vehicle to operate on either CNG or gasoline, thus becoming a so-called bi-fueled vehicle. Total costs of such a conversion are generally around \$2500 to \$3000 for automobiles and light trucks and around \$6000 for school busses.<sup>231</sup> If a vehicle were mass produced, analysts estimate that the incremental cost of bi-fuel would be significantly reduced.<sup>232</sup>

Once converted, the operating fuel costs for a natural gas vehicle are significantly lower than for gasoline powered vehicles. Estimates place the cost per equivalent gallon for natural gas at around \$0.35 to \$0.75, as compared to over one dollar per gallon for gasoline.<sup>233</sup> Mileage per equivalent gallon on CNG vehicles is the same as for gasoline powered vehicles.<sup>234</sup> Because fuel is the major operating cost component for most vehicles, and because most maintenance costs will be fixed regardless of the fuel that is utilized in the vehicle, this cost advantage significantly favors natural gas, especially for high-use vehicles.

Even with operating cost advantages, there are several drawbacks to using CNG as an alternative fuel. First, due to the low energy density, the range of many compressed natural gas bi-fueled vehicles will be lower than for gasoline powered vehicles. This means that the vehicle will need to be refilled more frequently. In addition, useful vehicle space is reduced in bi-fueled vehicles as compared to gasoline vehicles because of the volume restrictions imposed by the inclusion of both the liquid and gaseous fueling components.<sup>235</sup>

In addition, engine power efficiency of engines running on CNG will not be optimized if the base engine is configured for gasoline fueled operation. A dedicated CNG vehicle, that is, one that only runs on natural gas, will use a higher compression ratio than gasoline to take advantage of CNG's higher octane value. Ignition and valve timing could also be adjusted on dedicated CNG vehicles to optimize fuel use and power.<sup>236</sup> Last, the infrastructure for

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230. As indicated, the foregoing descriptions of retrofit components and conversion steps are only generalizations. The author expresses appreciation to J.P. Gamino and K.D. Kinser for their assistance with this section.

231. DESHAZO, STAREK & TANG, INC., *supra* note 77, at 11.

232. 1 OFFICE OF MOBILE SOURCES, *supra* note 214, at 11.

233. Natural gas is sold by the thousand cubic feet or "Mcf," instead of by the gallon, so equivalent prices must be calculated to compare the two fuels. DESHAZO, STAREK & TANG, INC., *supra* note 77, at 11. Earlier studies also estimated a similar range of the cost per equivalent gallon. 1 OFFICE OF MOBILE SOURCES, *supra* note 214, at 11 (\$0.30 to \$0.67).

234. DESHAZO, STAREK & TANG, INC., *supra* note 77, at 15.

235. 1 OFFICE OF MOBILE SOURCES, *supra* note 214, at 11.

236. *Id.*

refueling such vehicles has not developed to the point where service of an extensive natural gas powered fleet can be assured.

### XIII. COMPRESSED NATURAL GAS REFUELING STATIONS

One of the key obstacles to the penetration of CNG vehicles in the United States has been the virtual non-existence of a CNG maintenance and refueling infrastructure.<sup>237</sup> In a 1990 study, the EPA estimated that the 30,000 vehicles equipped to run on compressed natural gas were only supported by 275 private refueling stations.<sup>238</sup> If significant numbers of vehicles are to be converted to run on compressed natural gas, refueling options must be available for these vehicles. Three types of refueling options are available. First, slow fill refueling stations refuel vehicles during periods of non-use. Slow fill refueling is common where there are regular periods of non-use, and refueling takes several hours. These systems are commonly used where vehicles are kept at a central location after business hours. Home refueling is a second option for residences served by residential natural gas lines. In these systems, a small compressor is used to fill the vehicle, usually overnight while the vehicle is garaged. Third, quick fill refueling stations utilize a compressor to fill high pressure natural gas storage vessels, and a vehicle can be serviced in less than ten minutes in most cases.

Slow and quick fill refueling stations require a compressor system, piping, a dispensing system, and in some cases, storage vessels and sequencing systems. The refueling process begins with natural gas delivery to the refueling site from a connection to the local utility distribution system. The natural gas is then compressed and, after drying, usually stored in onsite pressurized storage vessels.

A dispensing system typically includes a control panel or system which determines the bank of vessels from which to draw the natural gas, regulates the gas as it is dispensed, and automatically shuts off the flow when the vehicle is full. An automated card reader or key system can be installed to allow unattended access to refueling and also to provide a record of transactions for billing and regulatory purposes. The design needs of each particular site will dictate the mix of equipment used. If there is no existing access to the local utility distribution system, a pipeline extension must be constructed. The utility connection, together with the fuel lines from the storage vessels to the dispensers, are usually the only components of the natural gas vehicle refueling station which are buried.

Compressors come in two varieties, electric powered and natural gas powered. Compressor capability determines whether the station will be slow fill or quick fill. Retail sites are always quick fill, meaning that refueling an average sized tank can be accomplished in roughly the time it takes to fill up with gasoline. By contrast, slow fill sites are typically used by fleet operators on their own property. The vehicles' tanks are filled more gradually - usu-

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237. *Id.* at 12.

238. *Id.* Of these stations, only 15 offered natural gas for sale to the public.

ally overnight. Slow fill does not require as large a compressor as quick fill and may or may not include any storage vessels. The compressor system usually rests on steel skids, which are then mounted on a concrete slab along with any storage vessels.

Storage vessels are essential at quick fill sites, and at slow fill sites they can increase capacity and improve efficiency. There are two basic types of vessels for the storage of CNG on site. The first are Department of Transportation (DOT) certified vessels, which have relatively small capacity and must be aggregated in cascades of twenty or more vessels. DOT certified vessels must be recertified every five years. The second type of storage vessels are American Society of Mechanical Engineers (ASME) certified vessels. These vessels are newer in design, larger, and have relatively greater capacity (one ASME vessel has roughly the capacity of a twenty-vessel DOT cascade). ASME certified vessels carry lifetime certification. ASME certified vessels are slightly more expensive than DOT cascades, but have a much higher flow rate and, therefore, save compressor operational costs. ASME tanks take up far less space than equivalent cascades of DOT certified vessels and are rapidly becoming the industry standard.

The dispenser is the final link between the pipeline and the customer. Dispensers come in various configurations, but must meet precise weight and measurement standards. Dispensers may include one of three different types of connection. This lack of standardization has created compatibility problems. The American Gas Association is attempting to address this concern and, together with the American National Standards Institute, has proposed a standard fueling connection.

Natural gas refueling stations may or may not be set up to receive cash. At the retail quick fill refueling stations, an automated electronic card reader can facilitate the transaction. If such a card reader is used, the refueling customer must run a magnetic strip card through the card reader, then type in mileage and other data before refueling may begin.

Stand-alone retail natural gas vehicle refueling stations are virtually nonexistent. They are almost always owned and/or operated in conjunction with preexisting or new retail gasoline stations. Most of the major oil companies probably have considered or are considering offering CNG refueling at selected sites. Some have already formed joint ventures or other relationships with local utility distribution companies or other entities to own and operate CNG refueling sites.<sup>239</sup>

#### XIV. BARRIERS TO COMPRESSED NATURAL GAS VEHICLE USE

Although CNG vehicles offer significant environmental benefits and savings with regard to fuel costs as compared to gasoline powered vehicles, two significant barriers exist that discourage the conversion of vehicles to natural

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239. The author again expresses appreciation to J.P. Gamino and K.D. Kinser for their assistance with the materials in this section.



gas use: (1) the initial cost of converting the vehicle to natural gas (or the additional cost of original equipment designed to use natural gas) and (2) the lack of an extensive refueling infrastructure that is readily accessible to fleet or public use. To the extent that these impediments can be removed, the number of CNG vehicles registered in non-attainment areas will increase, with resulting benefits to the environment. Two regulatory programs now being developed will assist in lowering these barriers by providing economic incentives to parties operating CNG powered fleets: (1) mobile source emission reduction credits (MERCs) and (2) the Clean Fuel Fleet Program.

## XV. MOBILE SOURCE EMISSION REDUCTION CREDITS (MERCs)

The 1990 Clean Air Act Amendments encourage the use of market-based approaches to achieve the environmental goals of the Act.<sup>240</sup> To avoid strict controls that could stifle growth in non-attainment areas, the concept of emission reduction credit trading programs has been sanctioned by the EPA.

### A. THE USE OF EMISSION TRADING TO MEET AIR QUALITY OBJECTIVES

In non-attainment areas that have relatively high stationary source control costs relative to mobile source control costs, the EPA has recognized that there may be significant benefits to programs that allow MERCs to be traded to stationary sources.<sup>241</sup> Historically, controls have focused first on stationary sources. As additional controls are placed on these sources, a trading program could become more and more valuable. The driving force that allows an emission credit trading program to achieve air quality goals is the mandated offset ratio. The offset ratio requires a new or modified source to acquire more emission reduction credits than projected increases in emissions. Over time, the offset ratio will significantly reduce emissions of ozone precursors.

While achieving air quality goals, the federally mandated offset requirement for new or modified sources will also adversely impact economic development in non-attainment areas. It is expected that large stationary sources already located in non-attainment areas will probably be able to apply controls to existing equipment to generate the needed offsets, but small sources and new sources will have to acquire offsets from external sources.<sup>242</sup>

Several objections exist to this market based trading system. First, to make an emission reduction credit system work so that air quality is achieved, there must be relatively good data with regard to existing or baseline emissions and accurate measurements of emission reductions. Second, an argument can be made that trading allows emissions to become overly concentrated in a given region of the non-attainment area and that a com-

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240. See Interim Guidance on the Generation of Mobile Source Emission Reduction Credits, 58 Fed. Reg. 11,134 (1993).

241. *Id.*

242. MARKETABLE PERMITS, *supra* note 4, at 123.

mand and control approach would better address this issue. While this argument has some merit, the cost of a command and control approach may be extreme.<sup>243</sup>

To the extent that fleet vehicles are converted to CNG in excess of regulatory requirements, and to the extent natural gas vehicles generate emission levels of both ozone precursors below regulatory levels, MERCs could be generated for the fleet owner. These MERCs may have a significant market value<sup>244</sup> and could be traded to offset vehicle conversion costs, thus providing an economic incentive for fleet conversion.

## B. EPA'S EMISSION TRADING POLICY STATEMENT

Since 1986, the EPA has recognized that reductions in certain emissions in excess of regulatory requirements could be traded to third parties for money or other consideration. To facilitate such trades, it adopted an Emissions Trading Policy Statement.<sup>245</sup> Under the Emissions Trading Policy Statement, the EPA established several requirements to insure preservation of air quality. First, to take credit for an emissions reduction, all reductions must be quantifiable. In other words, the source should be able to demonstrate, with relative certainty, the size of the emission reduction.

Second, credit will be granted for an emission reduction only to the extent that it exceeds regulatory levels. For example, if a source is required to reduce emissions under the NSR provisions, then the source cannot take credit for such reductions since they were imposed by regulators.

Third, the emission reductions must be permanent for the period during which the emissions are traded. For example, if a source shuts down operations, emissions credits can be claimed and traded only during the downtime period. In addition, the emissions reductions should be enforceable at both federal and state levels.

On February 23, 1993, the EPA published Interim Guidelines on the Generation of Mobile Source Emission Reduction Credits.<sup>246</sup> According to the EPA's guidance document, MERCs may be used in non-attainment areas to satisfy the RACT requirements imposed on existing sources, to meet general emission reduction requirements in the state's SIP, and to meet NSR required emissions offset requirements.<sup>247</sup> Conversely, under the guidance document, MERCs may not be used in non-attainment areas to satisfy emission reductions required under LAER standards on new or modified

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243. *Id.* Some small to medium sources reported that the cost of reducing NO<sub>x</sub> would be \$50,000 per ton or more, a level that would make command and control mandated equipment unusually expensive.

244. It has been estimated that emission reduction credits for VOC and NO<sub>x</sub> could trade between \$5000 and \$10,000 per ton. Credits for mobile sources could be lower due to regulatory restrictions on mobile source credit trading.

245. See 51 Fed. Reg. 43,814 (1986). Emission reductions from mobile sources are commonly referred to as mobile source emission reduction credits or MERCs, and emission reduction credits from stationary sources are referred to as ERCs.

246. 58 Fed. Reg. 11,134 (1993).

247. *Id.*

sources, I/M programs, or employer trip reduction programs.<sup>248</sup>

### C. MOBILE SOURCE EMISSION CREDITS ISSUES

MERCs will only be issued for vehicles that exceed the clean fuel vehicle emission standards required by the 1990 Clean Air Act Amendments.<sup>249</sup> Vehicles emitting less pollutants than the conventional standards, but not meeting clean fuel standards, will not receive credits. As a MERC emissions trading program is developed, there are a number of issues that need to be addressed before an efficient market for such credits can be developed. Some of these issues are discussed below.

#### 1. *Determining Baseline and Emission Reduction Levels*

Both the Emissions Trading Policy Statement and the Interim Guidance on the Generation of Mobile Source Emission Reduction Credits note that in order to obtain credits for emission decreases, the decreases must be quantifiable. To quantify the emission reduction, an emissions baseline must be determined for the specific mobile source.<sup>250</sup> The emissions baseline can either be determined by measurement, or estimated by an approved EPA mobile source model. Because mobile source operations may change significantly over time, the EPA Interim Guidance requires baseline emissions to be estimated each year credits are generated.<sup>251</sup> After the vehicle has been converted to CNG, the projected emissions level must again be estimated by either actually measuring the emissions or by using an EPA approved mobile source model.<sup>252</sup> The difference between the emissions baseline and the projected emissions level after the vehicle has been converted to CNG will quantify the MERC.<sup>253</sup>

Quantification of MERCs creates certain unique problems. First, the physical number of mobile sources generating emission reduction credits will quickly outnumber the number of stationary sources in an absolute sense. Second, emission reductions per mobile source will usually be much lower on a per unit basis than those of stationary sources. From a regulatory standpoint, it will require the dedication of more resources to track mobile source baseline and projected emissions levels because of the sheer numbers of these sources.

Third, where a vehicle is used will determine the effect of its emissions on air quality. In most cases, it is assumed that a vehicle registered in a non-

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248. According to the EPA, the LAER requirements are technology-based emissions limitations that must be met, where applicable, by specific stationary sources and do not permit emissions trading or averaging. The EPA also takes the position that the I/M and employer trip reduction programs include provisions that allow for trading and/or averaging of emissions or emission-producing activities, but only within those programs.

249. 42 U.S.C. § 7583 (Supp. III 1991).

250. See Interim Guidance on the Generation of Mobile Source Emission Reduction Credits, 58 Fed. Reg. 11,134, 11,136 (1993).

251. *Id.*

252. *Id.*

253. *Id.*

attainment area will be used in that non-attainment area, but that is not always the case. Maintenance of the vehicle can also affect both the baseline and the projected emissions level of a given vehicle.

In addition, the projected emissions level for bi-fueled vehicles that can burn both compressed natural gas and gasoline will be different than that for dedicated CNG vehicles. With a bi-fueled vehicle, the amount of time it uses the alternative fuel will determine the level of emission reduction, and calculation of the MERC must take this variable into account.<sup>254</sup> The EPA recognizes that it must rely on the states to develop a credible strategy for measuring emissions reductions for MERC calculation purposes.<sup>255</sup> Before MERCs can be actively traded, rules and regulations at the state level need to be developed so that a fleet owner can easily calculate and quantify the emission reduction credits generated by fleet conversions. Until such regulations are adopted, MERCs and the benefit they can bring to the state's air quality will not be actively generated or traded.

## 2. *Appropriate Offset/Trading Ratio*

The EPA has interpreted the 1990 Clean Air Act Amendments as allowing trades of emission reduction credits between mobile sources and stationary sources attempting to meet RACT standards in that same non-attainment area.<sup>256</sup> These trades will be allowed where "such trading results in an exceptional environmental benefits."<sup>257</sup> The EPA has proposed requiring an offset or trading ratio for these trades that is identical to the offset ratio specified for new sources. For example, in Houston/Galveston a new source must demonstrate 1.3 tons of emission reduction for every 1 ton of new emissions. This same ratio would generally be used for trades between mobile and stationary sources. The EPA has noted, however, that if a mobile source control program involves a fuel, process, or technology the widespread use of which holds particular promise for significant future environmental benefits and a ratio lower than the offset ratio would facilitate the market penetration of the fuel, process, or technology, then a lower ratio may be adopted.<sup>258</sup>

CNG vehicles, if widely used, will have a significant impact on air quality. To develop the refueling infrastructure necessary for widespread use of these alternative fueled vehicles, the lowest ratio allowable should be adopted. Once the refueling infrastructure develops, ratios could be increased to reflect the market penetration of this technology.

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254. Bi-fueled vehicles can be equipped with "fuel keys," which act to track, by computer, the fuel type dispensed by each vehicle. Such a system can be expanded to permit coding of appropriate mileage records. Coding will facilitate accurate calculation of vehicle miles traveled on each fuel. Fuel receipts from refueling stations can also be used to provide documentation with regard to the amount of natural gas used.

255. *Id.* at 11,137.

256. *Id.*

257. *Id.* at 11,135 n.5.

258. *Id.*

### 3. *Replicable Procedures for MERC Trading*

In 1981, the Texas Air Control Board adopted a rule that allowed a limited form of emission trading for stationary sources.<sup>259</sup> This rule is commonly referred to as the bubble rule since its effect is to allow a company to pretend its plant is under a bubble. Emission reductions are not required so long as substantially equivalent reductions were accomplished elsewhere under the bubble.<sup>260</sup>

The problem with this rule is that while emission trading is authorized, the Texas Natural Resource Conservation Commission must approve each individual transaction. The EPA is also required to review each individual transaction, because such trades are treated like a revision to the state's SIP. Thus, the applicant is potentially required to have a hearing on the proposal.<sup>261</sup> While a trading application is under review, a source can be technically in non-compliance.

To avoid the problems and delays inherent in revising a SIP and obtaining the approval of two agencies, standardized trading rules should be developed for emission reduction credit trades. Only when standardized rules on trading have been developed and approved by both the TNRCC and the EPA will emission reduction credit trading for both stationary and mobile sources become commonplace.

### 4. *Developing an Efficient Market for MERCs*

MERC trading will be sporadic unless an efficient market is developed. In Texas, there have been significant actions taken in this area. Several unique programs have been adopted to facilitate an efficient market that meets the needs of both the buyer and seller.

#### a. Emission Bank

First, the TNRCC has established an emissions bank in which MERCs can be deposited. The bank is administered by the TNRCC. While an emissions bank is not required under the 1990 Clean Air Act Amendments, it assists in facilitating an efficient emission reduction credit trading program. The use of the TNRCC's emission banking system is entirely voluntary, and a party with emission credits can, with TNRCC approval, trade its credits with another party on a case-by-case basis. Such emission reduction credits can also be used internally by the source to offset emission increases.

TNRCC's regulations allow the banking of both VOC and NO<sub>x</sub> emission reductions; however, interpollutant trading will not be allowed.<sup>262</sup> As a result, a party cannot trade NO<sub>x</sub> reduction credits for increases in VOC emis-

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259. James D. Braddock, Texas Regulatory Framework, Speech to the ERC Trading Program (1993); see 31 TEX. ADMIN. CODE § 101.23 (West 1989).

260. Braddock, *supra* note 259.

261. *Id.*

262. 18 Tex. Reg. 1411 (1993) (prop. to be codified at 31 TEX. ADMIN. CODE §§ 101.1, 101.29) (Tex. Nat. Resource Conservation Comm'n). The rules became effective March 15, 1993.

sions or vice versa. The EPA is currently reviewing the appropriateness of interpollutant trading. Depending on the outcome of such review, interpollutant trading may be allowed in the future.

Emission reduction credits in one non-attainment area cannot be traded in another non-attainment area. For example, credits earned in the Dallas/Fort Worth area cannot be traded or sold to industry in Houston/Galveston since they are separate non-attainment areas. For mobile sources, credits for natural gas vehicle conversions are credited to the non-attainment areas where the vehicles are registered.

Emission reduction credits from both stationary and mobile sources will be registered with the TNRCC in the order they are received from the applicable source. Registration must be made within six months of achieving the actual emissions reduction or the bank cannot be utilized. Once registered, the MERCs will then be certified by the TNRCC staff so as to verify the extent of emission reduction. Certification will make the credits immediately transferrable, and the purchaser of the credits will know that the credits have been pre-approved. Once registered and certified, an emission reduction credit can be either transferred or withdrawn from the bank.

The MERCs will be available for use for a period of five years from the date the reduction was actually achieved. Because the life of the MERC is fixed, its value can decrease substantially as the credits near the end of their five year lifespan. The MERCs will also be depreciated at three percent per year while they are being held in the TNRCCs bank.

#### b. Community Banking

Legislation unique to Texas allows the creation of local area emission reduction credit organizations (AERCOS or community banks).<sup>263</sup> These organizations can maintain an account at the TNRCCs emissions bank and promote economic development by acquiring or transferring emission reduction credits to prospective employers interested in relocating in an area. AERCOS can also provide financial assistance to projects that may generate credits, enter into contracts, and employ staff. A separate AERCO will be formed in each non-attainment area. Creation of an AERCO is initiated by the Council of Governments in the non-attainment areas.

#### c. NO<sub>x</sub> Emission Reduction Credit Trading

In addition to emission banking and AERCOS, the TNRCC is developing a program for NO<sub>x</sub> emission trading.<sup>264</sup> The cost of compliance with RACT NO<sub>x</sub> rules will be significant. NO<sub>x</sub> emission credits may assist facilities in meeting such standards. NO<sub>x</sub> emission credit trading is being considered by the TNRCC before VOC credit trading because there are fewer NO<sub>x</sub> major sources, emission levels are easier to quantify for NO<sub>x</sub>, and the new NO<sub>x</sub>

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263. Act of May 11, 1993, 73d Leg., R.S., ch. 128, 1993 Tex. Gen. Laws 128 (codified at TEX. HEALTH & SAFETY CODE § 384.001-.018) (Vernon Supp. 1994)).

264. MARKETABLE PERMITS, *supra* note 4, at 6.

RACT rules just adopted for Houston/Galveston and Beaumont/Port Arthur will require significant expenditures by industry. While aggressive steps have been taken to encourage a free market in emission reduction credits, additional rules to promote MERC trading are needed to push the natural gas fleet conversion process and the accompanying technology forward.

### 5. *Interpollutant Trading*

As discussed above, interpollutant trading between VOCs and NO<sub>x</sub> is now prohibited, though the EPA is examining the issue. Because the VOC/NO<sub>x</sub> ratio can determine whether the regulation of VOCs or NO<sub>x</sub> or both will be most effective in regulating ozone formation, and because the UAM can predict the effect of a decrease in either of such criteria pollutants, in some non-attainment areas interpollutant trading may assist in meeting air quality goals. In these areas, the flexibility of interpollutant trading could assist in economically improving air quality.

Alternatively, if interpollutant trading is allowed, an interpollutant trading ratio could be applied so as to insure air quality goals are met. For example, in areas where the VOC/NO<sub>x</sub> ratios are relatively large, ozone formation is NO<sub>x</sub> limited, and therefore the NO<sub>x</sub> controls are more effective in controlling ozone.<sup>265</sup> For interpollutant trades in these areas, 1.5 VOC emission reduction credits could be deemed equivalent to one NO<sub>x</sub> emission reduction credit.

### 6. *Allowing MERC Trading for LAER Requirements*

Under the guidance document issued by the EPA, MERCs may not be used to satisfy the requirements of new or modified sources in non-attainment areas subject to LAER standards. The Clean Air Act does not appear to preclude the EPA from allowing trading strategies to meet such standards. While extending emissions trading of MERCs to satisfy LAER standards may be complicated, such trading would promote the overriding objective of improving the air quality in the non-attainment region.

## XVI. THE CLEAN FUEL FLEET PROGRAM

Non-attainment areas that are classified as serious, severe, or extreme are required to revise their SIPs to establish a clean fuel fleet program.<sup>266</sup> At present, the areas subject to the program include twenty-two non-attainment areas in nineteen states.<sup>267</sup> Texas, El Paso, Beaumont/Port Arthur, and Houston/Galveston will require a federal clean fuel fleet program. The clean fuel fleet program will mandate purchases of alternative fueled vehicles or very clean gasoline powered vehicles for fleet use. Emission standards adopted for the clean fuel fleet program are those recently adopted by Cali-

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265. ENVIRONMENTAL STRATEGIES, *supra* note 6, at 14.

266. 42 U.S.C. § 7586 (Supp. III 1991). The clean fuel fleet program is also required in certain carbon monoxide non-attainment areas.

267. EPA, MOTOR VEHICLES AND THE 1990 CLEAN AIR ACT 4 (1993).

ifornia for low emission vehicles (LEVs).<sup>268</sup> Different standards apply to cars, various classes of light duty trucks, and for heavy duty vehicles.

Those fleets that operate in a non-attainment area and that contain any combination of ten or more covered light-duty vehicles, light-duty trucks, or light- or medium-heavy-duty vehicles will be subject to the program if the vehicles can be fueled at a central location and are not driven to private homes at night.<sup>269</sup> Exemptions exist for emergency vehicles, vehicles leased or rented to the public, and certain other vehicles.

Purchase requirements for such clean fuel vehicles will begin in 1998. In the first year of the clean fuel vehicle program, thirty percent of the vehicles added to the fleet are required to be clean fueled. In the second year of the program, fifty percent of the vehicles are required to be clean fueled. In the third year and every year thereafter, seventy percent of the vehicles added to the fleet must be clean fueled. Fleet purchase requirements also apply to federal agencies, except those exempted on national security grounds. States must allow fleet operators to earn credits for the purchase of: (1) more clean fuel vehicles than required to fulfill the purchase requirements under the program; (2) clean fuel vehicles that meet more stringent emission standards than required;<sup>270</sup> (3) clean fuel vehicles in exempted categories such as heavy-duty vehicles, rental vehicles, emergency vehicles, law enforcement vehicles, or nonroad vehicles; and (4) clean fuel vehicles purchased before the effective date of the fleet program.<sup>271</sup>

The EPA has proposed that each state decide the size, type, and location of fleets eligible to generate purchase credits under the fleet program. All fleet operators subject to the compliance requirements of the fleet program and other state permitted operators will be eligible to generate fleet purchase credits.<sup>272</sup> Under the clean fuel fleet program, these purchase credits can be used in two ways. First, they may be used by the fleet owner who generated them to demonstrate compliance with the fleet program purchase requirements in subsequent years. Second, they may be traded or sold within the same non-attainment area for use by another fleet owner to demonstrate compliance with the fleet purchase requirements. Purchase credits generated under the fleet program may be held for use at a later time without depreciation.<sup>273</sup>

Of importance to extra low emission vehicles, credits are to be adjusted to reflect the level of emission reduction achieved by the vehicle so that the credit earned in purchasing an extra-clean vehicle reflects its extra emission

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268. THE ENVIRONMENTAL AND ENERGY STUDY INSTITUTE, 1993 BRIEFING BOOK ON ENVIRONMENTAL AND ENERGY LEGISLATION, SUMMARY OF LAWS 45 (1993) [hereinafter BRIEFING BOOK].

269. *Id.*

270. Ultra low emission vehicle (ULEV), inherently low emission vehicle (ILEV), and zero emission vehicle (ZEV) standards are more stringent than LEV emission levels.

271. EPA, GUIDANCE FOR EMISSION REDUCTION CREDIT GENERATION BY CLEAN FUEL FLEETS & VEHICLES 3 (1993).

272. *Id.*

273. Purchase credits generated under the program can be traded only for purchases of vehicles in the same class (heavy-duty or light-duty).



reduction benefit as compared to a clean fuel vehicle. Dedicated natural gas vehicles, because of their lack of evaporative emissions, should qualify for additional credits under this guideline.

The fleet program also includes a new federal program to provide special incentives in the form of expanded transportation control measure (TCM) exemptions for the purchase of inherently low emission vehicles (ILEVs). ILEVs must meet two criteria: First, the vehicle must meet strict standards for evaporative emissions, even when the control systems for such emissions are disabled; Second, ILEVs must meet strict NO<sub>x</sub> emission standards. ILEVs can be purchased as part of the fleet program for either compliance or credit purposes, with the owner gaining incentives such as exemptions from certain transportation control measures and the ability to utilize high occupancy vehicle (HOV) lanes.<sup>274</sup> ILEVs will be identified by special markings so as to avoid misunderstandings as to why the vehicle can be operated in areas where apparently identical vehicles would be prohibited.

In addition to the federal legislation, Texas has enacted legislation requiring various vehicle fleets to purchase alternative fueled vehicles. School districts with fifty or more vehicles that transport children, state agencies with fifteen or more vehicles, and local transit authorities and districts are required gradually to implement the use of alternative fuels.<sup>275</sup> Metropolitan and regional transit authorities, city transportation departments, local governments with fifteen or more vehicles, and private fleets with twenty-five or more vehicles in urban non-attainment areas are also required to implement the use of alternative fuels such as natural gas.<sup>276</sup>

Senate Bill 737<sup>277</sup> authorizes the Texas Railroad Commission to issue loans and grants for the promotion of liquid petroleum gas or natural gas powered vehicles. In addition, a Fuels Council will be established to develop a program to support the use of natural gas, CNG, and liquified natural gas as alternative fuels.<sup>278</sup> The bill also allows bonds to be issued to provide funding for the conversion to alternative fuels of school district and mass transit buses. Bonds may also be issued for the construction of fueling facilities to service such alternative fuel vehicles.

To the extent rules can be adopted encouraging the early conversion of fleet vehicles under either federal or state clean fuel fleet programs, such early phase-in can encourage infrastructure development for such vehicles. As the infrastructure is developed to service and refuel CNG vehicles, more fleets will use alternative fuel vehicles.

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274. See 56 Fed. Reg. 50,196 (1991).

275. TEX. EDUC. CODE ANN. § 21.174 (Vernon Supp. 1994). By September 1, 1994, 30% or more of vehicles subject to the bill must be capable of operating on a TACB (now TNRCC) approved alternative fuel.

276. TEX. HEALTH & SAFETY CODE ANN. § 382.131-.141 (Vernon 1992); MARKETABLE PERMITS, *supra* note 4, at 116.

277. Act of June 15, 1993, 73d Leg., R.S., ch. 603, 1993 Tex. Gen. Laws 603 (codified at TEX. NAT. RESOURCES CODE § 113.241-.243, .281-.290 (Vernon Supp. 1994) and TEX. REV. CIV. STAT. art. 601d (Vernon Supp. 1994)).

278. TEX. NAT. RESOURCES CODE § 113.281-.290 (Vernon Supp. 1994).

## XVII. OTHER FEDERAL LEGISLATION PROMOTING ALTERNATIVE FUELED VEHICLES - THE ENERGY POLICY ACT OF 1992

The air quality goals contained in the 1990 Clean Air Act Amendments are not the only legislative goals that could be met by the use of alternative fueled vehicles. Congress has recognized that the transportation sector accounts for more than sixty percent of crude oil consumption in the United States, and that almost all transportation vehicles are powered by crude oil-based fuels.<sup>279</sup> In the second week of July 1993, the United States imported 7.9 million barrels of oil a day, the highest level of crude oil imports for any week on record.<sup>280</sup> In addition, the production of domestic crude oil was at the lowest level in over thirty-five years.<sup>281</sup> To curb this growing dependency, Congress enacted the Energy Policy Act of 1992<sup>282</sup> to promote the use of alternative fuels to replace gasoline and diesel fuel usage.

While the Energy Policy Act of 1992 was aimed at reducing dependence on foreign oil, like the 1990 Clean Air Act Amendments, it supports the development of markets for alternative fueled vehicles. The Act includes as valid alternative fuels such substitutes as natural gas, methanol, propane, ethanol, and electricity. Centrally fueled vehicle fleets will be subject to the Energy Policy Act, with the exception of fleets of rental cars, automobile dealer's stock, military vehicles, farm and construction equipment, police cars, emergency vehicles, and vehicles garaged overnight at personal residences.

By 1993, over 5000 alternative fueled vehicles must either be purchased or leased by the federal government, with another 7500 to be acquired or leased in 1994 and 10,000 in 1995. Beginning in 1996, one-quarter of newly purchased vehicles in the federal fleet must be alternative fueled, increasing to seventy-five percent by 1999 and each year thereafter. For state fleets, ten percent of newly acquired vehicles must be alternative fueled by 1995, increasing to seventy-five percent in 2000 and each year thereafter. In general, fleets owned by states, or private entities that own less than fifty vehicles are not covered by the provisions of the Act.<sup>283</sup>

In the private sector fleet, purchase requirements will be implemented first for companies that produce, transport, store, or sell alternative fuels as an end product. As such, electric utilities, natural gas pipelines, and ethanol refiners could be subject to fleet purchase requirements. For these companies, thirty percent of vehicles purchased or leased by these companies must be alternative fueled by 1996, increasing to ninety percent by 1999 and each year thereafter. For other private companies and local governments, fleet purchase goals for alternative fueled vehicles will be phased in starting at

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279. BRIEFING BOOK, *supra* note 268, at 71.

280. See Gerald F. Seib, *The 'Don't Worry, Be Happy' Route to Energy Policy*, WALL ST. J., July 28, 1993, at A16.

281. *Id.* The Wall Street Journal concluded that "in short, the U.S. is more dependent on imported oil than ever." *Id.*

282. Energy Policy Act of 1992, Pub. L. No. 102-486, 106 Stat. 2276 (1992).

283. *Id.*

twenty percent of acquired vehicles by 1999 and increasing to seventy percent in the year 2006 and each year thereafter.

The Energy Policy Act also provides federal income tax incentives to purchase or convert vehicles to alternative fuels. For conversions of gasoline powered vehicles to bi-fueled vehicles with CNG, the statute allows a deduction of up to \$2000 to offset the conversion costs to the alternative fuel. Buyers of alternative fueled light trucks or vans can take a deduction of up to \$5000 to offset conversion costs. Fuel marketers are allowed a deduction of up to \$100,000 to offset the cost of installing alternative fueled vehicle refueling facilities. The Energy Policy Act also authorizes loans to small business to finance alternate fuel conversions. While the objective of the Energy Policy Act differs from the objective of the Clean Air Act, both objectives can be met by the use of CNG vehicles.

### XVIII. CONCLUSION

In ozone non-attainment areas, compliance with the 1990 Clean Air Act Amendments will be extremely expensive and could adversely affect economic growth. To meet air quality goals and encourage economic growth, the most cost effective means to obtain emission reductions should be pursued. CNG vehicles emit fewer ozone precursors and less air toxics than conventional vehicles, and the cost per ton of such reductions is lower than the cost of controls on most stationary sources. CNG vehicles, in addition to meeting air quality goals, also meet concerns of energy security.

Mobile sources should be an important means to meet federal air quality standards. The use of the mobile source emission reduction credit and clean fuel fleet program can add flexibility to the achievement of this goal. Regulations to implement mobile source programs should be adopted as soon as possible to encourage infrastructure development and to meet the economic and environmental needs of the citizens of the State of Texas.