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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

JUL 11 2003

Mr. Jim Mathews
Northeast Texas Air Care
P.O. Box 1568
Austin, TX 78768-1568

Dear Mr. Mathews:

I am pleased to inform you that we received your letter dated June 13, 2003, forwarding the list of potential control measures for the Northeast Texas area. The first important milestone under the 8-hour Ozone Early Action Compact program is to identify and describe local control measures being considered during the local planning process by June 16, 2003. Your list of potential control measures was received on time and meets the milestone requirement which is specified in the *Compact* guidance issued by U.S. Environmental Protection Agency (EPA) Assistant Administrator Jeff Holmstead on November 14, 2002.

The EPA recognizes that the 8-hour Ozone Early Action Compact program is ongoing and that Northeast Texas Air Care, along with the Texas Commission on Environmental Quality and the other local partners, continues to make good progress. We appreciate your commitment to the *Compact* program and to achieving cleaner air sooner. My staff and I are always available to assist you as we work together towards that goal.

Should you have any questions, please feel free to call me or Mr. Thomas Diggs of my staff at (214) 665-7214.

Sincerely yours,

Richard E. Greene
Regional Administrator

cc: Robert Huston, Chairman
Texas Commission on Environmental Quality

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Final Report

Identification of Potential Emissions Reduction Strategies For the Northeast Texas Early Action Compact

Prepared by
Northeast Texas Air Care
Technical Committee

Prepared for
The East Texas Council of Governments
3800 Stone Road
Kilgore, Texas 75662

June 11, 2003

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EXECUTIVE SUMMARY

On December 20, 2002, NETAC signed an Early Action Compact (EAC) for 8-hour ozone. The objective of the EAC is to develop and implement additional emissions reduction strategies to bring Northeast Texas into compliance with EPA's 8-hour ozone standard. The first milestone in the EAC is:

- By June 16, 2003, the local area will identify and describe the local control measures that will be considered during the local planning process.

The objective for this milestone is to identify *potential* control measures that will be evaluated in more depth later in 2003. NETAC studies already have shown that NOx emission reductions are the most effective path to ozone attainment in Northeast Texas. This is because there is a high natural background of VOC emissions from biogenic sources (trees) in Northeast Texas. However, recent studies for the Houston area have shown that localized emissions of highly reactive VOCs (HRVOCs) from petrochemical facilities can be important to ozone formation in that area. Similar studies have not been completed in Northeast Texas that correlate HRVOC to high ozone, but control measures for HRVOCs also are considered for the major petrochemical facilities located near Longview.

The objective of the EAC is for Northeast Texas to be attaining the 8-hour ozone standard by 2007. Because attainment in 2007 will be determined by 3 years of ozone data (for 2005-2007), the EAC requires that emission controls must be in place (key turned) by the end of 2005. Therefore the control measure assessment must consider how long it will take to implement each measure.

This analysis constitutes an initial assessment of the potential control strategies that can be implemented in Northeast Texas to reduce ozone precursor emissions. Regional modeling may reveal the need to implement other or more effective measures. All measures that could benefit ozone reduction efforts will be considered.

Control Measure Assessment

An evaluation was conducted by the NETAC Technical Committee to identify potential control measures and meet the EAC milestone. The methodology followed to complete the assessment can be summarized as follows:

1. Tabulate and analyze the most recent (1999) emission inventory for the NETAC 5 county area to rank emissions sources and identify emission sources/sectors where control measures could make a difference to ozone.

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2. Identify what control measures are available for the important emission sources/sectors identified in (1).

3. Estimate the potential emission reductions that could be realized from (2), recognizing uncertainties by giving ranges of emission reductions.

4. Evaluate whether the control measures could be implemented in time to meet the EAC schedule, i.e., by the end of 2005.

The costs of emission reduction measures are not considered in this report. Costs will be considered in the next phase of control strategy evaluation when resources can be devoted to developing reliable costs for promising strategies.

Potential Control Measures Identified in the Assessment

A list of potential strategies was compiled based on the assessment described above. This list includes those that look capable of achieving substantial NOx and HRVOC reductions by December 2005. Before the list is finalized and strategies implemented, further analysis will be done to identify the strategies most beneficial to the Northeast Texas region. The strategies identified from the current effort are listed below:

Public Awareness Programs
- Ozone Action Days

Innovative Alternatives Program
- City of Tyler Energy Efficiency Improvements

Potential strategies for reduction of on-road emissions
- Clean Cities Program, clean-fueled vehicles

Potential strategies for Electric Generating Units
- Combustion tuning with advanced NO_x control computer programs
- Low-NOx burner and over-fire air
- Induced Flue Gas Recirculation

Potential strategies for Chemical Plant Operations
- Operational Tuning and Control Technology Options for compressor engines
- Operating Strategy and Control Technology Options for Boilers
- Enhanced Leak Detection and Repair Programs for HRVOCs

Potential Strategies for natural gas engines, such as those used in compressors
- 3-way catalysts for rich burn engines

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- Selective Catalytic Reduction for lean burn engines
- Engine upgrade of older, higher-emitting engines

Potential Strategies for liquefied petroleum gas boilers, such as those used at industrial sites

- Low-NOx burners
- Low-NOx burners plus Flue Gas Recirculation

Potential strategies for off-road diesel engines, such as those used in railroad, construction and mining, and agriculture operations

- Engine upgrade
- Equipment upgrade
- Fuel reformulation with cetane enhancers
- Fischer-Tropsch fuel use
- Fuel-water emulsion use
- Engine retrofit with a Lean NOx Catalyst
- Engine retrofit with Exhaust Gas Recirculation
- Engine retrofit with Selective Catalytic Reduction

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1. INTRODUCTION

Background

The Texas Commission on Environmental Quality (TCEQ) monitors air quality in Northeast Texas to determine whether the region is in compliance with EPA's National Ambient Air Quality Standards (NAAQS) for ozone. Historically, ozone levels in Northeast Texas have been close to the level of the ozone NAAQS and the region has been considered a "near-nonattainment area" (NNA). With the assistance of funding from the State legislature, a local stakeholder group called North East Texas Air Care (NETAC) has conducted scientific studies and developed control strategies to reduce ozone levels. Ozone levels are reduced by controlling emissions of ozone precursors, namely nitrogen oxides (NOx) and volatile organic compounds (VOCs). NETAC's activities lead to the recent submission of a revised State Implementation Plan (SIP) for 1-hour ozone in Northeast Texas. The 1-hour SIP revision enforces significant emissions reductions that were entered into on a voluntary basis by several local industries, namely American Electric Power (AEP), Eastman Chemical Company, Texas Operations and TXU.

NETAC has established several programs to reduce emissions of ozone precursors in the region. Through the Department of Energy's Clean Cities program, the use of alternative fuel vehicles is being promoted and employed throughout East Texas (see http://www.netac.org/cities.htm). The region has also established an Ozone Action Day program, which issues advisories to the public on days more prone to high ozone to encourage moderation of activities that emit ozone precursors (see http://www.netac.org/ozone.htm).

Early Action Compact

On December 20, 2002, NETAC signed an Early Action Compact (EAC) for 8-hour ozone. The objective of the EAC is to develop and implement additional emissions reduction strategies to bring Northeast Texas into compliance with EPA's 8-hour ozone standard. The first milestone in the EAC is:

- By June 16, 2003, the local area will identify and describe the local control measures that will be considered during the local planning process.

The objective for this milestone is to identify *potential* control measures that will be evaluated in more depth later in 2003. NETAC studies already have shown that NOx emission reductions are the most effective path to ozone attainment in Northeast Texas. This is because there is a high natural background of VOC emissions from biogenic sources (trees) in Northeast Texas. However, recent studies for the Houston area have shown that localized emissions of highly reactive VOCs (HRVOCs) from petrochemical facilities can be important to ozone formation in that area. Similar studies have not been completed in Northeast Texas that correlate HRVOC to high ozone, but control measures for HRVOCs also are considered for the major petrochemical facilities located near Longview.

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The objective of the EAC is for Northeast Texas to be attaining the 8-hour ozone standard by 2007. Because attainment in 2007 will be determined by 3 years of ozone data (for 2005-2007), the EAC requires that emission controls must be in place (key turned) by the end of 2005. Therefore the control measure assessment must consider how long it will take to implement each measure.

Control Measure Assessment

This report describes the evaluation that was conducted by the NETAC Technical Committee to identify potential control measures and meet the EAC milestone. The methodology followed to complete the assessment can be summarized as follows:

1. Tabulate and analyze the most recent (1999) emission inventory for the NETAC 5 county area to rank emissions sources and identify emission sources/sectors where control measures could make a difference to ozone.

2. Identify what control measures are available for the important emission sources/sectors identified in (1).

3. Estimate the potential emission reductions that could be realized from (2), recognizing uncertainties by giving ranges of emission reductions.

4. Evaluate whether the control measures could be implemented in time to meet the EAC schedule, i.e., by the end of 2005.

The costs of emission reduction measures are not considered in this report. Costs will be considered in the next phase of control strategy evaluation when resources can be devoted to developing reliable costs for promising strategies.

Report Organization

The information contained in this report was developed by several groups and then reviewed by the NETAC Technical Committee and presented for public comment at an open meeting. ENVIRON completed the tabulation and analysis of the 1999 emission inventory and the control measure assessment for most sources, as described in Chapter 2. The major industrial sources that have previously made voluntary emissions reductions (AEP, Eastman Chemical Company, Texas Operations, and TXU) completed their own assessments, which are presented in Chapters 3-5. One other company, Huntsman Chemical, provided information on HRVOC control measures that is included in Chapter 2. The potential for taking credit for energy efficiency improvements by the City of Tyler is discussed in Chapter 2. The comments received at the public meeting are discussed in Chapter 6.

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2. ANALYSIS OF POTENTIAL EMISSIONS REDUCTION STRATEGIES FOR AREA, MOBILE AND SELECTED POINT SOURCES

EMISSION INVENTORY ANALYSIS

The 1999 Emission inventory for the Tyler/Longview/Marshall Flexible Attainment Region was used to characterize important sources of NOx in the Northeast Texas region comprised of Gregg, Harrison, Rusk, Smith and Upshur counties. Relative NOx contributions by major source category are presented for the 5-county region in Figure 2-1. The 5 counties in the NETAC region can be seen in the map of the ozone modeling 4 –km grid shown in figure 2-2.

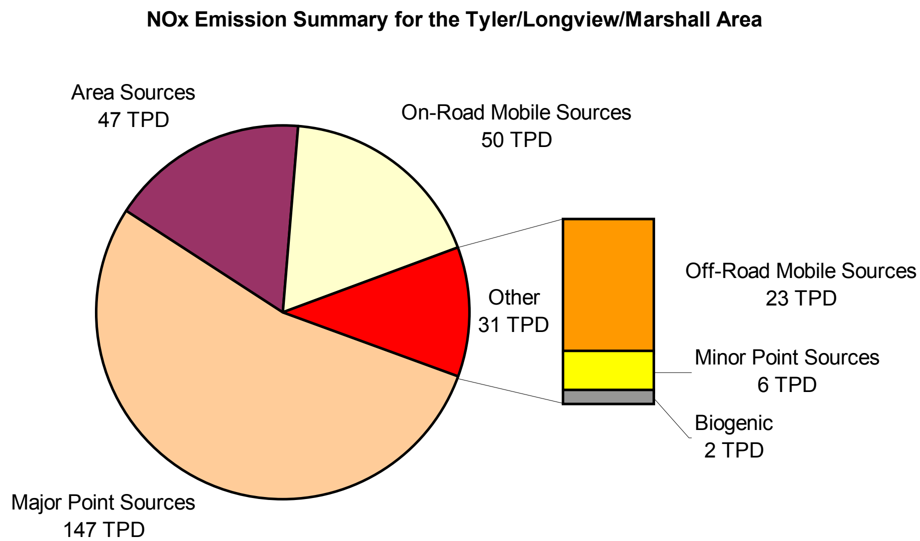

Figure 2-1. NOx Emission Summary for the 5-County Northeast Texas Region in 1999.

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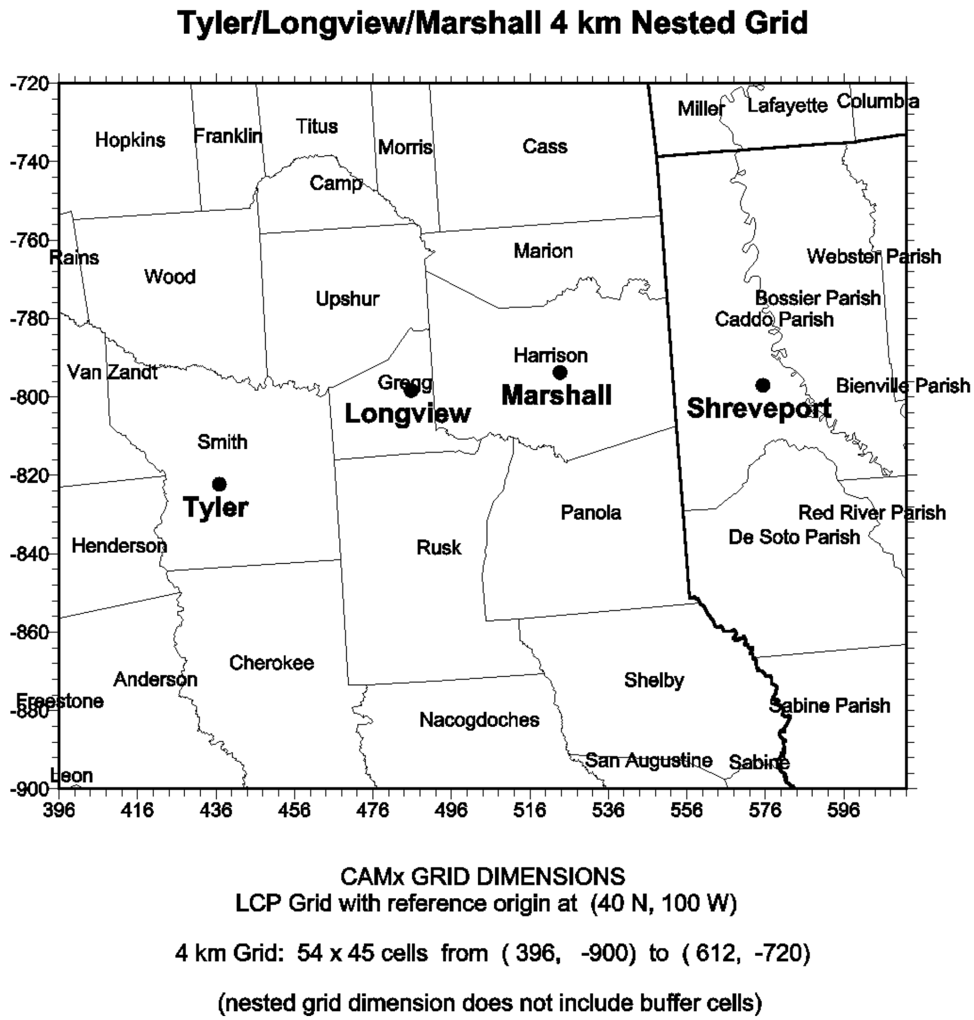

Figure 2-2. CAMx 4 km fine grid covering Northeast Texas.

Figure 2-1 and the following analysis exclude major sources outside the 5-county region and sources that began operation after 1999. One new source is the Tenaska Gateway Power Plant in Rusk County, which reported average NOx emissions of 1.1 tons per day for calendar year 2002. Since Tenaska Gateway is a new source it was permitted to low emission levels, and data reported to EPA's acid rain database show that the power plant is operating below the permitted emission levels.

The anthropogenic NOx emissions were analyzed to find groups of NOx sources that provide significant opportunities for reductions. NOx emissions from AEP, TXU, Eastman Chemical Company, Texas Operations and on-road mobile sources were considered separately. AEP, TXU, and Eastman Chemical Company, Texas Operations each contributed their own assessments, included as later chapters, as they have detailed knowledge of the equipment to be controlled and strategies already employed. On-road mobile control strategies are addressed later in this section, but they are not a major focus of the analysis because they are not considered very effective given the large NOx contributions from truck traffic on I-20.

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The remaining NOx emissions data were sorted by source category code (SCC) within each major source sector: major points, minor points, area, and off-road. Major points, minor points, and area sources are all stationary sources that are classified according to total emissions at a given location. A major point source is a facility emitting more than 100 TPY of NOx or VOC. Minor point sources emit greater than 25 TPY NOx or 10 TPY VOC, and area sources are stationary sources below this threshold.

NOx emissions within each of the major categories were then summed over each SCC to examine relative contributions by equipment type. The SCCs with total NOx contributions over 1 ton per day (TPD) in each major source category were considered areas where significant NOx reductions could potentially be achieved. Sources meeting this 1 TPD cutoff are presented in Table 2-1. As area and major and minor point sources are all stationary, these source categories have equipment types in common, which can be seen in Table 2-1. Additionally, the table has off-road emissions from construction and mining separated to better characterize emissions from Northeast Texas' lignite mining operations.

The combined emissions from sources listed in Table 2-1 account for more than 70 tons of NOx per day in the 5-county Northeast Texas region. Sources listed can be broken down to three broad classifications: natural gas reciprocating engines, liquified petroleum gas (LPG) boilers, and off-road diesel engines. For each of these equipment types, various technologies exist that have been demonstrated to significantly reduce NOx emissions, some of which are already being implemented in different parts of Texas. What follows is discussion of applicable strategies through which verifiable NOx reductions have been achieved elsewhere and for which the technology is readily available.

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Table 2-1. Major Source Category Contributors (> 1TPD) of NOx Emissions in the 5-County East Texas Region Excluding On-road Sources, Eastman Chemical Company, Texas Operations, TXU, and AEP.

SCC Code	NOx emissions (tons per day)	Source Description
Area Sources		
2310000000	35.96	Industrial Process; Oil and Gas Production; All Processes
2102007000	10.04	Stationary source fuel combustion; Industrial; Liquefied Petroleum Gas (LPG); Total: All boiler types
Major Point Sources		
20200253	3.47	Internal Combustion Industrial Equipment; Natural-gas fired; 4 cycle Rich burn
20200252	1.11	Internal Combustion Industrial Equipment; Natural-gas fired; 2 cycle Lean burn
20200254	1.01	Internal Combustion Industrial Equipment; Natural-gas fired; 4-cycle Lean Burn
Minor Point Sources		
20200252	5.13	Internal Combustion Industrial Equipment; Natural-gas fired; 2-cycle Lean Burn
Off-road Sources-Mining Operations		
2270002051	1.24	Mobile sources; Off-Highway diesel vehicle; Construction and mining equipment; Off-highway trucks
2270002069	0.65	Mobile sources; Off-Highway diesel vehicle; Construction and mining equipment; Crawler dozer/loaders
2270002036	0.34	Mobile sources; Off-Highway diesel vehicle; Construction and mining equipment; Excavators
Off-road Sources-Construction Equipment		
2270002069	1.43	Mobile sources; Off-Highway diesel vehicle; Construction and mining equipment; Crawler dozer/loaders
2270002060	1.22	Mobile sources; Off-Highway diesel vehicle; Construction and mining equipment; Rubber tire loaders
2270002036	0.73	Mobile sources; Off-Highway diesel vehicle; Construction and mining equipment; Excavators
Off-road Sources-Other		
2285002000	8.33	Mobile sources; Off-Highway diesel vehicle; Railroad diesel equipment; Total emissions
2270005015	1.37	Mobile sources; Off-Highway diesel vehicle; Agricultural equipment; Agricultural tractors

AREA SOURCE CONTROL STRATEGIES

Oil and Gas Production: All Processes

The largest contributor of NOx in table 2-1 totaling 36 tons per day is the area source category of "Oil and Gas Production: All Processes". Of that total, the Northeast Texas 1999 Emission Inventory attributes more than 32 tons of NOx per day to oil and gas compressors. These compressors are located at individual natural gas wells or at junctions of two or more extraction stations. Therefore, the maximum number of "area source" compressors

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contributing NOx in the region is probably less than the number of wells in operation. Recent survey data reveal 3686 producing wells in the 5-county Northeast Texas region. The same survey data characterize these engines as mostly uncontrolled, rich burn engines, the majority of which have a maximum power rating less than 500 horsepower.

The most viable method of reducing emissions from these sources is by installing three-way catalysts on the engines. Use of this technology requires an air-fuel ratio controller in addition to the catalyst, both of which have models available for the smaller (up to 500 hp) rich burn engines. This configuration generally achieves >90% NOx reduction. Success of the catalyst system relies on the engine operating within specifications and therefore may require maintenance at the time of install and afterwards.

The potential for NOx reductions from this source category is great. If 75% penetration was achieved at 90% NOx reduction, emission reductions of 22 tons per day could be achieved.[1] As all equipment required for implementation is available, significant reductions are feasible by the end of 2005.

Industrial LPG Boilers

Industrial LPG boilers, characterized in AP-42 as those with heat input capacities between 10 and 100 MMBtu (chapter 1, section 5), also contribute significantly to the NOx in the region with emissions totaling 10 tons of NOx per day. Possible strategies for reducing emissions from these sources include the use of Low NOx Burners (LNB), which can achieve 50% NOx reduction, or a combination of LNB and Flue Gas Recirculation (FGR), which has demonstrated NOx reductions of 60%. Survey data for Industrial LPG boilers would allow for better estimates of emission benefits. NETAC should conduct a survey of LPG boilers if this strategy is pursued.

If 50% penetration and 50% NOx reduction were assumed, the potential reductions from LPG boilers totals 2.5 tons per day of NOx reduced. This technology exists and is readily available; implementation by December 2005 is feasible.

MAJOR AND MINOR POINT SOURCE CONTROL STRATEGIES

4-Cycle Rich Burn Engines

4-cycle rich burn natural gas engines contribute approximately 3.5 tons of NOx per day to the point source total for the 5-county Northeast Texas region. A preliminary survey of available permit information shows that these engines have horsepower ratings higher (800-2,000 hp in the permit survey) than those powering compressors at natural gas wells. However, the recommended strategy for NOx emission control is the same as that for smaller engines: retrofit with three-way-catalyst systems. NOx reduction rates are similar at around 90%.

[1] The conservative assumption of 75% penetration allows for the possibility that 25% of emissions are coming from already controlled engines. In reality, even if a significant fraction of these compressor engines are already controlled, their NOx contribution would likely be significantly less than the 25% assumed.

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Assuming 50% of the emissions in this source category are from uncontrolled engines in a well-maintained retrofit-ready state, potential reductions from these engines are approximately 1.6 tons of NOx per day. The technology is readily available, and achieving emission reductions via this strategy is feasible by December 2005.

4-Cycle Lean Burn Engines

Natural gas fired, 4-cycle lean burn engines contribute approximately 1 ton of NOx per day to the 5-county Northeast Texas region. The only commercially available technology for reducing NOx from lean burn engines is Selective Catalytic Reduction (SCR), which has been demonstrated to achieve NOx reductions greater than 90%.

AP-42 provides emission factors for equipment operating at different loads; 90% is a cut-off for which emission factors are reported. AP-42 emission factors for engines operating at <90% load show NOx emissions to be higher for 4-cycle rich burn than for 4-cycle lean burn. Therefore, engine replacement alone as a control strategy is unlikely to significantly reduce emissions. For significant reductions, the 4-cycle lean burn engine could be replaced with a 4-cycle rich burn engine with an air-fuel ratio controller and three-way catalyst retrofit.

As some of these 4-cycle lean burn engines may have controls installed, a penetration rate of approximately 50% is assumed for reduction via replacement with 4-cycle rich burn and retrofit with three-way catalysts. The repowering would result in a NOx increase of approximately 10%, and the three-way catalyst would reduce NOx from the new configuration by 90% yielding a net NOx reduction of approximately 0.4 tons per day. The rich burn engines and catalyst systems are presently available, and reductions can feasibly be achieved by the end of 2005.

2-Cycle Lean Burn

In the 5-county Northeast Texas region, 2-cycle lean burn natural gas engine contributions from both major and minor point sources total 6.2 tons NOx per day. Retrofit with SCR equipment is not recommended as the 2-cycle design results in much higher contaminant concentrations in the exhaust, which leads to rapid destruction of the catalyst.

AP-42 emission factors show uncontrolled 4-cycle lean burn operation at <90% load emit less NOx than uncontrolled 2-cycle lean burn engines operating <90%. However, should the engine ever necessitate load >90%, emissions from the 4-cycle engine exceed those from the 2-cycle. An effective strategy for reducing emissions from the 2-cycle lean burn natural gas engines is replacement with a 4-cycle rich burn natural gas engine and subsequent retrofit with a three-way-catalyst system.

If a replacement and retrofit program were implemented as described above, an entirely uncontrolled base fleet could be assumed based on the difficulty of implementing controls for 2-cycle engines. Assuming no change in base emission factors and 90% NOx reduction from

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installation of the three-way catalyst, potential NOx reductions from the 2-cycle category are more than 5.5 tons of NOx per day.[2] Emission reductions by December 2005 are feasible.

OFF-ROAD MOBILE SOURCE CONTROL STRATEGIES

The largest off-road mobile sources of emissions in Northeast Texas are locomotives and construction, mining, and agricultural equipment. Emission reductions can be practically gained from three primary methods: engine (or equipment) replacement, engine retrofit, and fuel measures. These basic control methods and their potential are outlined in Table 2-2 for diesel equipment. Fuel programs are of interest because of the fill-and-go nature of the control measure, which often requires little or no capital cost. New engine/vehicle programs are practical because the owner/operator can upgrade their fleet to more functional equipment while improving air quality, but this usually entails a high initial capital cost. The retrofit strategies are lower cost than whole engine or vehicle replacement but are typically less practical and less widely applicable. Funding from the Texas Emissions Reduction Program (TERP) may be available to support some of the projects discussed below.

Table 2-2. On and Off-road Diesel Control Technologies.

Emission Reduction Method	VOC	NOx	Comments
Fuel –reformulation (California Air Resources Board fuel/cetane enhancers)	Small	5%	Beyond Texas Low Emission Diesel (LED)
Fuel – extreme reformulation (Fischer-Tropsch fuel)	Small	5 – 15%	Beyond Texas LED
Fuel – water emulsions	Small	~15%	Beyond Texas LED
New engine/replacement (engine only or whole vehicle)	Small	Up to 50%	Depends upon the engines used and replaced
Engine retrofit – NOx control: Lean NOx catalyst (LNC), Exhaust Gas Recirculation (EGR), and Selective Catalytic Reaction (SCR)	No effect	20 – 90%	Depends upon method used and only applicable to certain vehicles
Advanced technologies (Fuel cells or turbines)	Up to 100%	Up to 100%	Only applicable to certain vehicles

Railroad Diesel Equipment

The largest contributor to off-road NOx emissions in Northeast Texas is railroad diesel equipment at 8.3 tons per day. Within this source, 7.6 tons per day are attributable to line-haul engines, which are not under the jurisdiction or influence of Northeast Texas. The 0.6 tons of NOx emitted daily by switching engines could employ some of the reduction strategies discussed above. Upgrading the engines to a minimum of Tier 0 could reduce emissions by 28%. Upgrade to Tier 1 or 2 could result in emission reductions up to 50%, but switching engines are typically not purchased new. However, should fleet managers wish to implement this strategy, Tier 1 engines are available now and Tier 2 engines may become available

[2] As the NOx emission factor of a 4-cycle rich burn engine is less than that of a 2-cycle lean burn engine operating <90% load and greater than that of a 2-cycle lean burn engine operating >90% load, a 0% change in base emission factor was assumed as the actual operating conditions of the engines are unknown.

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before December 2005. Fuel measures for railroad diesel equipment are limited to the use of fuel/water emulsions and liquefied natural gas, but these measures require extensive engine changes and have not proved entirely practical except in limited circumstances where engines operate on fixed routes.

Implementing the Tier 0 upgrade strategy for all switching engines in Northeast Texas could reduce NOx emissions by 0.16 tons per day, all of which could be achieved by December 2005.

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Off-Highway Mining, Construction, and Agricultural Equipment

The remaining off-road NOx contributors listed in Table 2-1 are powered by similar diesel engines; therefore, similar strategies can be employed to reduce emissions from all sources in this group with emissions totaling 5.5 tons of NOx per day. One strategy suitable for reducing NOx from diesel engines is retrofit with a lean NOx catalyst. Another option is engine or equipment upgrade to those meeting Tier 2 standards. Reductions realized from this strategy would be 50% for engines older than 1995 and 35% for engines 1995 or newer.

Fuel/water emulsions have been demonstrated to achieve 21% NOx reduction in off-road diesel equipment. This strategy is currently being employed in Dallas and Houston. SCR is also an option for off-road diesel engines and can achieve NOx reductions of 80%. The City of Houston has gained TERP funding to widely implement these devices within a year, and a unit has already been demonstrated in the field.

All of the strategies discussed above are in distribution, and it would be feasible to achieve emission reductions by December 2005. Assuming the lower range of reductions is realized, at 25% reduction more than 1.7 tons of NOx can be reduced per day from all off-road diesel sources included in this analysis. Solely from the lignite mining equipment in Table 2-1, a 25% reduction in NOx emissions would result in reductions of 0.6 TPD. The potential also exists for further emission reductions from similarly powered off-road equipment not included in this analysis.

ON-ROAD MOBILE SOURCE CONTROL STRATEGIES

The emission reduction alternatives available for reducing on-road emissions are similar to those available for off-road engines and can be grouped into three general categories: fuel measures, engine (or equipment) replacement, and engine retrofit.

Some basic control methods and their potential are outlined in the Table 2-2 above and Table 2-3 below. The benefits and limitations of different approaches parallel those for off-road equipment. Fuel programs are of interest because of the fill-and-go nature of the control measure requiring little or no capital cost. New engine/vehicle programs are practical because the owner/operator can upgrade their fleet to more functional equipment while improving air quality, but these usually entail a high initial capital cost. The retrofit strategies are lower cost than whole engine or vehicle replacement, but are typically less practical and less widely applicable.

Table 2-3. On and Off-road Spark-Ignition (Gasoline, LPG, CNG) Control Technologies.

Emission Reduction Method	VOC	NOx	Comments
New engine/replacement (with those meeting new emission standards)	Large	Large	Depends upon the engines used and replaced; NOx control for >25 hp engine and VOC for small engines
Engine retrofit – NOx control: 3-way Catalyst (TWC) only for heavy-duty vehicles	Large	Up to 90%	Depends upon method used and application
Other measures: electric vehicles and equipment charged from grid	Up to 100%	Up to 100%	Limited application

While on-road emission reductions may be less practical for Northeast Texas than other emission reduction programs, other regions throughout the U.S. have implemented emission reduction projects through the use of state funding, such as Congestion Mitigation and Air Quality (CMAQ) funding. Much of the funding used for localized on-road emission reduction programs is regionally specific and therefore not available for programs in Northeast Texas. Additionally, Northeast Texas is ineligible for state CMAQ funds to implement such a program.

Regions with existing on-road programs implement a range of transportation control measures with the most effective measure being clean vehicle purchase programs and alternative commuting options. The Houston-Galveston Area Council (H-GAC) currently administers the most effective clean vehicle purchase program within Texas and is discussed here as an example. H-GAC assists public and private entities in implementing low emission vehicle fleets and fueling infrastructure. Federal funds are available for eligible projects that use approved technology to reduce smog-forming emissions from on-road motor vehicles in the Houston-Galveston nonattainment area. (http://www.houston-cleancities.org/#) Eligible projects include strategies similar to those listed in tables 2-2 and 2-3, and funding covers a percentage of new equipment and infrastructure costs.

HIGHLY REACTIVE VOC CONTROL STRATEGIES

Eastman Chemical Company, Texas Operations is discussed in Chapter 4. Huntsman Chemical owns a polypropylene plant in Longview and provided the information presented below:

"Our suspected reactive chemicals are propylene and ethylene. Our greatest gain as it relates to control strategies would be a VOC reduction in our fugitive emission programs (LDAR). In 2003 we will begin an extensive voluntary program to reduce our fugitive emissions by converting our LDAR program from 28M to 28VHP. What this amounts to is going from a maximum leak rate for valves and flanges of 10,000 ppm to a maximum leak rate of 500 ppm. This process will happen over a four-year period. We are estimating our reductions of VOCs will be 29 tons/year by 2005 and 44 tons/year by 2008. This equates to a VOC emission reduction of 15% and 22% respectively by 2008 from our projected (new permit in final stages of the TCEQ approval process) permitted allowable."

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East Texas Clean Cities Coalition

The Department of Energy (DOE) Clean Cities program is an example of a voluntary mobile source emission reduction program in East Texas. The East Texas Clean Cities Coalition (ETCCC), coordinated by the East Texas Council of Governments (ETCOG), has been working towards official designation by the DOE for the past year and a half and expects to be designated by the end of 2003. ETCCC promotes the use of alternative fuels to gasoline and diesel, such as propane, natural gas, ethanol, and biodiesel. One result of these cleaner burning fuels is an improvement in air quality. An Alternative Fuel Vehicle (AFV) survey conducted by ETCCC indicated there are 471 vehicles in East Texas region capable of operating on an alternative fuel. The largest operator of AFVs in East Texas is the Texas Department of Transportation (TxDOT) who operates 209 AFVs.

An incremental cost is often associated with the purchase of AFVs along with a lack of sufficient infrastructure to support the vehicles. There are however a number of ways to decrease this incremental cost. Many vehicle manufacturers offer incentives and rebates with the purchase of AFVs. A tax credit can also be received with the installation of associated infrastructure. Once officially designated, ETCCC will be able to compete for DOE State Special Energy Projects funding ($4.6 million in 2003) to purchase AFVs, build infrastructure, or use for AFV school buses.

Another source of funding for AFV projects is the Texas Emission Reduction Plan (TERP), which received full funding during the 78^{th} Texas State Legislature in the spring of 2003. The primary purpose of TERP is to reduce, through voluntary incentive programs, the emissions of oxides of nitrogen (NOx). Programs to be funded under TERP include an Emission Reduction Incentives Grant Program, Heavy-Duty Motor Vehicle Lease or Purchase Incentive Program, and a Light-Duty Vehicle Incentive Program.

TERP provides grants to eligible projects in affected counties to offset the incremental cost associated with the activities to reduce emissions of NOx from high-emitting mobile diesel sources in nonattainment areas and near nonattainment areas of the state (includes Gregg, Harrison, Rusk, Smith, Upshur, and Henderson Counties). The TCEQ may reimburse a purchaser or lessee of a new on-road heavy-duty (over 10,000 lb) vehicle statewide for incremental costs of purchasing or leasing the vehicle in lieu of a higher-emitting diesel-powered vehicle. The vehicle being purchased or leased must be certified by the U.S. Environmental Protection Agency (EPA) to meet certain designated lower emissions standards for NOx. The Light-Duty Motor Vehicle Purchase or Lease Incentive Program is similar to the Heavy-Duty Program, and provides incentives statewide for the purchase or lease of light-duty (less than 10,000 lb) motor vehicles that are certified by the EPA to meet a lower emissions standard for NOx. The incentive program is administered by the Texas Comptroller of Public Accounts.

OZONE SIP CREDIT FOR ENERGY EFFICIENCY IMPROVEMENTS

The City of Tyler is carrying out a series of energy efficiency improvements that will reduce electricity consumption. EPA currently is evaluating whether areas can take ozone SIP credit

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for emissions reductions resulting from energy savings. The City of Tyler projects are to be completed by July 2004, and the estimated energy savings are shown in the table below.

Improvement Measure	Energy Savings (Annual kWh)
Building Lighting, HVAC and Controls Upgrades	1,617,173
Traffic Light Upgrades	1,630,324
Park Lighting Upgrades	60,083
Wastewater Plant Motor and Controls Upgrades	1,346,060
Total	4,653,640

The City of Longview has an energy efficiency plan that includes energy efficient lighting, traffic signal improvements and upgrading HVAC equipment at city facilities. These improvements are scheduled for completion by December 2005.

At the present time, EPA is drafting an "Innovative Alternatives Policy" which will provide the basis for SIP credits for programs such urban heat island mitigation strategies, ozone destroying catalysts, and *energy efficiency programs*. This would be a national policy that NETAC could certainly consider using for the City of Tyler projects. The policy is still undergoing internal review at EPA. Additionally, EPA is working on a specific policy for Energy Efficiency (EE) programs. This policy may be released as early as this coming July, but most likely around September 2003. While we have not been privileged to examine this policy, it would likely have requirements similar to other programs related to SIP credits under the 1990 Clean Air Act. Any SIP credits would need to be emission reductions in addition to those already claimed in the current SIP, and would have to be real, enforceable, and implementable.

Since 1998, EPA has had an Energy/Renewable Energy (EE/RE) Set-Aside for use by states affected in the 1998 NOx SIP call. This essentially is an option for the 22 states within the SIP call area to include emission reductions through voluntary actions such as energy efficiency projects in their SIP. However, Texas is not one of the states affected by the NOx SIP call. The guidance developed in this program will likely be a major part of the evolving national EPA policy on Energy Efficiency. To learn more about the EE/RE set aside program as potential indicator of how the new policy might be applied in Texas, go to http://www.epa.gov/appdstar/state_local_govnt/state_outreach/repaweb.html.

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3. EVALUATION OF POTENTIAL EMISSION REDUCTION STRATEGIES FOR AEP-SWEPCO

AEP-Swepco has evaluated potential NO_x emission reduction strategies that could be implemented at Wilkes, Welsh, Knox Lee, and Pirkey by the Early Action Compact deadline of December 31, 2005. Table 3-1 provides information on NO_x reductions achieved since 1999, and Table 3-2 addresses potential technologies/methodologies that could be investigated for future reductions.

Table 3-1. NOx Reduction Equipment Installed.

Unit	Technology/Year	NOx Rate Reduction	Current NOx Emission Rate*	Comments
Wilkes Unit 1	None	NA	0.15 lb/mmBTU 1.4 TPD	Unit already meets SB 7 emission rate
Wilkes Unit 2	Low NOx Burners, 1999	60%	0.17 lb/mmBTU 2.9 TPD	Rate is on a 30 day rolling average. 1995 baseline year.
Wilkes Unit 3	Low NOx Burners, 2000	45%	0.17 lb/mmBTU 2.6 TPD	Rate is on a 30 day rolling average. 1995 baseline year.
Knox Lee Unit 5	Flame Tempering, 2000	28%	0.18 lb/mmBTU 3.2 TPD	Rate is on a 30 day rolling average. 1995 baseline year.
Pirkey	Low NOx Burners and Over Fire Air, 2002	30%	0.22 lb/mmBTU 17.9 TPD	Rate is on a 30 day rolling average. 1997 baseline year.
Welsh 1	Low NOx burners and Over-fire Air, 2002	46%	0.17 lb/mmBTU 11.9 TPD	Rate is an annual average. 1998 baseline year.
Welsh 3	Low NOx burners and Over-fire Air, 2001	51%	0.17 lb/mmBTU 11.1 TPD	Rate is an annual average. 1998 baseline year.

* NOx tons per day (TPD) were calculated by ENVIRON using the 2007 attainment demonstration heat input values.

Table 3-2. Potential NOx Reduction Technologies.

Unit	Potential Technology	NOx Reduction Range*	Feasibility[1]
Wilkes Unit 1	Induced Flue Gas Recirculation	20 – 40 % 0.3 – 0.6 TPD	Estimate two years to budget, plan, engineer and install. Proven technology for this type unit.
Wilkes Unit 2	Induced Flue Gas Recirculation	20 – 40 % 0.6 – 1.2 TPD	Estimate two years to budget, plan, engineer and install. Proven technology for this type unit.
Wilkes Unit 3	Induced Flue Gas Recirculation	20 – 40 % 0.5 – 1 TPD	Estimate two years to budget, plan, engineer and install. Proven technology for this type unit.
Knox Lee Unit 5	Induced Flue Gas Recirculation	20 – 40 % 0.6 – 1.3 TPD	Estimate two years to budget, plan, engineer and install. Proven technology for this type unit.
Pirkey	Control Systems	0 – 5% 0 – 0.9 TPD	Estimate two years to plan, budget, engineer and install. Enhances current equipment.
Pirkey	Selective Non-catalytic Reduction Trim	15 – 25% 2.7 – 4.5 TPD	Not proven on large lignite units. Test is pending. Estimate two years to plan, budget, engineer and install.
Welsh 2	Low NOx Burners and Over-fire Air	30-50% 2.9 – 4.9 TPD	Estimate two years to budget, plan, engineer and install. Proven technology for this type unit.

* NOx tons per day (TPD) were calculated by ENVIRON using the 2007 attainment demonstration heat input values.

[1] Feasibility is based on being able to install by EAC milestone date of 12/31/05. Only considered commercially available technology.

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4. EVALUATION OF POTENTIAL EMISSION REDUCTION STRATEGIES FOR EASTMAN CHEMICAL COMPANY, TEXAS OPERATIONS

Eastman Chemical Company has evaluated potential NO_x emission reduction strategies that could be implemented at their Texas Operations site in Longview by the Early Action Compact deadline of December 31, 2005. The following table provides information on potential technologies/methodologies that could be investigated for future reductions of NO_x and HRVOC.

Table 4-1. Potential NOx and HRVOC Reduction Strategies at Eastman Chemical Company, Texas Operations.

Unit(s)	Emission Reduction Strategies	NOx or HRVOC Reduction Range Tons/Day	Feasibility
Polyethylene Compressor Engines	Investigate Operational Tuning and Control Technology Options	0.41 - 0.55 TPD NOx	Moderate. Estimate two years to investigate, budget, plan, engineer and install.
Utility Boilers	Investigate Operating Strategy and Control Technology Options	0.14 - 0.20 TPD NOx	Moderate. Estimate two years to investigate, budget, plan, engineer and install.
Cracking Plant Auxiliary Boilers	Investigate Operating Strategy and Control Technology Options	0.07 - 0.14 TPD NOx	Moderate. Estimate two years to investigate, budget, plan, engineer and install.
Polyethylene Division Fugitive Equipment	Enhanced Leak Detection and Repair Programs	0.27 – 0.41 TPD HRVOC	High. Estimate 100% of these emission reductions could be accomplished before the 2004 ozone season begins.
Utilities and Feedstocks Division Fugitive Equipment	Enhanced Leak Detection and Repair Programs	0.27- 0.41 TPD HRVOC	High. Estimate 50% of these emission reductions could be accomplished before the 2004 ozone season begins, with the remaining 50% to be accomplished by December, 2005.

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5. EVALUATION OF POTENTIAL EMISSION REDUCTION STRATEGIES FOR TXU

TXU Energy has evaluated potential NO_x emission reduction strategies that could be implemented at Martin Lake Steam Electric Station by the Early Action Compact deadline of December 31, 2005. Martin Lake plant consists of three lignite/coal-fired electric generating units and is located in Rusk County. The following table provides information on NO_x reductions since 1999 and potential technologies/methodologies that could be investigated for future reductions.

Table 5-1. Current and Potential Reduction Strategies at TXU Energy.

Current and Potential NO_x Reduction Strategies	NO_x Emission*	NO_x Reduction*	Retrofit Control
Average plant emission rate for 1999	0.292 lb/mmBTU 84 TPD	-	-
Agreed Order commitment[11] (Effective May 1, 2003)	0.2 lb/mmBTU 57.5 TPD	32% 26.5 TPD	Low NO_x Concentric System Level 2 – Low NO_x burner systems with close-coupled and separated overfire air
Additional NO_x reductions by combustion tuning with advanced NO_x control computer programs (currently installed and in test operation)	0.18 to 0.19 lb/mmBTU 51.8 to 54.6 TPD	5 – 10% 2.9 – 5.7 TPD	Advanced NO_x Control – Neural network based controls that bias boiler controls to minimize NO_x as boiler conditions and fuel quality vary. TXU Energy may be able to achieve additional reductions with the low NO_x burners and optimized combustion practices. Operations during peak summer conditions must be evaluated to make a determination on an achievable rate.

* NOx tons per day (TPD) were calculated by ENVIRON using the 2007 attainment demonstration heat input values.

Post combustion controls could not be installed by the EAC milestone date and, therefore, are not considered as potential technologies. Also, these technologies have not been demonstrated on lignite-fired units and some have not been demonstrated on units of this size.

[1] Monticello Steam Electric Station is included in the Agreed Order; however, current experience with installed equipment indicates that no timely additional reductions are feasible. Monticello plant is in Titus County.

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6. PUBLIC COMMENTS

The draft report identifying potential emission reduction strategies was presented at a public meeting held in the Longview Public Library on May 28, 2003. Four speakers commented on the report in the public meeting. The written comments provided by one speaker are included verbal comments of three speakers are summarized below. After the public meeting, the NETAC technical committee met to discuss the comments and the report was modified as appropriate. NETAC will continue to consider these public comments as control strategies are developed for the EAC.

Written Comments of Henry Bradbury for the Caddo Lake Institute, May 28, 2003, regarding draft report titled:

Evaluation of Potential Emissions Reduction Strategies For the Northeast Texas Early Action Compact, May 23, 2003

<u>Report title</u>

1. Comment: Amend report title to more accurately reflect purpose:
   From: "Evaluation of Potential Emissions Reduction Strategies"
   To: "Identification of Potential Emissions Reduction Strategies"

   Or, add subtitle to existing title noting: Phase 1-Identification of Control Technologies.

<u>Page ES-1</u>

2. Redefine first milestone
   Comment: As written, the milestone indicates that all control technology measures will be identified and defined by June 16, 2003. The milestone should make it clear that this is not an exclusive list, but a work in progress and subject to additions as the process moves forward.

<u>Page ES-2</u>

Potential Control Measures Identified in the Assessment

3. Comment: As stated, the potential control measures are based on the assessment methodology provided. However, the report is absent the methodology detail (for major industrial sources) that generated these findings.

4. Comment: Additional effort should be employed by ENVIRON to assure that all potential control measures capable of achieving NOx reductions have been identified.

Page 1.2
Control Measure Assessment

5. Comment: The methodology to identify potential control measures does not appear to be applied uniformly to all sources considered in the report. The data provided by ENVIRON for sources other than the "major industrial sources" is more comprehensive, and closely aligns the stated methodology.

There is insufficient information available in Chapters 3-5 documenting that the stated methodology was employed. The information provided in these chapters should align the stated methodology and be presented in a consistent form.

6. Comment: Revise the scope of the Control Measure Assessment to include major sources (power plants) outside the five county area consistent with EPA provisions for such.

7. Comment: Consideration should be given to including emission reduction projects that do not appear to meet the December 31, 2005 deadline. In the event that the control measures identified for installation on or before December 31, 2005 does not meet the emission reduction objectives, having a second tier available for reconsideration would be advantageous.

Page 2.2
First paragraph

8. Comment: Tenaska Gateway Power Plant is located in southeast Rusk County, not Harrison County.

Page 2.9
Highly Reactive VOC Control Strategies

9. Comment: The title of this section focuses on HRVOC, though it is not clear if the VOC's mentioned in this section are HRVOC.

10. Comment: Clarification should be provided as to what role HRVOC's play in the air quality equation. Has the role of HRVOC's been confirmed?

11. Comment: Detail should be provided to show that the results that are provided by Huntsman Chemical align the stated control measure assessment methodology.

Chapters 3-5

12. Comment: Additional detail is warranted by each submitter that documents alignment with stated control measure assessment methodology.

Chapter 4

13. Comment: Scope of reduction strategies appears limited. No discussion of flares or other point sources.

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Summary of the Comments of Jessica Noble, WECAN

Could clean fuels be used more widely in Northeast Texas to further reduce emissions from vehicles?

Summary of the Comments of Tammy Campbell, WECAN and NETAC Policy Committee member

Does Longview have an energy efficiency program similar to the program described for Tyler? Do the air quality measurements collected by NETAC provide data on highly reactive VOCs?

Summary of the Comments of Karen Maines, Smart Growth Task

NETAC should consider whether planting more shade trees could be employed as an "urban heat island" mitigation strategy to improve air quality in Northeast Texas (as discussed at http://eandle.lbl.gov/HeatIsland/AirQuality). This would complement the other benefits to the environment of having more trees in urban areas.

The Following Comments were Submitted by Tammy Campbell, WECAN, after the Close of Comment Period on June 4.

June 6, 2003

1. **Comment:** What assurance is there that the list of candidate control measures as outlined in the report will be:
   "sufficient to ensure a control strategy can be developed to achieve attainment of the 8-hour ozone standard by 2007"? - As directed by EPA in their April 4, 2003 Memorandum to Air Directors, Regions III, IV, VI, and VIII, titled: Early Action Compacts (EACs): The June 16, 2003 Submission and Other Clarifications.

2. **Comment:** Considering the tight schedule and what is at stake, and that all the identified emission reductions to date might not be fully implementable, the Technical Committee must assure that the potential emission reductions strategies identified is more than adequate to meet the stated objective.

   - Currently, the potential NOx emission reductions identified in the report represent, at best, an 8.8 % reduction in daily NOx emissions (Total reductions identified 24.3 tons/day, total daily NOx emissions 275 tons/day). It is doubtful that all these emission reductions can be realized. In the absence of not knowing what level of reduction is required, an overall goal should be implemented to identify potential emission reductions at least a 10%.

3. **Comment**: According to the Early Action Compact for Northeast Texas, item E (Maintenance for Growth), EPA requires that The CAAP address emissions growth at least five years beyond December 31, 2007 to assure that the area will remain in compliance with the 8 hour standard.

   - Would not this list of potential emission reductions need to be extensive enough to accommodate future anticipated growth and assure compliance through December 31, 2012?

   If that is the requirement, have we identified an adequate level of potential emission reductions to achieve this goal?

4. **Comment:** The recent high ozone days of May 28 (95) and June 1 (107) give question if we really know what is going on in the world of "actual" emissions. For example, on May 28, at 5 AM the ozone monitor for Longview was reading "0", by noon the reading was 95, and the temperature was only 78.5 degrees F at noon!

   5 6 7 8 9 10 11 N 1

0	4	24	49	68	73	93	**95**	86	80	76	75

   This was preceded by an evening with very little wind (0-2.3 mph) between midnight and 8 AM, which would pretty much rule out that it blew in from somewhere else.

   Similar event took place on June 1, with a reading of 107.

   Can NETAC or its consultant provide an explanation of these episodes?

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