REVISIONS TO THE STATE IMPLEMENTATION PLAN (SIP) FOR THE CONTROL OF OZONE AIR POLLUTION

POST-1999 RATE-OF-PROGRESS AND ATTAINMENT DEMONSTRATION FOLLOW-UP SIP FOR THE HOUSTON/GALVESTON OZONE NONATTAINMENT AREA

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION
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SECTION VI. CONTROL STRATEGY

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LIST OF ACRONYMS

ACT - Alternative Control Techniques
AFV - Alternative Fuel Vehicle
AIRS - Aerometric Information Retrieval System
APA - Administrative Procedure Act
ARACT - Alternate Reasonably Available Control Technology
ARPDB - Acid Rain Program Data Base
ASC - Area Source Categories
ASE - Alliance to Save Energy
ASM - Acceleration Simulation Mode
ATA - Airline Transport Association
ATC - Air Traffic Control
BACT - Best Available Control Technology
BEIS - Biogenic Emissions Inventory System
BEIS-2 - Biogenic Emissions Inventory System, version2
BELD - Biogenic Emissions Land Cover Database
BIF - boilers and industrial furnaces
BIOME - Biogenic Model for Emissions
BPA - Beaumont/Port Arthur
Cal LEV - California Low Emission Vehicle
CAM - Compliance Assurance Monitoring
CAMS - Continuous Air Monitoring Station
CAMx - Comprehensive Air Model with Extensions
CARB - California Air Resources Board
CARE - Clean Air Responsibility Enterprise
CB-IV HC - Carbon Bond IV Hydrocarbon
CFR - Code of Federal Regulations
CEMS - Continuous Emissions Monitoring System
CMAQ - Congestion Mitigation and Air Quality
CMSA - Consolidated Metropolitan Statistical Area
CNG - Compressed Natural Gas
CO - Carbon Monoxide
COAST - Coastal Oxidant Assessment for Southeast Texas
CTG - Control Technique Guidelines
DART - Dallas Area Rapid Transit
DERC - Discrete Emission Reduction Credit
DFW - Dallas/Fort Worth
DFWN - Dallas/Fort Worth North
DFWRTM - Dallas/Fort Worth Regional Travel Model
DOW - Day of Week
DPS - Department of Public Safety
DRI - Desert Research Institute
DV - Design Value
EDFW - Extended Dallas/Fort Worth

EGAS - Economic Growth Analysis System
EGF - Electric Generating Facilities
EGR - Exhaust Gas Recirculation
EI - Emissions Inventory
EIQ - Emissions Inventory Questionnaire
ELP - El Paso
EPA - U.S. Environmental Protection Agency
EPN - Emission Point Number
ERC - Emission Reduction Credit
ERG - Eastern Research Group
ETR - Employer Trip Reduction
FAA - Federal Aviation Administration
FACA - Federal Advisory Committee Act
FCAA - Federal Clean Air Act
FMVCP - Federal Motor Vehicle Control Program
FR - Federal Register
FTE - Full Time Equivalent Employee
FTP - File Transfer Protocol
g/hp-hr - Grams Per Horsepower-Hour
GIS - Geographic Information System
GloBEIS - Global Biogenic Emissions Inventory System
g/mi - Grams Per Mile
GSE - Ground Support Equipment
GVWR - Gross Vehicle Weight Rating
HAP - Hazardous Air Pollutant
HAXL - Houston Air Excellence in Leadership
HB - House Bill
HC - Hydrocarbon
HDD - Heavy-duty Diesel
HDDV - Heavy-duty Diesel Vehicle
HDEWG - Heavy Duty Engine Working Group
HDV - Heavy-duty Vehicle
HGA - Houston/Galveston
HGAC - Houston-Galveston Area Council
HON - Hazardous Organic NESHAPS
HOV - High Occupancy Vehicle
hp - Horsepower
HPMS - Highway Performance Monitoring System
HRM - Houston Regional Monitoring
ICI - Industrial, Commercial, and Institutional
IIG - Interim Implementation Guidance
IIP - Interim Implementation Plan
I/M - Inspection and Maintenance
INIT - Initial Condition Tracer
ITWS - Integrated Terminal Weather System
IWW - Industrial Wastewater

KG/HA - Kilograms/hectare
KM - Kilometer
LDT - Light-duty Truck
LED - Low Emission Diesel
LEV - Low Emission Vehicle
LNG - Liquefied Natural Gas
LSG - Low Sulfur Gasoline
m - Meter
MACT - Maximum Achievable Control Technology
MDERC - Mobile Discrete Emission Reduction Credit
MERC - Mobile Emission Reduction Credit
METT - Mass Emissions Transient Testing
MMBtu - Million British Thermal Unit
MPA - Metropolitan Planning Area
MY - Model Year
NAAQS - National Ambient Air Quality Standard
NCDC - National Climatic Data Center
NCTCOG - North Central Texas Council of Governments
NEGU - Non-electric Generating Units
NESHAPS - National Emission Standards for Hazardous Air Pollutants
NEVES - Non-road Engine and Vehicle Emission Study
NHSDA - National Highway System Designation Act
NLEV - National Low Emission Vehicle
NNSR - Nonattainment New Source Review
NO_x - Nitrogen Oxides or Oxides of Nitrogen
NO_y - Nitrogen Species
NSR - New Source Review
NWS - National Weather Service
O_3 - Ozone
OAQPS - Office of Air Quality Planning and Standards
OBD - On-Board Diagnostics
OSAT - Ozone Apportionment Technology
OTAG - Ozone Transport Assessment Group
OTAQ - Office of Transportation and Air Quality
PAMs - Photochemical Assessment Monitoring Sites
PCV - Positive Crankcase Ventilation
PEI - Periodic Emissions Inventory
PM_{10} - Particulate Matter less than 10 microns
ppb - Parts Per Billion
ppm - Parts Per Million
ppmv - Parts Per Million by Volume
PSDB - Point Source Database
PSIA - Pounds per Square Inch Absolute
PSR -
QA/QC - Quality Assurance/Quality Control
RACT - Reasonably Available Control Technology

RAQPC - Regional Air Quality Planning Committee
RAZ - Regional Analysis Zone
RCTSS - Regional Computerized Traffic Signal System
RFG - Reformulated Gasoline
REMI - Regional Economic Modeling, Inc.
RFO - Request for Offer
ROP - Rate-of-Progress
RPM - Revolutions Per Minute
RSD - Remote Sensing Device
RVP - Reid Vapor Pressure
SAE - Society of Automotive Engineers
SAIMM - Systems Applications International Meteorological Model
SB - Senate Bill
SCAQMD - South Coast Air Quality Management District [Los Angeles area]
SCC - Source Classification Code
SCRAM - Support Center for Regulatory Air Models
SETRPC - Southeast Texas Regional Planning Commission
SIC - Standard Industrial Classification
SIP - State Implementation Plan
SITWC - Spark Ignition Three-Way Catalyst
SO_2 - Sulfur Dioxide
SO_x - Sulfur Compounds
SOCMI - Synthetic Organic Chemical Manufacturing Industry
SOS - Southern Oxidants Study
SULEV - Super-Ultra-Low Emission Vehicle
TAC - Texas Administrative Code
TACB - Texas Air Control Board
TAFF - Texas Alternative Fuel Fleet
TCAA - Texas Clean Air Act
TCF - Texas Clean Fleet
TCM - Transportation Control Measure
TIP - Transportation Implementation Plan
TMC - Texas Motorist's Choice
TMO - Transportation Management Organization
TNMOC - Total nonmethane organic compounds
TNRCC - Texas Natural Resource Conservation Commission (commission)
TPOD - Tons Per Ozone Day
TPY - Tons Per Year
TSP - Total Suspended Particulate
TTI - Texas Transportation Institute
TxDOT - Texas Department of Transportation
UAM - Urban Airshed Model
USDA - United States Department of Agriculture
USGS - United States Geological Survey
UTM - Universal Transverse Mercator
VAVR - Voluntary Accelerated Vehicle Retirement

VERP - Voluntary Emission Reduction Permit
VID - Vehicle Identification Database
VIN - Vehicle Identification Number
VIR - Vehicle Inspection Report
VMAS - Vehicle Mass Analysis System
VMEP - Voluntary Mobile Source Emissions Reduction Program
VMT - Vehicle Miles Traveled
VNR or VNRAT- VOC-NO_x ratios
VOC - Volatile Organic Compound
VRF - Vehicle Repair Form
WOE - Weight of Evidence
ZEV - Zero Emission Vehicle

VI: Ozone Control Strategy

A. INTRODUCTION

This introduction is intended to provide the reader with a broad overview of the SIP revisions that have been submitted to the EPA by the State of Texas. Some sections may be obsolete or superseded by new revisions, but have been retained for the sake of historical completeness. The reader is referred to the body of the SIP for details on the current SIP revision.

Requirements for the SIP specified in 40 CFR Part 51.12 provide that "...in any region where existing (measured or estimated) ambient levels of pollutant exceed the levels specified by an applicable national standard," the plan shall set forth a control strategy which shall provide for the degree of emission reduction necessary for attainment and maintenance of such national standard." Ambient levels of SO_2 and NO_x, as measured from 1975 through 1977, did not exceed the national standards set for these pollutants anywhere in Texas. Therefore, no control strategies for these pollutants were included in revisions to the Texas SIP submitted on April 13, 1979. Control strategies were submitted and approved for inclusion in the SIP for areas in which measured concentrations of ozone, TSP, or CO exceeded an NAAQS during the period from 1975 to 1977. On October 5, 1978, the Administrator of the EPA promulgated a lead ambient air quality standard. The FCAA Amendments of 1977 required that each state submit an implementation plan for the control of any new criteria pollutant. A SIP revision for lead was submitted in March 1981.

The control strategies submitted in 1979 provided, by December 31, 1982, the amount of emission reductions required by EPA policy to demonstrate attainment of the primary NAAQS, except for ozone, in the Harris County nonattainment area. For that area, an extension to December 31, 1987 was requested, as provided for in the FCAA Amendments of 1977.

Supplemental material, including emission inventories for VOCs and TSP submitted with the 1979 SIP revisions, is included in Appendices H and O of the 1979 SIP submittal.

Proposals to revise the Texas SIP to comply with the requirements of the FCAA Amendments of 1977 were submitted to EPA on April 13, November 2, and November 21, 1979. On December 18, 1979 (44 FR 75830-74832), EPA approved the proposed revision to the Texas SIP relating to vehicle inspection and maintenance and extended the deadline for attainment of the NAAQS for ozone in Harris County until December 31, 1987 (see Appendix Q of the 1979 SIP submittal for the full text of the extension request and the approval notice). On March 25, 1980 (45 FR 19231-19245), EPA approved and incorporated into the Texas SIP many of the remaining provisions included in the proposals submitted by the state in April and November 1979. The March 25, 1980 *Federal Register* notice also included conditional approval of a number of the proposed SIP revisions submitted by the state.

Additional proposed SIP revisions were submitted to EPA by the state on July 25, 1980 and July 20, 1981 to comply with the requirements of the March 25, 1980 conditional approvals. By May 31, 1982, all of the proposed revisions to the Texas SIP submitted to EPA in April and November 1979, July 1980, and July 1981, with the exception of provisions relating to the definition of major modification used in NSR and certain portions of the control strategy for TSP in Harris County, had been fully approved or addressed in

a *Federal Register* notice proposing final approval. The NSR provisions were approved on August 13, 1984.

The FCAA Amendments of 1977 required SIPs to be revised by December 31, 1982 to provide additional emission reductions for those areas for which EPA approved extensions of the deadline for attainment of the NAAQS for ozone or CO. In 1982 the state submitted a revision to the Texas SIP to comply with the FCAA Amendments of 1977 and EPA rules for 1982 SIP revisions. Supplementary emissions inventory data and supporting documentation for the revision were included in Appendices Q through Z of the 1982 SIP submittal.

The only area in Texas receiving an extension of the attainment deadline to December 31, 1987 was Harris County for ozone. Proposals to revise the Texas SIP for Harris County were submitted to EPA on December 9, 1982. On February 3, 1983, EPA proposed to approve all portions of the plan except for the Vehicle Parameter I/M Program. On April 30, 1983, the EPA Administrator proposed sanctions for failure to submit or implement an approvable I/M program in Harris County. Senate Bill 1205 was passed on May 25, 1983 by the Texas Legislature to provide the Texas Department of Public Safety with the authority to implement enhanced vehicle inspection requirements and enforcement procedures. On August 3, 1984, EPA proposed approval of the Texas SIP pending receipt of revisions incorporating these enhanced inspection procedures and measures ensuring enforceability of the program. These additional proposed SIP revisions were adopted by the state on November 9, 1984. Final approval by EPA was published on June 26, 1985.

Although the control strategies approved by EPA in the 1979 SIP revisions were implemented in accordance with the provisions of the plan, several areas in Texas did not attain the primary NAAQS by December 31, 1982. On February 23, 1983, EPA published a *Federal Register* notice identifying those areas and expressing the intent to impose economic and growth sanctions provided in the FCAA. However, EPA reversed that policy in the November 2, 1983 *Federal Register*, deciding instead to call for supplemental SIP revisions to include sufficient additional control requirements to demonstrate attainment by December 31, 1987.

On February 24, 1984, the EPA Region 6 Administrator notified the Governor of Texas that such supplemental SIP revisions would be required within one year for ozone in Dallas, Tarrant, and El Paso Counties and CO in El Paso County. The TACB requested a 6-month extension of the deadline (to August 31, 1985) on October 19, 1984. EPA approved this request on November 16, 1984.

Proposals to revise the Texas SIP for Dallas, Tarrant, and El Paso Counties were submitted to EPA on September 30, 1985. However, the revisions for Dallas and Tarrant Counties did not provide sufficient reductions to demonstrate attainment of the ozone standard and on July 14, 1987, EPA published intent to invoke sanctions. Public officials in the two counties expressed a strong desire to provide additional control measures sufficient to satisfy requirements for an attainment demonstration.

A program of supplemental controls was taken to public hearings in late October 1987. As a result of testimony received at the hearings, a number of the controls were modified and several were deleted, but sufficient reductions were retained to demonstrate attainment by December 31, 1991. These controls were adopted by the TACB on December 18, 1987 and were submitted to EPA as proposed revisions to

the SIP. Supplemental data and supporting documentation are included in Appendices AA through AO of the 1987 SIP submittal.

The FCAA Amendments of 1990 authorized EPA to designate areas failing to meet the NAAQS for ozone as nonattainment and to classify them according to severity. The four areas in Texas and their respective classifications include: HGA (severe), BPA (serious), ELP (serious), and DFW (moderate).

The FCAA Amendments required a SIP revision to be submitted for all ozone nonattainment areas classified as moderate and above by November 15, 1993, which described in part how an area intends to decrease VOC emissions by 15%, net of growth, by November 15, 1996. The amendments also required all nonattainment areas classified as serious and above to submit a revision to the SIP by November 15, 1994, which described how each area would achieve further reductions of VOC and/or NO_x in the amount of 3.0% per year averaged over three years and which includes a demonstration of attainment based on modeling results using the UAM. In addition to the 15% reduction, states were also required to prepare contingency rules that would result in an additional 3.0% reduction of either NO_x or VOC, of which up to 2.7% may be reductions in NO_x. Underlying this substitution provision is the recognition that NO_x controls may effectively reduce ozone in many areas and that the design of strategies is more efficient when the characteristic properties responsible for ozone formation and control are evaluated for each area. The primary condition to use NO_x controls as contingency measures is a demonstration through UAM modeling that these controls will be beneficial toward the reduction of ozone. These VOC and/or NO_x contingency measures would be implemented immediately should any area fall short of the 15% goal.

Texas submitted rules to meet the ROP reduction in two phases. Phase I consisted of a core set of rules comprising a significant portion of the required reductions. This phase was submitted by the original deadline of November 15, 1993. Phase II consisted of any remaining percentage toward the 15% net of growth reductions, as well as additional contingency measures to obtain an additional 3.0% of reductions. Phase II was submitted by May 15, 1994. The complete list of contingency measures was submitted by November 15, 1994. The appropriate compliance date was to be incorporated into each control measure to ensure that the required reductions would be achieved by the November 15, 1996 deadline. A commitment listing the potential rules from which the additional percentages and contingency measures were selected was submitted in conjunction with the Phase I SIP on November 15, 1993. That list of Phase II rules was intended to rank options available to the state and to identify potential rules available to meet 100% of the targeted reductions and contingencies. Only those portions of the Phase II rules needed to provide reasonable assurance of achieving the targeted reduction requirements were adopted by the commission.

The DFW and ELP areas achieved sufficient reductions with the 15% ROP SIP to demonstrate attainment by 1996. Attainment Demonstration SIP Revisions for these two areas were submitted on September 14, 1994.

The FCAA Amendments of 1990 classified the BPA area as a serious nonattainment area. The BPA nonattainment area includes Hardin, Jefferson, and Orange Counties. The BPA nonattainment area has an ozone design value of 0.16 ppm, which places the area in the serious classification.

The FCAA Amendments of 1990 required a Post-96 ROP SIP revision and accompanying rules to be submitted by November 15, 1994. According to the FCAA Amendments, this submittal had to contain an Attainment Demonstration based on UAM. Additionally, the revision had to demonstrate how the HGA and BPA nonattainment areas intended to achieve a 3% per year reduction of VOC and/or NO_x until the year 2007, and additional reductions as needed to demonstrate modeled attainment. The plan was also required to carry an additional 3% of contingency measures to be implemented if the nonattainment area fails to meet a deadline. To use NO_x reductions for all or part of the Post-96 controls or the contingency measures required a demonstration using UAM showing that NO_x controls would be beneficial in reducing ozone.

On November 9, 1994, the state submitted a SIP revision designed to meet the 3% per year ROP requirements for the years 1997-1999. This Post-96 ROP SIP revision detailed how the BPA and HGA nonattainment areas intended to achieve these three years' reductions of VOC (or 9% net-of-growth). Most of this amount was achieved by quantifying additional reductions due to existing rules and reductions due to federally-mandated rules. Rules to achieve the further reductions needed to meet the ROP SIP goal were submitted to EPA on January 11, 1995. This submittal included modeling demonstrating progress toward attainment, using a 1999 future year emissions inventory.

On August 14, 1994, the state submitted preliminary UAM modeling results for the BPA and HGA nonattainment areas that showed the relationship between emission levels of VOC and NO_x, and ozone concentrations. This modeling was conducted with a 1999 future year emissions inventory. Based on the results of this preliminary modeling, which showed that NO_x reductions might increase ozone concentrations, on April 12, 1995 the state received a temporary §182(f) exemption from all NO_x requirements, including RACT, I/M, NO_x NSR, and transportation conformity requirements. Permanent §182(f) exemptions from all NO_x requirements were granted for DFW and ELP, and temporary exemptions until December 31, 1996 for HGA and BPA. The commission subsequently requested that EPA extend this date until December 31, 1997. EPA approved this 1-year extension on May 14, 1997.

On March 2, 1995, Mary Nichols, EPA Assistant Administrator for Air and Radiation, issued a memo which gave states some flexibility to design a phased Attainment Demonstration. It provided for an initial phase which was intended to continue progress in reducing levels of VOC and/or NO_x, while giving states an opportunity to address scientific issues such as modeling and the transport of ozone and its precursor pollutants. The second phase was designed to draw upon the results of the scientific effort and design a plan to bring the area into attainment. To constitute Phase I under this approach, the EPA guidance required that states submit the following SIP elements by December 31, 1995:

- Control strategies to achieve reductions of ozone precursors in the amount of 3% per year from the 1990 baseline EI for the years 1997, 1998, and 1999.
- UAM modeling through the year 1999, showing the effect of previously-adopted control strategies which were designed to achieve a 15% reduction in VOCs from 1990 through 1996.
- A demonstration that the state has met the VOC RACT requirements of the FCAA Amendments.
- A detailed schedule and plan for the "Phase II" portion of the attainment demonstration which will show how the nonattainment areas can attain the ozone standard by the required dates.
- An enforceable commitment to:
    - Participate in a consultative process to address regional transport;

- Adopt additional control measures as necessary to attain the ozone NAAQS, meet ROP requirements, and eliminate significant contribution to nonattainment downwind; and
- Identify any reductions that are needed from upwind areas to meet the NAAQS.

Texas submitted the first two of these required sections in November 1994. The remaining three, a VOC RACT demonstration, the required commitments, and a Phase II plan and schedule, were submitted on January 10, 1996 to EPA.

ROP SIP modeling was developed for the HGA nonattainment area in two phases using the UAM. The first phase of ROP modeling was the modeling submitted in January 1995, as described above. The second phase of the ROP modeling was conducted using data obtained primarily from the COAST project, an intensive 1993 field study. The COAST modeling for HGA and the associated SIP were projected to be completed by December 1996 for submittal in May of 1997. Control strategies developed in this second phase were planned to be based on a more robust database, providing a higher degree of confidence that the strategies would result in attainment of the ozone NAAQS or target ozone value. A discussion of the schedule for the UAM modeling for the Phase II Attainment Demonstration can be found in Appendix 11-F of the January 10, 1996 submittal.

On January 29, 1996, EPA proposed a limited approval/limited disapproval for the Texas 15% ROP SIP revision. EPA proposed a limited approval because the SIP revision would result in significant emission reductions from the 1990 baseline and would, therefore, improve air quality. Simultaneously, the EPA proposed a limited disapproval because it believed that the plan failed to demonstrate sufficient reductions to meet the 15% ROP requirements. It also proposed a limited approval/disapproval of the contingency plans (designed to achieve an additional 3% of reductions if needed because a milestone is missed) along the same lines as the 15% action. EPA stated that some of the control measures submitted along with the SIP revision did not meet all of the requirements of the FCAA Amendments of 1990 and, therefore, cannot be approved. EPA further stated that it was not making a determination at this time about whether the state had met its requirements regarding RACT, or any other underlying FCAA Amendments of 1990 requirements. Finally, EPA proposed approval of the Alternate Means of Control portion of the November 9, 1994 Post-96 SIP submittal, but did not propose action on any other portion of that submittal.

Additionally, on November 29, 1995, the President signed the National Highway Systems Designation Act, which, among other things, prohibited EPA from discounting the creditable emissions from a decentralized vehicle I/M testing program if an approvable conditional I/M SIP revision was submitted to EPA within 120 days of the bill's signature. EPA's Office of Mobile Sources issued guidance stating that it would accept an interim I/M SIP proposal and Governor's letter 120 days after signature of the bill in lieu of an adopted SIP revision. The SIP proposal and letter was submitted to the EPA prior to the March 27, 1996 deadline to meet the 120-day time frame. The final I/M SIP revision (Rule Log No. 96104-114-AI), commonly referred to as the "Texas Motorist's Choice Program," was adopted by the commission on May 29, 1996 and submitted to the EPA by the state on June 25, 1996. On October 3, 1996, EPA proposed (61 FR 51651-51659) conditional interim approval of the Texas Motorist's Choice Program based upon the state's good faith estimate of emission reductions and the program's compliance with the Clean Air Act.

Part of EPA's determination that the new I/M SIP is approvable depends on the program's ability to achieve sufficient creditable VOC reductions so that the 15% ROP can still be achieved. The

commission designed the revised I/M program to fit in with the other elements of the 15% SIP to achieve the full amount of creditable reductions required. The I/M program also achieves creditable reductions for the Post-96 ROP SIP.

Changes to the I/M program have had an impact on the ELP §818 Attainment Demonstration as well. This demonstration was predicated on the assumption that the I/M program would be implemented as adopted for the 15% SIP. An addendum to the §818 Demonstration shows that the basic underlying assumptions of the modeling still pertain despite the revisions to the I/M program.

The ETR program revision to the SIP and ETR rule were adopted in October 1992 by the TACB to meet the mandate established in the FCAA Amendments of 1990 (§182 (d)(1)(B)). This section of the FCAA required states with severe or extreme ozone nonattainment areas to develop and implement ETR programs in those areas. For Texas, the only area affected was the HGA area. The ETR program required large employers (those with 100 or more employees) to implement trip reduction programs that would increase the average passenger occupancy rate of vehicles arriving at the workplace during the peak travel period by 25% above the average for the area.

Congress amended the FCAA in December of 1995 by passing House Rule 325. This amendment allows the state to require an ETR program at its discretion. It also allows a state to “remove such provisions (ETR program) from the implementation plan...if the state notifies the Administrator, in writing, that the state has undertaken, or will undertake, one or more alternative methods that will achieve emission reductions (1.81 tons/day) equivalent to those achieved by the removed...provisions.” As such, large employers will no longer be mandated to implement trip reduction programs. The HGA ozone nonattainment area will, however, through the coordination of the Houston-Galveston Area Council, implement a voluntary regional initiative to reduce vehicle trips.

The 1990 Adjusted Base Year EI was submitted on November 12, 1993. It is the official inventory of all emission sources (point, area, on-road and non-road mobile) in the four nonattainment areas. There have been several changes to the EI due to changes in assumptions for certain area and non-road mobile source categories. Changes to the baseline EI have affected the target calculations and creditable assumptions made in the 15% and 9% SIPs.

In December of 1990, then-Texas Governor William Clements requested that the BPA area be reclassified as a "moderate" ozone nonattainment area in accordance with §181(a)(4) of the FCAA Amendments of 1990. That request was denied on February 13, 1991. A recent review of the original request and supporting documentation has revealed that this denial was made in error. As provided by §110(k)(6) of the Act, the EPA Administrator has the authority to reverse a decision regarding original designation if it is discovered that an error had been made.

Monitoring data from a privately-funded, special purpose monitoring network which was not included in the Aerometric Information Retrieval System database was improperly used to deny this request. Furthermore, subsequent air quality trends demonstrated that BPA is more properly classified as a moderate nonattainment area, and could attain the standard by the required date for moderate areas of November 15, 1996. Therefore, Governor Bush sent a letter and technical support to EPA on July 20, 1995, requesting that the BPA area be reclassified to moderate nonattainment status. BPA planned to demonstrate attainment one of the following ways:

- Monitored values showing attainment of the standard at state-operated monitors for the years 1994-1996, which is the time line the FCAA Amendments of 1990 specifies for moderate areas.
- UAM modeling showing attainment of the standard but for transport of ozone and/or precursors.

EPA Region 6 verified the data submitted in support of this request and concurred that it is valid. On June 3, 1996, the reclassification of the BPA area became effective. Because the area was classified as serious, it was following the SIP submittal and permitting requirements of a serious area, which included the requirements for a Post-96 SIP. With the consolidated SIP submittal, the commission removed the BPA area from the Post-96 SIPs, which became applicable to the HGA nonattainment area only.

The State of Texas, in a committal SIP revision submitted to EPA on November 15, 1992, opted out of the Federal Clean Fuel Fleet program in order to implement a fleet emission control program designed by the state. In 1994, Texas submitted the state's opt-out program in a SIP revision to the EPA and adopted rules to implement the TAFF program. In 1995, the 74th Texas Legislature modified the state's alternative fuels program through passage of SB 200. In response to SB 200, the commission adopted regulations modifying the TAFF program to create the TCF program.

Since adoption on July 24, 1996 and subsequent submission to EPA of the TCF SIP revision, the 75th Texas Legislature modified the state's alternative program once again through passage of SB 681. Staff modified the TCF program, now called the TCF Low Emission Vehicle program, to reflect changes mandated by SB 681.

On June 29, 1994, the commission adopted a revision to the SO_2 SIP regarding emissions in Harris County. The SIP revision was required by EPA because of exceedances of the SO_2 NAAQS in 1986, 1988, and 1990. An EPA study conducted by Scientific Applications International Corporation also predicted SO_2 exceedances. On April 22, 1991, the EPA declared that portions of Harris County were potentially in nonattainment of the SO_2 NAAQS. Consequently, the HRM Corporation volunteered to find reductions in SO_2 in order to prevent being redesignated to nonattainment. HRM's efforts resulted in finding voluntary SO_2 reductions. These reductions were adopted in 13 commission Agreed Orders and were included as part of the June 29, 1994 SIP revision. The EPA approved the Harris County SO_2 SIP on March 6, 1995 (60 FR 12125).

On May 14, 1997, the commission adopted an additional revision to the Harris County SO_2 SIP to incorporate modifications to two of the 13 commission Agreed Orders. The remaining sections of the SIP remained the same. While on the scale of "minor technical corrections," the modified orders were submitted as a SIP revision because the new emission rates differ from what EPA had previously approved. The two Agreed Order modifications concerned grandfathered units at Simpson Pasadena Paper Company and Lyondell-Citgo Refining Company, Ltd. The commission approved changes to both Agreed Orders on July 24, 1996.

On May 14, 1997, the commission also adopted a revision to the SIP modifying the vehicle I/M program. This revision removed the test-on-resale component that had been included in the vehicle I/M program, as designed in July of 1996. Test-on-resale required persons selling their vehicles in the I/M core program areas to obtain emissions testing prior to the title transfer of such vehicles. Test-on-resale was not required to meet the FCAA Amendments of 1990 and did not produce additional emissions reduction

benefits. The SIP revision also incorporated into the SIP the Memorandum of Understanding between the commission and the Department of Public Safety, adopted by the commission on November 20, 1996.

The FCAA Amendments of 1990 required that, for severe and above ozone nonattainment areas, states develop SIP revisions that include specific enforceable TCMs, as necessary, to offset increases in motor vehicle emissions resulting from growth in VMT or the number of vehicle trips. This SIP revision would also satisfy reductions in motor vehicle emissions consistent with the 15% ROP and the Post-1996 ROP SIPs.

Therefore, the commission developed and submitted to EPA a committal SIP revision for the HGA nonattainment area on November 13, 1992, and VMT Offset SIP revisions on November 12, 1993 and November 6, 1994, to satisfy the requirements of the 15% ROP SIP revision. The former SIP revision laid out a set of TCMs and other mobile source controls which reduced emissions below the modeled ceiling. The 1994 SIP revision did not require additional TCMs.

As a result of changes in the I/M and the ETR programs, it was necessary to do the 1997 VMT Offset SIP revision for the HGA area, which was adopted on August 6, 1997. Additional TCMs were included: high occupancy vehicle lanes, park and ride lots, arterial traffic management systems, computer transportation management systems, and signalization. These TCMs were part of the "Super SIP" submitted to EPA on July 24, 1996.

Using the best technical guidance and engineering judgement available at the time, the State of Texas calculated emissions reductions available from the enhanced monitoring rule that was to be part of the Title V permitting program. The enhanced monitoring rule was later revised and transformed into the CAM Rule. Texas maintained that its calculation methodologies still accurately reflected the amount of creditable reductions available. EPA disagreed with the calculation methodologies used by the state and intends to disapprove the 9% SIP as a result. EPA also indicated that the emission reduction credits claimed for the Texas Clean Fuels Fleet program were not approvable due to a legislative change to the program. The state plans to submit a SIP revision for this program in a separate action, but has removed the credits claimed in the 9% SIP in this action. The State of Texas proposes to submit a revision to the 9% SIP which revises the reductions claimed by the state toward the 9% emissions target.

The State of Texas did not reapply for an extension of the NO_x §182(f) waivers for HGA and BPA as discussed previously. Therefore, on December 31, 1997, the waivers expired. The state is now required to implement several NO_x control programs. Among them is a requirement for all major NO_x sources within the area to implement RACT. The state has adopted a revised compliance date of November 15, 1999 for this program.

The commission, in a committal SIP revision adopted on June 3, 1998, and submitted to EPA on June 23, 1998, agreed to implement OBD checks as part of the I/M program by the federal deadline of January 1, 2001.

On July 29, 1998, the commission adopted regulations and a revision of the TCF SIP to set forth the LEV requirements for mass transit fleets in each of the serious and above nonattainment areas, and for local government and private fleets operated primarily within the serious and above nonattainment areas. These rules satisfy the state requirements to adopt rules to implement SB 681.

The DFW area was classified as a moderate ozone nonattainment area in accordance with the FCAA Amendments of 1990. As a moderate nonattainment area, DFW was to demonstrate, through monitoring, attainment of the 1-hour ozone standard by November 15, 1996, or face being "bumped up" to the serious classification. Air quality data from DFW ambient air quality monitors for the years 1994-96 show that the 1-hour NAAQS for ozone has been exceeded more than one day per year over this three-year period. On February 18, 1998, the EPA issued a final notice in the *Federal Register* that the DFW area was being reclassified to the serious classification for failing to attain the NAAQS for ozone. As a result of this reclassification, the EPA required that a new SIP demonstrating attainment of the ozone standard in DFW be submitted by March 20, 1999. The state submitted a SIP for DFW that included photochemical modeling showing the level of reductions needed to attain the standard by 1999, a 9% ROP target calculation for the years 1997-99, VOC RACT rules in Chapter 115 applicable to sources meeting the 50 tpy major source level, NO_x RACT rules in Chapter 117 applicable to major sources of NO_x, and amendments to Chapter 116 reinstating nonattainment new source review for NO_x. The governor submitted this SIP to EPA on March 16, 1999. Because there was not enough time to implement the rules to achieve necessary reductions of ozone precursor emissions in the DFW area by the required attainment date of November 15, 1999, the state proposed to submit in March 2000 a full attainment demonstration including a complete rule package necessary to attain the 1-hour ozone standard.

On February 24, 1999 the commission adopted a SIP revision for the DFW area which was submitted to EPA on March 16, 1999. This SIP was not only intended to demonstrate how the DFW area would attain the standard through the submission of an updated emissions inventory and photochemical modeling, but to also include a 9% ROP target calculation in order to satisfy EPA's requirement of reasonable further progress in emission reductions for the DFW area for the years 1997-99. The reductions toward ROP were short of the 9% target and the SIP lacked required modeled control strategies; therefore, a follow-up SIP was developed. More information about the follow-up submittal is addressed later in this introduction.

On May 12, 1999 the commission adopted a revision to the SIP for the Northeast Texas region which would make certain local ozone precursor emission reductions federally enforceable. This revision was submitted to EPA on June 4, 1999. Four affected companies (Norit Americas, Inc.; La Gloria Oil and Gas Company; Eastman Chemical Company, Texas Eastman Division; and ARCO Permian) in the Northeast Texas region voluntarily agreed to be subject to the implementation of enforceable emission reduction measures pursuant to Part A, Sections 2-5 of the Northeast Texas Flexible Attainment Region (FAR) Memorandum of Agreement. The FAR approach allows time for the area's control program to work, similar to contingency measures in a post-1990 maintenance agreement, prior to EPA issuing a call for a SIP revision or nonattainment redesignation. The MOA required the immediate implementation of control measures through the use of Agreed Orders, which are included in the SIP revision to make them federally enforceable.

On June 30, 1999 the commission adopted a revision to the SIP in order to incorporate cleaner gasoline rules. The cleaner gasoline is required to have a lower RVP outside the DFW and HGA areas, and a limit on the amount of sulfur in each gallon of gasoline. The RVP required in this SIP revision is 7.8 psi starting May 1, 2000. The RVP limit would be in effect every summer from May 1st through October 1st. A 7.8 psi RVP fuel is expected to reduce evaporative emissions from automobiles, off-highway gasoline powered equipment, and all gasoline storage and transfer operations. Evaporative VOC emissions from automobiles will be reduced by at least 14%. The sulfur cap requirement is 150 ppm per

gallon of gasoline, starting January 1, 2004. Low sulfur gasoline is expected to reduce NO_x emissions from today's cars by 8.5% according to the EPA complex model. The rules would further provide for counties or large cities to opt into these regulations earlier than required provided that certain conditions are met. If EPA were to adopt sulfur regulations to require compliance by January 1, 2004, the commission's rules would no longer apply, allowing the federal sulfur rules to take precedence. However, areas that choose to opt-in early would continue to follow the sulfur requirements of their early compliance plan until EPA actually implemented its regulations, unless otherwise specified in the commission order.

On July 28, 1999 the commission adopted a site-specific revision to the SIP which provides for the redesignation to attainment of that portion of Collin County currently designated as nonattainment for the lead NAAQS. The revision also provides a maintenance plan for the area to ensure continued compliance. As part of the maintenance plan, the revision establishes a new contingency plan through an agreed order and replaces Agreed Board Orders 92-09(k) and 93-12 and Board Order 93-10. The revision also provides for a commitment by the commission to keep the existing monitoring network in place until the end of the maintenance period.

On October 15, 1999 the commission adopted a revision to the SIP for the DFW ozone nonattainment area. This SIP was developed in order to address the shortfall in the reductions towards the 9% ROP target and the lack of modeled control strategies from the February 24, 1999 revision. Potential emission reduction credits were reviewed that were not claimed in the February 1999 SIP in order to make up the ROP shortfall. The focus was on VOC reductions because fewer VOC reductions would be needed to make up the shortfall compared to NO_x emission reductions. The ROP lacked about 20% of the VOC reductions needed, which amounted to 5.87 tpd. Making complete the 9% ROP portion of the SIP should allow certain transportation projects to avoid being put on hold. Elements have been identified that were not previously considered that would bring SIP emission reduction credits in order to complete the 9% ROP requirements for the years 1996-99. These technical corrections were included in the October 1999 revised SIP.

In November 1998, the HGA SIP revision submitted to EPA in May 1998 became complete by operation of law. However, EPA stated that it could not approve the SIP until specific control strategies were modeled in the attainment demonstration. EPA specified a submittal date of November 15, 1999 for this modeling. As the HGA modeling protocol evolved, the state eventually selected and modeled seven basic modeling scenarios. As part of this process, a group of HGA stakeholders worked closely with commission staff to identify local control strategies for the modeling. This modeling showed a gap in reductions necessary for attainment of the 1-hour ozone standard. The commission adopted these revisions to the SIP on October 27, 1999.

In January 1997 the commission proposed a program that, for the first time in Texas' air pollution control history, extended beyond the confines of the urbanized areas. The concept of the regional strategy was developed as a result of several major occurrences. These events include the COAST Study, participation in the OTAG process, deployment of intensive aircraft monitoring by Baylor University, and the development of regional photochemical modeling. While Texas was not involved in the OTAG SIP call requiring mandatory statewide NO_x reductions, the commission realized the importance of the role of transported ozone and/or its precursors and the need for a statewide comprehensive plan in order to assist the areas that are struggling to attain the ozone standard. The impact on several states from the smoke

and haze episodes from fires in Central America during the summer of 1998 helped reinforce the fact that air pollution is capable of traveling hundreds of miles.

The purpose of the regional strategy was to reduce ozone causing compounds in the eastern half of the state in order to help reduce background levels of ozone in both nonattainment areas as well as those areas close to noncompliance for the new 8-hour ozone standard. Components of the regional strategy included support for the NLEV program, cleaner burning gasoline and stage I vapor recovery, voluntary involvement in the permitting of grandfathered facilities, and reductions from major stationary sources.

On July 16, 1998, EPA issued a guidance memorandum titled "Extension of Attainment Dates for Downwind Transport Areas." The guidance, referred to hereinafter as the "transport guidance," provides a means for EPA to extend the attainment date for an area affected by transported air pollution, without reclassifying ("bumping up") the area to a higher classification. The transport guidance is particularly relevant to BPA, which is downwind of the HGA area and is affected by transport from HGA. If EPA approved such a determination for BPA, the area would have until no later than November 15, 2007, the attainment date for HGA, to attain the 1-hour ozone standard. There is also mounting technical data which suggests that the DFW area is impacted by transport and high regional background levels of ozone. A modeling demonstration has been developed and shows that the air quality in the DFW area is influenced at times from the HGA area. This demonstration, if approved by the EPA, would allow EPA to determine that the area should not be bumped up from serious to severe under the conditions of the July 16, 1998 transport guidance. If approved by the EPA the new attainment date for the DFW area would be no later than November 15, 2007, the attainment date for HGA.

As a result of the transport demonstrations for BPA and DFW, the development of SIPs in Texas will be, for the first time ever, on a coordinated timeline. This coordinated planning effort will include three of the state's four 1-hour ozone nonattainment areas as well as future 8-hour ozone areas. While there is uncertainty with the 8-hour ozone standard due to a pending court case, EPA's original plan calls for designations of 8-hour areas in 2000, SIP submittals by 2003, and attainment of the 8-hour standard by 2007. This statewide comprehensive planning with 2007 as a target date will allow Texas to utilize its resources in the most efficient manner to develop control strategies to reduce air pollution not only in the urbanized areas but regionally as well.

The challenges associated with reducing pollution levels to comply with the federal standards are very great, especially in the state's two largest urban areas - DFW and HGA. Commission staff worked very closely with local entities to develop recommendations that will get the respective areas into attainment. Future attainment relies on not only the development of local and state control measures, but on future federal rules involving new technologies as well. These especially involve cleaner fuels and cleaner engines for both on-road as well as non-road mobile sources. Unfortunately, many of these federal measures will not be available until the 2004 timeframe and then time will be required to provide for turnover before they will become effective at reducing pollution levels. This would make it very difficult for any large urban nonattainment area to comply before the 2007 timeframe. As a result of federal measures, state regulations, and local initiatives it is estimated that emissions in the eastern and central part of the state that contribute to the production of ground level ozone will be reduced by approximately 100 tpd by 2001; approximately 1200 tpd by 2003; approximately 1400 tpd by 2005; and approximately 1500 tpd by 2007. Texas is committed to implementing these strategies as quickly as practicable.

In the April 2000 SIP revision for HGA the state made the following enforceable commitments : 1) to quantify the shortfall of NO_x reductions needed for attainment; 2) to list and quantify potential control measures to meet the shortfall of NO_x reductions needed for attainment; 3) to adopt the majority of the necessary rules for the HGA attainment demonstration by December 31, 2000, and to adopt the rest of the rules as expeditiously as practical, but no later than July 31, 2001; 4) to submit a Post-99 ROP analysis by December 31, 2000; 5) to perform a mid-course review by May 1, 2004; and 6) to perform new mobile source modeling, using MOBILE6, within 24 months of the model's release. In addition, if a transportation conformity analysis is to be performed between 12 months and 24 months after the MOBILE 6 release, transportation conformity will not be determined until Texas submits an MVEB which is developed using MOBILE 6 and which the EPA finds adequate. Finally, if any of the measures adopted in the SIP pertain to motor vehicles, the commission commits to recalculate and resubmit a MVEB by December 31, 2000.

The BPA area is classified as moderate, and therefore was required to attain the 1-hour ozone standard by November 15, 1996. The BPA area did not attain the standard by that date, and also did not attain the standard by November 15, 1999, the attainment date for serious areas. In determining the appropriate attainment date for an area, EPA may consider the effect of transport of ozone or its precursors from an upwind area which interferes with the downwind area's ability to attain. On April 16, 1999, EPA proposed in the *Federal Register* to allow BPA to take advantage of the transport guidance if an approvable attainment demonstration is submitted by November 15, 1999. The SIP revision, adopted by the commission on October 27, 1999 and submitted to EPA by November 15, 1999, contained results of photochemical modeling demonstrating transport from HGA to BPA, and, following EPA's transport guidance, demonstrating that BPA attains the 1-hour ozone standard. In addition, the November 1999 SIP revision contained adopted rules for IWW and batch process sources to ensure that VOC emission limits for these sources meet EPA's guidelines for RACT. Furthermore, the SIP revision included adopted rules establishing NO_x RACT emission limits for gas-fired, lean-burn stationary internal combustion engines. These NO_x rules represented "Phase I" of a two-part revision to the BPA attainment demonstration SIP.

The April 2000 SIP revision represented "Phase II" of the BPA attainment demonstration SIP, and contained adopted rules specifying NO_x emission limits for electric utility boilers, industrial boilers, and industrial process heaters. In accordance with EPA guidance, implementation of these NO_x emission limits represented a reasonable level of control, necessary for an approvable attainment demonstration. Modeling of these Phase II reductions showed that the BPA area attains the 1-hour ozone standard, using WOE analyses.

The DFW area's attainment deadline as a serious ozone nonattainment area was November 15, 1999. In March 1999 the state submitted an attainment demonstration to EPA, however this SIP submittal did not contain the necessary rules to bring the DFW area into attainment by the November 1999 deadline. As a result, EPA issued a letter of findings that the March 1999 submittal was incomplete. This findings triggered an 18-month sanctions clock effective May 13, 1999.

The state now has mounting technical data which suggests that DFW is significantly impacted by transport and regional background levels of ozone. The reductions from the strategies needed for the HGA area and the regional rules discussed are a necessary and integral component in the strategy for DFW's attainment of the 1-hour ozone standard. The April 2000 SIP contained a modeling demonstration

which showed that the air quality in the DFW area is influenced at times from the HGA area. This demonstration, if approved by EPA, would allow EPA to determine that the DFW area should not be bumped up to a more severe classification. It would also allow DFW to have until no later than November 15, 2007, the attainment date for HGA, to reach attainment.

In order to develop local control strategy options to augment federal and state programs, the DFW area established a North Texas Clean Air Steering Committee made up of local elected officials and business leaders. Specific control strategies were identified for review by technical subcommittee members. In addition, the NCTCOG hired an environmental consultant to assist with the analysis and evaluation of control strategy options. The consultant was responsible for presenting the findings of the technical subcommittees to the NCTCOG air quality policy and steering committees for final approval prior to being submitted to the state. A WOE argument was developed for DFW which consisted of several elements which, taken together, formed a compelling argument that attainment will be achieved by 2007.

On April 19, 2000 the state adopted a revision to the Northeast Texas FAR SIP. The Flexible Attainment Region Agreement requires that contingency measures be implemented as a result of exceedances of the National Ambient Air Quality Standard for ozone. As outlined in the FAR Action Plan under Part B, Contingent Measures, in the event of a subsequent violation the SIP must be revised to include quantifiable and enforceable control measures. Through the use of Agreed Orders these measures were adopted and included in the Northeast Texas FAR SIP to make them federally enforceable.

On May 3, 2000 the state adopted a revision to the TCM and VMT portions of the SIP. This revision required TCM project-specific descriptions and estimated emissions reductions to be included in the SIP and allowed nonattainment area MPOs to substitute TCMs without a SIP revision if the substitution results in equal or greater emission reductions.

On December 6, 2000 the state adopted a revision to the Houston/Galveston Post-1999 ROP and Attainment Demonstration SIP. The December 2000 submittal contained the following elements: 1) rules and photochemical modeling analyses in support of the HGA ozone attainment demonstration; 2) post-1999 ROP plans for the milestone years 2002 and 2005, and for the attainment year 2007; 3) transportation conformity MVEBs for NO_x and VOC; 4) enforceable commitments to implement further measures in support of the HGA attainment demonstration; and 5) a commitment to perform and submit a mid-course review by May 2004.

The development of the December 2000 SIP revision proved to be an extremely challenging effort, due to the magnitude of reductions needed for attainment and the shortage of readily available control options. The emission reduction requirements included as part of this SIP revision represented substantial, intensive efforts on the part of stakeholder coalitions in the HGA area, in partnership with the commission. These coalitions, involving local governmental entities, elected officials, environmental groups, industry, consultants, and the public, as well as the commission and EPA, worked diligently to identify and quantify control strategy measures for the HGA attainment demonstration.

In order for the state to have an approvable attainment demonstration, the EPA indicated that the state needed to adopt those strategies modeled in the November 1999 SIP submittal, and then adopt sufficient measures to close the remaining gap in NO_x emissions. The modeling indicated an emissions gap such that an additional 91 tpd of NO_x reductions was necessary for an approvable attainment demonstration.

The HGA nonattainment area needs to ultimately reduce NO_x by more than 750 tpd to reach attainment with the 1-hour ozone standard. In addition, a VOC reduction of about 25% will also have to be achieved.

Background on the Current Revision

This revision to the SIP for the HGA ozone nonattainment area includes the following elements: 1) corrections to the ROP table/budget for the years 2002, 2005, and 2007 due to a mathematical inconsistency; 2) incorporation of a change to the idling restriction control strategy clarifying that the operator of a rented or leased vehicle is responsible for compliance with the requirements of Chapter 114 in situations where the operator of a leased or rented vehicle is not employed by the owner of the vehicle (the commission committed to making this change when the rule was adopted in December 2000); 3) incorporation of revisions to the clean diesel fuel rules to provide greater flexibility in complying with the requirements of the rule while preserving the emission reductions necessary to demonstrate attainment in the HGA area; 4) incorporation of a stationary diesel engine proposal that was developed as a result of the state's analysis of EPA's reasonably available control measures; 5) incorporation of revisions to the point source NO_x rules; 6) incorporation of revisions to the emissions cap and trade rules; 7) the removal of the construction equipment operating restriction and the accelerated purchase requirement for Tier 2/3 heavy duty equipment; 8) the replacement of these rules with the Texas Emission Reduction Plan program; 9) the layout of the mid-course review process which details how the state will fulfill the commitment to obtain the additional emission reductions necessary to demonstrate attainment of the 1-hour ozone standard in the HGA area; and 10) replacement of 2007 Rate of Progress MVEBs to be consistent with the attainment MVEBs.

As was discussed in the December 2000 revision, the modeling resulted in a 141 ppb peak ozone level which correlated to a gap calculation of 91 tpd NO_x equivalent. An additional five tpd has been added to the gap to address the diesel pull-ahead strategy that was included in the December 2000 revision, making the gap 96 tpd. EPA has indicated that the state cannot take credit for the five tpd NO_x reductions associated with the diesel pull-ahead strategy because the excess emissions were not included in the emissions inventory, therefore the state cannot take credit for reducing them. The five tpd have been added to the gap as additional reductions that the commission will address during the mid-course review process. The gap control measures adopted in December 2000, along with the stationary diesel engine rules included in this revision, result in NO_x reductions of 40 tpd, which leaves a total remaining gap of 56 tpd. The state has committed to addressing this gap through the mid-course review process.

Chapter 7 of this revision includes a detailed overview of the entire mid-course review process. It begins with an analysis of all reasonably available control measures for both VOC and NO_x. The process then addresses the state's options for reducing NOx emissions over the next several months. Next, the anticipated results from the Texas 2000 study as well as other expected improvements and enhancements to the science are described, including the schedule to incorporate those improvements during two phases: the first phase ending in 2002, and the second ending by mid- 2004. Finally, there is a discussion of the technologies which have been developed and are undergoing testing to quantify their reduction potential, followed by a discussion of new and innovative ideas that are currently being contemplated.

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CHAPTER 1: GENERAL

1.1 BACKGROUND

The HGA ozone nonattainment area is classified as Severe-17 under the FCAA Amendments of 1990 (42 United States Code (USC) §§7401 et seq.), and therefore is required to attain the 1-hour ozone standard of 0.12 ppm by November 15, 2007. The HGA area, defined by Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties, has been working to develop a demonstration of attainment in accordance with 42 USC §7410. On January 4, 1995, the state submitted the first of its Post-1996 SIP revisions for HGA.

The January 1995 SIP consisted of UAM modeling for 1988 and 1990 base case episodes, adopted rules to achieve a 9% ROP reduction in VOCs, and a commitment schedule for the remaining ROP and attainment demonstration elements. At the same time, but in a separate action, the State of Texas filed for the temporary NO_x waiver allowed by §182(f) of the FCAA. The January 1995 SIP and the NO_x waiver were based on early base case episodes which marginally exhibited model performance in accordance with EPA modeling performance standards, but which had a limited data set as inputs to the model. In 1993 and 1994, the commission was engaged in an intensive data-gathering exercise known as the COAST study. The state believed that the enhanced EI, expanded ambient air quality and meteorological monitoring, and other elements would provide a more robust data set for modeling and other analysis, which would lead to modeling results that the commission could use to better understand the nature of the ozone air quality problem in the HGA area.

Around the same time as the 1995 submittal, EPA policy regarding SIP elements and time lines went through changes. Two national programs in particular resulted in changing deadlines and requirements. The first of these programs was the OTAG. This group grew out of a March 2, 1995 memo from Mary Nichols, former EPA Assistant Administrator for Air and Radiation, that allowed states to postpone completion of their attainment demonstrations until an assessment of the role of transported ozone and precursors had been completed for the eastern half of the nation, including the eastern portion of Texas. Texas participated in this study, and it has been concluded that Texas does not significantly contribute to ozone exceedances in the Northeastern U.S. The other major national initiative impacting the SIP planning process has been the revisions to the national ozone standard. EPA promulgated a final rule on July 18, 1997 changing the ozone standard to an 8-hour standard of 0.08 ppm. In November 1996, concurrent with the proposal of the standards, EPA proposed an IIP that it believed would help areas like HGA transition from the old to the new standard. In an attempt to avoid a significant delay in planning activities, Texas began to follow this guidance, and readjusted its modeling and SIP development time lines accordingly. When the new standard was published, EPA decided not to publish the IIP, and instead stated that, for areas currently exceeding the 1-hour ozone standard, that standard would continue to apply until the area attained. The FCAA requires that HGA attain the standard by November 15, 2007.

EPA issued revised draft guidance for areas such as HGA that do not attain the 1-hour ozone standard. The commission adopted on May 6, 1998 and submitted to EPA on May 19, 1998 a revision to the HGA SIP which contained the following elements in response to EPA's guidance:

- UAM modeling based on emissions projected from a 1993 baseline out to the 2007 attainment date;

- An estimate of the level of VOC and NO_x reductions necessary to achieve the 1-hour ozone standard by 2007;
- A list of control strategies that the state could implement to attain the 1-hour ozone standard;
- A schedule for completing the other required elements of the attainment demonstration;
- A revision to the Post-1996 9% ROP SIP that remedied a deficiency that EPA believed made the previous version of that SIP unapprovable; and
- Evidence that all measures and regulations required by Subpart 2 of Title I of the FCAA to control ozone and its precursors have been adopted and implemented, or are on an expeditious schedule to be adopted and implemented.

In November 1998, the SIP revision submitted to EPA in May 1998 became complete by operation of law. However, EPA stated that it could not approve the SIP until specific control strategies were modeled in the attainment demonstration. EPA specified a submittal date of November 15, 1999 for this modeling. In a letter to EPA dated January 5, 1999, the state committed to model two strategies showing attainment.

As the HGA modeling protocol evolved, the state eventually selected and modeled seven basic modeling scenarios. As part of this process, a group of HGA stakeholders worked closely with commission staff to identify local control strategies for the modeling. These local strategies are described in Chapter 3 under Scenarios III and VI. Some of the scenarios for which the stakeholders requested evaluation included options such as California type fuel and vehicle programs as well as an ASM-equivalent I/M program. Other scenarios incorporated the estimated reductions in emissions that were expected to be achieved throughout the modeling domain as a result of the implementation of several voluntary and mandatory statewide programs adopted or planned independently of the SIP. It should be made clear that the commission did not propose that any of these strategies be included in the ultimate control strategy submitted to EPA in 2000. The need for and effectiveness of any controls which may be implemented outside the 8-county area will be evaluated on a county by county basis.

The SIP revision was adopted by the commission on October 27, 1999 and submitted to EPA by November 15, 1999, and contained the following elements:

- Photochemical modeling of potential specific control strategies for attainment of the 1-hour ozone standard in the HGA area by the attainment date of November 15, 2007;
- An analysis of seven specific modeling scenarios reflecting various combinations of federal, state, and local controls in HGA. Additional scenarios H1 and H2 build upon Scenario VIf;
- Identification of the level of reductions of VOC and NO_x necessary to attain the 1-hour ozone standard by 2007;
- A 2007 mobile source budget for transportation conformity;
- Identification of specific source categories which, if controlled, could result in sufficient VOC and/or NO_x reductions to attain the standard;
- A schedule committing to submit by April 2000 an enforceable commitment to conduct a mid-course review; and
- A schedule committing to submit modeling and adopted rules in support of the attainment demonstration by December 2000.

As the result of an agreed settlement between several environmental groups and EPA, in November 1999 EPA informed the state that an additional SIP revision was required in order to quantify additional potential reductions to fill the shortfall or "gap" needed for attainment. This "gap closure" SIP, submitted by the commission in April 2000, contained the following enforceable commitments by the state:

- To quantify the shortfall of NO_x reductions needed for attainment;
- To list and quantify potential control measures to meet the shortfall of NO_x reductions needed for attainment;
- To adopt the majority of the necessary rules for the HGA attainment demonstration by December 31, 2000, and to adopt the rest of the shortfall rules as expeditiously as practical, but no later than July 31, 2001;
- To submit a Post-99 ROP plan by December 31, 2000;
- To perform a mid-course review by May 1, 2004; and
- To perform modeling of mobile source emissions using MOBILE6, to revise the on-road mobile source budget as needed, and to submit the revised budget within 24 months of the model's release. In addition, if a conformity analysis is to be performed between 12 months and 24 months after the MOBILE6 release, the state will revise the MVEB so that the conformity analysis and the SIP MVEB are calculated on the same basis.

The development of the attainment demonstration SIP for the HGA area has proved to be an extremely challenging effort, due to the magnitude of reductions needed for attainment and the shortage of readily available control options. The emission reduction requirements included as part of the December 2000 SIP revision represented substantial, intensive efforts on the part of stakeholder coalitions in the HGA area, in partnership with the commission. These coalitions, involving local governmental entities, elected officials, environmental groups, industry, consultants, and the public, as well as the commission and EPA, worked diligently to identify and quantify control strategy measures for the HGA attainment demonstration.

In order for the state to have an approvable attainment demonstration, EPA indicated that the state must adopt those strategies modeled in the November 1999 SIP submittal, and then adopt sufficient measures to close the remaining gap in NO_x emissions. The modeling included in the December 2000 revision indicated an emissions gap such that an additional 91 tpd of NO_x reductions was necessary for an approvable attainment demonstration. The HGA nonattainment area will need to ultimately reduce NO_x by more than 750 tpd to reach attainment with the 1-hour ozone standard. In addition, a VOC reduction of about 25% will also have to be achieved.

The December 2000 SIP revision contained rules and photochemical modeling analyses in support of the HGA ozone attainment demonstration. In addition, the revision contained post-1999 ROP plans for the milestone years 2002 and 2005, and for the attainment year 2007, and transportation conformity MVEBs for NO_x and VOC. The SIP also contained enforceable commitments to implement further measures in support of the HGA attainment demonstration, as well as a commitment to perform and submit a mid-course review. Implementation of the rules and other control measures contained in the revision will close the gap and achieve attainment of the 1-hour ozone standard in the HGA area by November 15, 2007, the date required for attainment.

This revision to the SIP for the HGA ozone nonattainment area includes the following elements: 1) corrections to the ROP table/budget for the years 2002, 2005, and 2007 due to a mathematical inconsistency; 2) incorporation of a change to the idling restriction control strategy clarifying that the operator of a rented or leased vehicle is responsible for compliance with the requirements of Chapter 114 in situations where the operator of a leased or rented vehicle is not employed by the owner of the vehicle (the commission committed to making this change when the rule was adopted in December 2000); 3) incorporation of revisions to the clean diesel fuel rules to provide greater flexibility in complying with the requirements of the rule while preserving the emission reductions necessary to demonstrate attainment in the HGA area; 4) incorporation of a stationary diesel engine proposal that was developed as a result of the state's analysis of EPA's reasonably available control measures; 5) incorporation of revisions to the point source NO_x rules; 6) incorporation of revisions to the emissions cap and trade rules; 7) the removal of the construction equipment operating restriction and the accelerated purchase requirement for Tier 2/3 heavy duty equipment; 8) the replacement of these rules with the Texas Emission Reduction Plan program; 9) the layout of the mid-course review process which details how the state will fulfill the commitment to obtain the additional emission reductions necessary to demonstrate attainment of the 1-hour ozone standard in the HGA area; and 10) replacement of 2007 Rate of Progress MVEBs to be consistent with the attainment MVEBs.

As was discussed in the December 2000 revision, the modeling resulted in a 141 ppb peak ozone level which correlated to a gap calculation of 91 tpd NO_x equivalent. An additional five tpd has been added to the gap to address the diesel pull-ahead strategy that was included in the December 2000 revision, making the gap 96 tpd. EPA has indicated that the state cannot take credit for the five tpd NO_x reductions associated with the diesel pull-ahead strategy because the excess emissions were not included in the emissions inventory, therefore the state cannot take credit for reducing them The five tpd have been added to the gap as additional reductions that the commission will address during the mid-course review process. The gap control measures adopted in December 2000 along with the stationary diesel engine rules included in this revision, result in NO_x reductions of 40 tpd, which leaves a total remaining gap of 56 tpd. The state has committed to addressing this gap through the mid-course review process.

Chapter 7 of this revision includes a detailed overview of the entire mid-course review process. It begins with an analysis of all reasonably available control measures for both VOC and NO_x. The process then addresses the state's options for reducing NO_x emissions over the next several months. Next, the anticipated results from the Texas 2000 study as well as other expected improvements and enhancements to the science are described, including the schedule to incorporate those improvements during two phases: the first phase ending in 2002, and the second ending by mid- 2004. Finally, there is a discussion of the technologies which have been developed and are undergoing testing to quantify their reduction potential, followed by a discussion of new and innovative ideas that are currently being contemplated.

1.2 PUBLIC HEARING INFORMATION

The commission held public hearings at the following times and locations:

CITY	DATE	TIME	LOCATION
Galveston	June 13, 2001	6:00 p.m.	City Council Chambers 823 Rosenberg, Room 200
Rosenberg	June 14, 2001	10:00 a.m.	Civic and Convention Center 3825 Highway 36 South, Room C
Houston	June 14, 2001	6:00 p.m.	City Hall Council Chambers 901 Bagby
Austin	June 15, 2001	10:00 a.m.	TNRCC Complex 12100 N. I-35 Building E, Room 201S
Houston	July 2, 2001	6:00 p.m.	City Hall Council Chambers 901 Bagby

Written comments were also accepted via mail, fax, or e-mail. The comment period ended on July 2, 2001.

1.3 SOCIAL AND ECONOMIC CONSIDERATIONS

For a detailed explanation of the social and economic issues involved with any of the strategies, please refer to the preambles that precede each proposed rule package accompanying this SIP.

1.4 FISCAL AND MANPOWER RESOURCES

The state has determined that its fiscal and manpower resources are adequate and will not be adversely affected through implementation of this plan.

CHAPTER 2: EMISSIONS INVENTORY

2.1 - 2.8 (No change since the December 2000 revision)

2.9 MOTOR VEHICLE EMISSIONS BUDGETS

EPA requires all ROP and attainment demonstration SIPs to establish motor vehicle emissions budgets for transportation conformity purposes. As described in Chapter 7, the commission will be evaluating new technologies and programs during the next four year mid-course review process. As these technologies or programs develop sufficiently to warrant rules, the commission will also evaluate their impact on the mobile source budget and revise it accordingly. Likewise, Chapter 7 describes a number of technical studies underway which are designed to improve the assumptions upon which the modeling is based. As these enhancements are incorporated into the model, the commission will be evaluating the overall control strategy. If the commission adopts additional control measures to reduce on-road motor vehicle emissions as a SIP revision, the commission will concurrently revise the motor vehicle emissions budget(s) for the SIP and submit such revised budget(s) to EPA as a revision to the SIP. With regard to on-road mobile source control measures, the state understands from EPA that only technology-related measures, such as I/M, cleaner fuels, and use restrictions/incentives may be included. Measures that could limit future highway construction, such as growth restrictions, may not be included.

A motor vehicle emission budget is the on-road mobile source allocation of the total allowable emissions for each applicable criteria pollutant or precursor, as defined in the SIP. Transportation conformity determinations must be performed using the budget test, once EPA determines the budget(s) adequate for transportation conformity purposes. In order to pass the budget test, areas must demonstrate that the estimated emissions from transportation plans, programs and projects do not exceed the motor vehicle emissions budget(s).

The motor vehicle emissions budgets for the 8-county HGA nonattainment area are listed in the Table 2.9-1 (ROP budgets) and 2.9-2 (attainment budgets). The attainment budgets in Table 2.9-2 represent the 2007 projected on-road mobile source VOC and NO_x emissions that demonstrate attainment.

Table 2.9-1 2002 and 2005 ROP Motor Vehicle Emission Budgets for HGA

	NO_x (tpd)	VOC (tpd)
2002 ROP budget	260.85	99.21
2005 ROP budget	228.11	80.39

The following budget has been inserted as a new ROP budget pursuant to settlement agreements. Emissions estimates used to demonstrate conformity will be derived using the assumptions used to develop these emissions budgets for the 2007 attainment SIP MVEB, pursuant to 40 CFR §93.122(a)(6).

2007 ROP budget	156.60	79.51

Table 2.9-2 2007 Attainment Demonstration Motor Vehicle Emission Budgets for HGA

	NO_x (tpd)	VOC (tpd)
2007 on-road emissions projection (after modeling of base control measures)	164.43	81.46
2007 on-road gap control measures	–12.81	–1.95
Diesel pull-ahead strategy*	+5.00	---
2007 budget	156.62	79.51

*The diesel pull-ahead strategy was originally included in the December 6, 2000 SIP revision. However, EPA has indicated that the state cannot take credit for the five tpd NO_x reductions associated with the diesel pull-ahead strategy because the excess emissions were not included in the emissions inventory, therefore the state cannot take credit for reducing them. These five tons were, therefore, are being added back to the MVEB.

CHAPTER 3: PHOTOCHEMICAL MODELING

(No change since December 2000 revision)

CHAPTER 4: DATA ANALYSIS

(No change since December 2000 revision)

CHAPTER 5: RATE OF PROGRESS

The FCAA Amendments of 1990 require that areas classified moderate or above with respect to the ozone NAAQS submit ROP plans demonstrating continued progress toward achieving the standard. The ROP plan must demonstrate that specific reductions of emissions of VOC and/or NO_x from the 1990 baseline have been achieved, accounting for growth that occurred after 1990, accompanied by rules to implement these reductions. In addition, 3% contingency measures must be adopted, to be implemented in the event that milestone reductions fail to occur.

The first of these plans, the 15% ROP, was submitted by the state in November 1993 (Phase I) and May 1994 (Phase II). The 15% ROP documented 15% VOC reductions, net of growth, from 1990 to 1996, along with adopted rules and other measures. The next plan, the post-1996 ROP, was submitted by the state in November 1994 and revised in July 1996 and May 1998. The post-1996 ROP demonstrated an additional 3% reduction per year, or 9% net of growth, from 1996 to 1999, accompanied by adopted rules and other measures. Since the FCAA allows NO_x reductions to be substituted for VOC reductions only for the post-1996 ROP plans, in its May 1998 SIP revision the state documented reductions of 6% for VOC and 3% for NO_x. The VOC and NO_x reductions are calculated from these pollutants' respective emissions inventories. Of the 3% required contingency measures, 2% (or two-thirds of the total) was met by VOC reductions, and 1% (or one-third of the total) was met by NO_x reductions.

The current SIP revision contains post-1999 ROP plans for the milestone years 2002 and 2005, and for the attainment year 2007. The 2002 ROP documents 3% per year, or 3% NO_x and 6% VOC reductions occurring from 1999 to 2002; the 2005 ROP documents 3% per year, or 9% NO_x reductions occurring from 2002 to 2005; and the 2007 ROP documents 3% per year, or 6% NO_x reductions occurring from 2005 to 2007 (attainment year). Each of these post-1999 ROP plans also contains adopted regulations and other measures needed to achieve the Post-1999 ROP requirements up to the attainment date and to attain the 1-hour ozone standard.

Tables 5.1-1 through 5.1-12 contain the 2002, 2005, and 2007 ROP calculations and the emission reduction estimates. Each of the above-referenced plans demonstrates compliance with the ROP requirements, and in fact goes beyond the 3% per year reduction requirement of the FCAA. The 2002 plan relies on a combination of NO_x and VOC reductions, whereas the 2005 and 2007 ROP plans rely on NO_x reductions alone. VOC reduction tables are included for all three milestone years, since the 2002, 2005, and 2007 ROP VOC budgets (and for 2007, the generally more restrictive attainment budget) are important for transportation conformity determinations.

In the current SIP revision, the 2002 ROP plans were revised to correct an inconsistency between Table 5.1-1 and Table 5.1-2 (for NO_x) and between Table 5.1-3 and Table 5.1-4 (for VOC). In both sets of tables, the respective NO_x or VOC reductions required for 2002 have been changed to be consistent with one another. In addition, the combination of NO_x and VOC reductions was changed to 3% NO_x and 6% VOC, to give a total 9% reduction for 1999-2002, net of growth.

Also in the current SIP revision, the 2005 ROP plans were revised to correct an error in the previous travel demand modeling. As the result of an incorrect factor applied for the midday time period in the travel demand modeling, approximately 16,000,000 VMT were inadvertently dropped from that time

period. To correct this factor, the travel demand data were re-run to incorporate the omitted VMT. Tables 5.1-5 through 5.1-8 reflect the corrected VMT.

In each set of tables for a given year and pollutant, the ROP budget is calculated by taking the creditable reductions to date (from Line 12 of the first respective table) and adding the ROP reduction for the year in question (from Column 5 of the second respective table), and subtracting this total from the baseline (from Column 2 of the second table). It should be noted that the Line 12 creditable reductions (first respective table) include TCMs, whereas the corresponding value in the second table does not. This is because only Tier I/II, I/M, RFG, NLEV, and HDDV are included in the second table. This difference is always the TCM credit of 0.86 tpd VOC (0.36 tpd from the 15% SIP + 0.5 tpd from the 9% SIP).

Table 5.1-1
2002 ROP Required NO_x Emissions Target Calculations
Houston Ozone Nonattainment Area
Ozone Season NO_x Tons Per Day
April 27, 2001

Step	Emissions Basis	Stationary		Mobile		Total
		Point	Area	On-road	Non-road	
1	1990 ROP Nonattainment Area Base Year EI	794.85	14.37	337.03	198.08	1344.33
2	Adjusted Base Year EI Relative to 1999	794.85	14.37	262.23	198.08	1269.53
3	Adjusted Base Year EI Relative to 2002	794.85	14.37	234.80	198.08	1242.10
4	3% of Adjusted Base Year EI Relative to 1999					37.26
5	RVP and Fleet turnover correction [steps (2-3)]		0.00	27.43		27.43
6	1999 Target Level					1191.77
7	2002 Target Level [steps (6-5-4)]					1127.08
8	2002 Emissions Forecast (Grown)	712.78	14.94	346.14	173.07	1246.93
9	Inventory Adjustment (see note 4)				72.69	72.69
10	2002 Emissions Forecast with Adjustment (8 + 9)	712.78	14.94	346.14	245.76	1319.62
11	Total Reductions Required by 2002 with growth [steps (10-7)]					192.54
12	Creditable Reductions to date (include 1996 & 1999 ROP)	95.00	0.00	36.49	0.00	131.49
13	***NOx Reduction Required for 2002 ROP***					61.05

Notes:
1. Base year on-road mobile emissions calculated with MOBILE5 for an ozone season weekday.
2. Adjusted base year on road mobile emissions and 1999 forecast on-road mobile emissions calculated with MOBILE5A for an ozone season weekday.
3. 1990 base year point source emissions of 481.95 tpd are adjusted by addition of 1.33 tpd from pulp and paper mills table in Appendix 11c-K of the July 1996 SIP.
4. Non-road emission inventories are calculated using a baseline inventory calculated with the NONROAD model adjusted using a methodology ratio. The methodology ratio corrects the NONROAD values for differences in the NEVES and NONROAD methodologies using 1999 grown NEVES and 1999 NOROAD inventories to determine the ratio. This correction is done in order to maintain consistency with the 1990 base year, 1996 ROP, and 1999 ROP inventories.

Table 5.1-2
NOx ESTIMATES TOWARDS 2002 9% ROP SIP - HOUSTON/GALVESTON
3% of 2002 ROP Reductions from NO_x
April 27, 2001

Base Year and Baseline Inventories

Emissions Inventory Source Category	1990 Adjusted Base Year	Percent	Growth 1990 to 2002	2002 Baseline	Percent
Area Sources	14.37	1.2%	4.0%	14.94	1.1%
Point Sources	794.85	64.0%	-10.3%	712.78	54.0%
On-road Mobile Sources	234.80	18.9%	47.4%	346.14	26.2%
Non-road Mobile Sources	198.08	15.9%	24.1%	245.76	18.6%
Total	**1242.10**		6.2%	**1319.62**	

Estimated NO_x Reductions for 2002 ROP and 2003 Contingency

	Baseline TPD	Total Reduction 1990 to 2002 TPD	Cumulative Total Reductions from Previous ROPs TPD	2002 ROP Reduction TPD	Percent of Requirement
Federally Mandated Controls					
NO_x RACT		95.00	95.00	0.00	0.00%
Tier I/II, I/M, RFG, NLEV, HDDV	346.14	85.29	36.49	48.80	79.93%
Gasoline utility engine rule, marine recreational & HDDV standards (non-road)	245.76	23.57	0.00	23.57	38.61%
Federal Controls Subtotal				72.37	118.54%
State and Local Controls					
NO_x Point Source	712.78	0.00	0.00	0.00	0.00%
State and Local Controls Subtotal				0.00	
Total 2002 Control Strategy Reductions				**72.37**	
Contingency Strategy					
2003 Tier I/II, I/M, RFG, NLEV, HDDV				8.52	68.59%

Target Assessment	
NOx Reduction Required for 2002 ROP	61.05
Creditable Reductions	72.37
Excess (Shortfall)	**11.32**
Required Contingency	12.42
Required Target + Contingency	73.47
Total Reductions	80.89
Excess (Shortfall)	**7.42**

Notes:

1. NO_x reductions will comprise 1/3 of the required contingency measure amounts of 3% of the adjusted base year EI. VOC reductions will comprise 2/3 of the required contingency measure amounts of 3% of the adjusted base year EI.

2. The value for the required NO_x reduction (target) is calculated based upon EPA guidance, takes into account the effects of growth and non-creditable reductions, and is calculated on a separate spreadsheet. If the target value from the separate spreadsheet calculation is less than zero, the value is set to zero in the target assessment section of this spreadsheet.

3. Non-road emission reduction calculations are done using a baseline inventory calculated with the NONROAD model adjusted using a methodology ratio. The methodology ratio corrects the NONROAD values for differences in the NEVES and NONROAD methodologies using 1999 grown NEVES and 1999 NONROAD inventories to determine the ratio. This correction is done in order to maintain consistency with the 1990 base year, 1996 ROP, and 1999 ROP inventories.

Table 5.1-3
2002 ROP Required VOC Emissions Target Calculations
Houston Ozone Nonattainment Area
Ozone Season VOC Tons Per Day
April 27, 2001

Step	Emissions Basis	Stationary		Mobile		Total
		Point	Area	On-road	Non-road	
1	1990 ROP Nonattainment Area Base Year EI	483.28	200.07	251.52	129.98	1064.85
2	Adjusted Base Year EI Relative to 1999	483.28	200.07	153.01	129.98	966.34
3	Adjusted Base Year EI Relative to 2002	483.28	200.07	134.02	129.98	947.35
4	6% of Adjusted Base Year EI Relative to 1999					56.84
5	RVP and Fleet turnover correction [steps (2-3)]		0.00	18.99		18.99
6	1999 Target Level					772.08
7	2002 Target Level [steps (6-5-4)]					696.25
8	2002 Emissions Forecast (Grown)	518.85	184.65	179.95	154.87	1038.32
9	Inventory Adjustment (see note 4)				4.65	4.65
10	2002 Emissions Forecast with Adjustment (8 +9)	518.85	184.65	179.95	159.52	1042.97
11	Total Reductions Required by 2002 with growth [steps (10-7)]					346.72
12	Creditable Reductions to date (include 1996 &1999 ROP)	176.85	45.21	59.86	21.11	303.03
13	***Required VOC reductions for 2002 ROP***					43.69

Notes:
1. Base year on-road mobile emissions calculated with MOBILE5 for an ozone season weekday.
2. Adjusted base year on road mobile emissions and 1999 forecast on-road mobile emissions calculated with MOBILE5A for an ozone season weekday.
3. 1990 base year point source emissions of 481.95 tpd are adjusted by addition of 1.33 tpd from pulp and paper mills table in Appendix 11c-K of the July 1996 SIP.
4. Non-road emission inventories are calculated using a baseline inventory calculated with the NONROAD model adjusted using a methodology ratio. The methodology ratio corrects the NONROAD values for differences in the NEVES and NONROAD methodologies using 1999 grown NEVES and 1999 NOROAD inventories to determine the ratio. This correction is done in order to maintain consistency with the 1990 base year, 1996 ROP and 1999 ROP inventories.

Table 5.1-4
VOC ESTIMATES TOWARDS 2002 9% ROP SIP - HOUSTON/GALVESTON
6% of 2002 ROP Reductions from VOC
April 27, 2001

Base Year and Baseline Inventories

Emissions Inventory Source Category	1990 Adjusted Base Year	Percent	Growth 1990 to 2002	2002 Baseline	Percent
Area Sources	200.07	21.1%	-7.7%	184.65	17.8%
Point Sources	483.28	51.0%	7.4%	518.85	50.0%
On-road Mobile Sources	134.02	14.1%	34.3%	179.95	17.3%
Non-road Mobile Sources	129.98	13.7%	19.1%	154.87	14.9%
Total	**947.35**		9.6%	**1038.32**	

Estimated VOC Reductions for 2002 ROP and 2003 Contingency

	Baseline TPD	Total Reduction 1990 to 2002 TPD	Cumulative Total Reductions from Previous ROPs TPD	2002 ROP Reduction TPD	Percent of Requirement
Federally Mandated Controls					
HON		0.47	0.47	0.00	0.00%
Pulp & Paper, RFG - Tanks & RFG - Loading Racks		14.53	8.41	6.12	14.01%
RE Floating Tanks		26.96	26.86	0.10	0.23%
Gasoline utility engine rule, Marine recreational & HDDV standards	154.87	50.69	14.84	35.85	82.06%
Tier I/II, I/M, RFG, NLEV, HDDV	179.95	79.88	59.00	20.88	47.79%
Federal Controls Subtotal				62.95	144.08%
Total 2002 Control Strategy Reductions				**62.95**	
Contingency Strategy					
2003 Tier I/II, I/M, RFG, NLEV, HDDV				5.15	27.18%

Target Assessment

VOC Reduction Required for 2002 ROP(target)	43.69
Creditable Reductions	62.95
Excess (Shortfall)	**19.26**
Required Contingency	18.95
Required Target + Contingency	62.64
Total Reductions	68.10
Excess (Shortfall)	**5.46**

Notes:

1. NO_x reductions will comprise 1/3 of the required contingency measure amounts of 3% of the adjusted base year EI. VOC reductions will comprise 2/3 of the required contingency measure amounts of 3% of the adjusted base year EI.

2. The value for the required VOC reduction (target) is calculated based upon EPA guidance, takes into account the effects of growth and non-creditable reductions, and is calculated on a separate spreadsheet. If the target value from the separate spreadsheet calculation is less than zero, the value is set to zero in the target assessment section of this spreadsheet.

3. Non-road emission reduction calculations are done using a baseline inventory calculated with the NONROAD model adjusted using a methodology ratio. The methodology ratio corrects the NONROAD values for differences in the NEVES and NONROAD methodologies using 1999 grown NEVES and 1999 NONROAD inventories to determine the ratio. This correction is done in order to maintain consistency with the 1990 base year, 1996 ROP, and 1999 ROP inventories.

Table 5.1-5
2005 ROP Required NO_x Emissions Target Calculations
Houston Ozone Nonattainment Area
Ozone Season NO_x Tons Per Day
April 27, 2001

Step	Emissions Basis	Stationary		Mobile		Total
		Point	Area	On-road	Non-road	
1	1990 ROP Nonattainment Area Base Year EI	794.85	14.37	337.03	198.08	1344.33
2	Adjusted Base Year EI Relative to 2002	794.85	14.37	234.80	198.08	1242.10
3	Adjusted Base Year EI Relative to 2005	794.85	14.37	230.49	198.08	1237.79
4	9% of Adjusted Base Year EI Relative to 2005					111.40
5	RVP and Fleet turnover correction [steps (2-3)]		0.00	4.31		4.31
6	2002 Target Level					1127.08
7	2005 Target Level [steps (6-5-4)]					1011.37
8	2005 Emissions Forecast (Grown)	713.12	14.70	362.40	185.69	1275.91
9	Inventory Adjustment(see note 4)				77.99	77.99
10	2005 Emissions Forecast with Adjustment (8 + 9)	713.12	14.70	362.40	263.68	1353.90
11	Total Reductions Required by 2002 with growth [steps (10-7)]					342.53
12	Creditable Reductions to date (include 1996,1999, & 2002)	95.00	0.00	85.29	23.57	203.86
13	***NOx Reduction Required for 2005 ROP***					138.67

Notes:
1. Base year on-road mobile emissions calculated with MOBILE5 for an ozone season weekday.
2. Adjusted base year on road mobile emissions and 1999 forecast on-road mobile emissions calculated with MOBILE5A for an ozone season weekday.
3. 1990 base year point source emissions of 481.95 tpd are adjusted by addition of 1.33 tpd from pulp and paper mills table in Appendix 11c-K of the July 1996 SIP.
4. Non-road emission inventories are calculated using a baseline inventory calculated with the NONROAD model adjusted using a methodology ratio. The methodology ratio corrects the NONROAD values for differences in the NEVES and NONROAD methodologies using 1999 grown NEVES and 1999 NOROAD inventories to determine the ratio. This correction is done in order to maintain consistency with the 1990 base year, 1996 ROP and 1999 ROP inventories.

Table 5.1-6
NOx ESTIMATES TOWARDS 2005 9% ROP SIP - HOUSTON/GALVESTON
9% of 2005 ROP Reductions from NOx
September 10, 2001

Base Year and Baseline Inventories

Emissions Inventory Source Category	1990 Adjusted Base Year	Percent	Growth 1990 to 2005	2005 Baseline	Percent
Area Sources	14.37	1.2%	2.3%	14.70	1.1%
Point Sources	794.85	64.2%	-10.3%	713.12	52.7%
On-road Mobile Sources	230.49	18.6%	57.2%	362.40	26.8%
Non-road Mobile Sources	198.08	16.0%	33.1%	263.68	19.5%
Total	**1237.79**		9.4%	**1353.90**	

Estimated NO_x Reductions for 2005 ROP and 2006 Contingency

	Baseline TPD	Total Reduction 1990 to 2005 TPD	Cumulative Total Reductions from Previous ROPs TPD	2005 ROP Reduction TPD	Percent of Requirement
Federally Mandated Controls					
NO_x RACT		95.00	95.00	0.00	0.00%
Tier I/II, I/M, RFG, NLEV, HDDV	362.40	134.29	85.29	49.00	33.39%
Gasoline utility engine rule, Marine recreational & HDDV standards (non-road)	263.68	48.56	23.57	24.99	17.03%
Federal Controls Subtotal				73.99	
State and Local Controls					
NO_x Point Source	713.12	446.00	0.00	446.00	321.63%
State and Local Controls Subtotal				446.00	
Total 2005 Control Strategy Reductions				**519.99**	
Contingency Strategy					
2006 Tier I/II, I/M, RFG, NLEV, HDDV				0.00	0.00%

Target Assessment

NO_x Reduction Required for 2005 ROP(target)	138.67
Creditable Reductions	519.99
Excess (Shortfall)	**381.32**
Required Contingency	37.13
Required Target + Contingency	175.80
Total Reductions	519.99
Excess (Shortfall)	**344.19**

Notes:

1. NO_x reductions will comprise all of the required contingency measure amounts of 3% of the adjusted base year EI. None of the contingency requirement will be taken from VOC reductions.

2. The value for the required NOx reduction (target) is calculated based upon EPA guidance, takes into account the effects of growth and non-creditable reductions, and is calculated on a separate spreadsheet. If the target value from the separate spreadsheet calculation is less than zero, the value is set to zero in the target assessment section of this spreadsheet.

3. Non-road emission reduction calculations are done using a baseline inventory calculated with the NONROAD model adjusted using a methodology ratio. The methodology ratio corrects the NONROAD values for differences in the NEVES and NONROAD methodologies using 1999 grown NEVES and 1999 NONROAD inventories to determine the ratio. This correction is done in order to maintain consistency with the 1990 base year, 1996 ROP, and 1999 ROP inventories.

Table 5.1-7
2005 ROP Required VOC Emissions Target Calculations
Houston Ozone Nonattainment Area
Ozone Season VOC Tons Per Day
April 27, 2001

Step	Emissions Basis	Stationary		Mobile		Total
		Point	Area	On-road	Non-road	
1	1990 ROP Nonattainment Area Base Year EI	483.28	200.07	251.52	129.98	1064.85
2	Adjusted Base Year EI Relative to 2002	483.28	200.07	134.02	129.98	947.35
3	Adjusted Base Year EI Relative to 2005	483.28	200.07	132.58	129.98	945.91
4	0% of Adjusted Base Year EI Relative to 2005					0.00
5	RVP and Fleet turnover correction [steps (2-3)]		0.00	1.44		1.44
6	2002 Target Level					696.25
7	2005 Target Level [steps (6-5-4)]					694.81
8	2005 Emissions Forecast (Grown)	519.04	187.51	186.97	164.78	1058.30
9	Inventory Adjustment(see note 4)				4.94	4.94
10	2005 Emissions Forecast with Adjustment (8 + 9)	519.04	187.51	186.97	169.72	1063.24
11	Total Reductions Required by 2002 with growth [steps (10-7)]					368.43
12	Creditable Reductions to date (include 1996,1999, & 2002 ROP)	183.07	45.21	80.74	56.96	365.98
13	***VOC Reduction Required for 2005 ROP***					2.45

Notes:
1. Base year on-road mobile emissions calculated with MOBILE5 for an ozone season weekday.
2. Adjusted base year on road mobile emissions and 1999 forecast on-road mobile emissions calculated with MOBILE5A for an ozone season weekday.
3. 1990 base year point source emissions of 481.95 tpd are adjusted by addition of 1.33 tpd from pulp and paper mills table in Appendix 11c-K of the July 1996 SIP.
4. Non-road emission inventories are calculated using a baseline inventory calculated with the NONROAD model adjusted using a methodology ratio. The methodology ratio corrects the NONROAD values for differences in the NEVES and NONROAD methodologies using 1999 grown NEVES and 1999 NOROAD inventories to determine the ratio. This correction is done in order to maintain consistency with the 1990 base year, 1996 ROP and 1999 ROP inventories.

Table 5.1-8
VOC ESTIMATES TOWARDS 2005 9% ROP SIP - HOUSTON/GALVESTON
0% of 2005 ROP Reductions from VOC
April 27, 2001

Base Year and Baseline Inventories

Emissions Inventory Source Category	1990 Adjusted Base Year	Percent	Growth 1990 to 2005	2005 Baseline	Percent
Area Sources	200.07	21.2%	-6.3%	187.51	17.6%
Point Sources	483.28	51.1%	7.4%	519.04	48.8%
On-road Mobile Sources	132.58	14.0%	41.0%	186.97	17.6%
Non-road Mobile Sources	129.98	13.7%	30.6%	169.72	16.0%
Total	**945.91**		12.4%	**1063.24**	

Estimated VOC Reductions for 2005 ROP and 2006 Contingency

	Baseline TPD	Total Reduction 1990 to 2005 TPD	Cumulative Total Reductions from Previous ROPs TPD	2005 ROP Reduction TPD	Percent of Requirement
Federally Mandated Controls					
HON		0.47	0.47	0.00	0.00%
Pulp & Paper, RFG - Tanks & RFG - Loading Racks		14.53	14.53	0.00	0.00%
RE Floating Tanks		26.97	26.96	0.01	
Gasoline utility engine rule, Marine recreational & HDDV standards	169.72	77.17	50.69	26.48	
Tier I/II, I/M, RFG, NLEV, HDDV	186.97	105.72	79.88	25.84	
Federal Controls Subtotal				52.33	
Total 2005 Control Strategy Reductions				**52.33**	
Contingency Strategy					
2006 Tier I/II, I/M, RFG, NLEV, HDDV				0.00	0.00%

Target Assessment	
VOC Reduction Required for 2005 ROP(target)	2.45
Creditable Reductions	52.33
Excess (Shortfall)	**49.88**
Required Contingency	0.00
Required Target + Contingency	0.00
Total Reductions	52.33
Excess (Shortfall)	**49.88**

Notes:

1. NO_x reductions will comprise 1/3 of the required contingency measure amounts of 3% of the adjusted base year EI. VOC reductions will comprise 2/3 of the required contingency measure amounts of 3% of the adjusted base year EI.

2. The value for the required VOC reduction (target) is calculated based upon EPA guidance, takes into account the effects of growth and non-creditable reductions, and is calculated on a separate spreadsheet. If the target value from the separate spreadsheet calculation is less than zero, the value is set to zero in the target assessment section of this spreadsheet.

3. Non-road emission reduction calculations are done using a baseline inventory calculated with the NONROAD model adjusted using a methodology ratio. The methodology ratio corrects the NONROAD values for differences in the NEVES and NONROAD methodologies using 1999 grown NEVES and 1999 NONROAD inventories to determine the ratio. This correction is done in order to maintain consistency with the 1990 base year, 1996 ROP, and 1999 ROP inventories.

Table 5.1-9
2007 ROP Required NOx Emissions Target Calculations
Houston Ozone Nonattainment Area
Ozone Season NOx Tons Per Day
September 10, 2001

Step	Emissions Basis	Stationary		Mobile		Total
		Point	Area	On-road	Non-road	
1	1990 ROP Nonattainment Area Base Year EI	794.85	14.37	337.03	198.08	1344.33
2	Adjusted Base Year EI Relative to 2005	794.85	14.37	230.49	198.08	1237.79
3	Adjusted Base Year EI Relative to 2007	794.85	14.37	228.97	198.08	1236.27
4	6% of Adjusted Base Year EI Relative to 2007					74.18
5	RVP and Fleet turnover correction [steps (2-3)]		0.00	1.52		1.52
6	2005 Target Level					1011.37
7	2007 Target Level [steps (6-5-4)]					935.67
8	2007 Emissions Forecast (Grown)	713.46	14.58	371.17	194.08	1293.29
9	Inventory Adjustment (see note 4)				81.51	81.51
10	2005 Emissions Forecast with Adjustment(8 + 9)	713.46	14.58	371.17	275.59	1374.80
11	Total Reductions Required by 2002 with growth [steps (10-7)]					439.13
12	Creditable Reductions to date (include 1996, 1999, 2002, & 2005 ROP)	541.00	0.00	134.29	48.56	723.85
13	***NOx Reduction Required for 2007 ROP***					-284.72

Notes:

1. Base year on-road mobile emissions calculated with MOBILE5 for an ozone season weekday.
2. Adjusted base year on road mobile emissions and 1999 forecast on-road mobile emissions calculated with MOBILE5A for an ozone season weekday.
3. 1990 base year point source emissions of 481.95 tpd are adjusted by addition of 1.33 tpd from pulp and paper mills table in Appendix 11c-K of the July 1996 SIP.
4. Non-road emission inventories are calculated using a baseline inventory calculated with the NONROAD model adjusted using a methodology ratio. The methodology ratio corrects the NONROAD values for differences in the NEVES and NONROAD methodologies using 1999 grown NEVES and 1999 NOROAD inventories to determine the ratio. This correction is done in order to maintain consistency with the 1990 base year, 1996 ROP and 1999 ROP inventories.

Table 5.1-10
NOx ESTIMATES TOWARDS 2007 6% ROP SIP - HOUSTON/GALVESTON
6% of 2007 ROP Reductions from NOx
September 10, 2001

Base Year and Baseline Inventories

Emissions Inventory Source Category	1990 Adjusted Base Year	Percent	Growth 1990 to 2007	2007 Baseline	Percent
Area Sources	14.37	1.2%	1.5%	14.58	1.1%
Point Sources	794.85	64.3%	-10.2%	713.46	51.9%
On-road Mobile Sources	228.97	18.5%	62.1%	371.17	27.0%
Non-road Mobile Sources	198.08	16.0%	39.1%	275.59	20.0%
Total	**1236.27**		11.2%	**1374.80**	

Estimated NO_x Reductions for 2007 ROP and 2008 Contingency

	Baseline TPD	Total Reduction 1990 to 2007 TPD	Cumulative Total Reductions from Previous ROPs TPD	2007 ROP Reduction TPD	Percent of Requirement
Federally Mandated Controls					
NOx RACT		95.00	95.00	0.00	
Tier I/II, I/M, RFG, NLEV, HDDV	371.17	182.00	134.29	47.71	
Gasoline utility engine rule, Marine recreational & HDDV standards (non-road)	275.48	65.76	48.56	17.20	
Federal Controls Subtotal				64.91	
State and Local Controls					
NO_x Point Source	713.46	588.00	446.00	142.00	
State and Local Controls Subtotal				0.00	
Total 2007 Control Strategy Reductions				**206.91**	
Contingency Strategy					
2008 Tier I/II, I/M, RFG, NLEV, HDDV				0.00	0.00%

Target Assessment

NOx Reduction Required for 2007 ROP(target)	0.00
Creditable Reductions	206.91
Excess (Shortfall)	**206.91**
Required Contingency	24.73
Required Target + Contingency	24.73
Total Reductions	206.91
Excess (Shortfall)	**182.18**

Notes:
1. NO_x reductions will comprise all of the required contingency measure amounts of 3% of the adjusted base year EI. None of the contingency requirement will be taken from VOC reductions.

2. The value for the required NO_x reduction (target) is calculated based upon EPA guidance, takes into account the effects of growth and non-creditable reductions, and is calculated on a separate spreadsheet. If the target value from the separate spreadsheet calculation is less than zero, the value is set to zero in the target assessment section of this spreadsheet.

3. Non-road emission reduction calculations are done using a baseline inventory calculated with the NONROAD model adjusted using a methodology ratio. The methodology ratio corrects the NONROAD values for differences in the NEVES and NONROAD methodologies using 1999 grown NEVES and 1999 NONROAD inventories to determine the ratio. This correction is done in order to maintain consistency with the 1990 base year, 1996 ROP, and 1999 ROP inventories.

Table 5.1-11
2007 ROP Required VOC Emissions Target Calculations
Houston Ozone Nonattainment Area
Ozone Season VOC Tons Per Day
April 27, 2001

Step	Emissions Basis	Stationary		Mobile		Total
		Point	Area	On-road	Non-road	
1	1990 ROP Nonattainment Area Base Year EI	483.28	200.07	251.52	129.98	1064.85
2	Adjusted Base Year EI Relative to 2005	483.28	200.07	132.58	129.98	945.91
3	Adjusted Base Year EI Relative to 2007	483.28	200.07	131.61	129.98	944.94
4	0% of Adjusted Base Year EI Relative to 2007					0.00
5	RVP and Fleet turnover correction [steps (2-3)]		0.00	0.97		0.97
6	2005 Target Level					694.81
7	2007 Target Level [steps (6-5-4)]					693.84
8	2007 Emissions Forecast (Grown)	519.23	191.29	190.10	171.89	1072.51
9	Inventory Adjustment (see note 4)				5.16	5.16
10	2007 Emissions Forecast with Adjustment (8 + 9)	519.23	191.29	190.10	177.05	1077.67
11	Total Reductions Required by 2002 with growth [steps (10-7)]					383.83
12	Creditable Reductions to date (include 1996,1999, 2002, & 2005 ROP)	183.07	45.21	106.58	83.44	418.30
13	***VOC Reduction Required for 2007 ROP***					-34.47

Notes:
1. Base year on-road mobile emissions calculated with MOBILE5 for an ozone season weekday.
2. Adjusted base year on road mobile emissions and 1999 forecast on-road mobile emissions calculated with MOBILE5A for an ozone season weekday.
3. 1990 base year point source emissions of 481.95 tpd are adjusted by addition of 1.33 tpd from pulp and paper mills table in Appendix 11c-K of the July 1996 SIP.
4. Non-road emission inventories are calculated using a baseline inventory calculated with the NONROAD model adjusted using a methodology ratio. The methodology ratio corrects the NONROAD values for differences in the NEVES and NONROAD methodologies using 1999 grown NEVES and 1999 NOROAD inventories to determine the ratio. This correction is done in order to maintain consistency with the 1990 base year, 1996 ROP and 1999 ROP inventories.

Table 5.1-12
VOC ESTIMATES TOWARDS 2007 9% ROP SIP - HOUSTON/GALVESTON
0% of 2007 ROP Reductions from VOC
April 27, 2001

Base Year and Baseline Inventories

Emissions Inventory Source Category	1990 Adjusted Base Year	Percent	Growth 1990 to 2007	2007 Baseline	Percent
Area Sources	200.07	21.2%	-4.4%	191.29	17.8%
Point Sources	483.28	51.1%	7.4%	519.23	48.2%
On-road Mobile Sources	131.61	13.9%	44.4%	190.10	17.6%
Non-road Mobile Sources	129.98	13.8%	36.2%	177.05	16.4%
Total	**944.94**		14.0%	**1077.67**	

Estimated VOC Reductions for 2007 ROP and 2008 Contingency

	Baseline TPD	Total Reduction 1990 to 2007 TPD	Cumulative Total Reductions from Previous ROPs TPD	2007 ROP Reduction TPD	Percent of Requirement
Federally Mandated Controls					
HON		0.47	0.47	0.00	0.00%
Pulp & Paper, RFG - Tanks & RFG - Loading Racks		14.54	14.53	0.01	
RE Floating Tanks		27.47	26.97	0.50	
Gasoline utility engine rule, Marine recreational & HDDV standards	177.05	94.32	77.17	17.15	
Tier I/II, I/M, RFG, NLEV, HDDV	190.10	118.26	105.72	12.54	
Federal Controls Subtotal				30.20	
Total 2007 Control Strategy Reductions				**30.20**	
Contingency Strategy					
2006 Tier I/II, I/M, RFG, NLEV, HDDV				0.00	0.00%

Target Assessment

VOC Reduction Required for 2007 ROP(target)	0.00
Creditable Reductions	30.20
Excess (Shortfall)	**30.20**
Required Contingency	0.00
Required Target + Contingency	0.00
Total Reductions	30.20
Excess (Shortfall)	**30.20**

Notes:

1. NO_x reductions will comprise 1/3 of the required contingency measure amounts of 3% of the adjusted base year EI. VOC reductions will comprise 2/3 of the required contingency measure amounts of 3% of the adjusted base year EI.

2. The value for the required VOC reduction (target) is calculated based upon EPA guidance, takes into account the effects of growth and non-creditable reductions, and is calculated on a separate spreadsheet. If the target value from the separate spreadsheet calculation is less than zero, the value is set to zero in the target assessment section of this spreadsheet.

3. Non-road emission reduction calculations are done using a baseline inventory calculated with the NONROAD model adjusted using a methodology ratio. The methodology ratio corrects the NONROAD values for differences in the NEVES and NONROAD methodologies using 1999 grown NEVES and 1999 NONROAD inventories to determine the ratio. This correction is done in order to maintain consistency with the 1990 base year, 1996 ROP, and 1999 ROP inventories.

CHAPTER 6: REQUIRED CONTROL STRATEGY ELEMENTS

Table 6-1.1 HGA NO_x Reduction Estimates[1]

September 8, 1993 Base Case Emissions Inventory	1993 Base Case (tpd)	Percent of 1993 Total	2007 Future Base	2007 Controlled (tpd)	Percent of 2007 Total
On-road mobile sources	416	32%	215	164	40%
Area and non-road mobile sources	155	12%	147	129	31%
Point sources[2]	695	54%	721	103	25%
Biogenic sources	18	1%	18	18	4%
TOTALS	**1284**	**100%**	**1101**	**414**	**100%**

[1]Totals may not equal 100% due to round-off.
[2]Point source inventory subject to revision. See Chapter 3, Section 3.5.3 of the December 2000 SIP revision for explanation.

6.1 OVERVIEW

The development of the attainment demonstration SIP for the HGA area has proved to be an extremely challenging effort, due to the magnitude of reductions needed for attainment and the shortage of readily available control options. Several leading-edge, innovative control technologies are now approaching an advanced state of development due to the role played by Texas stakeholders and others in aggressively pursuing new ozone control technologies. As promising as these new technologies may be, however, they alone are not yet adequate to bring the HGA area into attainment. There are test programs already initiated evaluating all of these new technologies which will provide the commission with the necessary information to base decisions on during the full continuum of the mid-course review (see Chapter 7) which is a multi-part process. Ideally, this attainment demonstration would rely upon technical solutions that provided the cleanest possible automobiles and trucks, ships, locomotives, aircraft, construction equipment, etc., within a few years' time. Unfortunately, the current state of technology, coupled with the inevitable lag time to achieve significant equipment turnover, prevents a purely technical solution from being a reality by 2007, the attainment year. For this reason, the commission must implement measures that rely on behavioral changes, in addition to technological controls.

The HGA nonattainment area will need to ultimately reduce NO_x by more than 750 tpd to reach attainment with the 1-hour ozone standard. In addition, a VOC reduction of about 25% will also have to be achieved. Implementation of the rules and other control measures contained in this SIP revision will close the gap and achieve attainment of the 1-hour ozone standard in the HGA area by November 15, 2007, the date required for attainment. Table 6.1-2 provides a summary of the NO_x control strategies and reductions for the HGA attainment demonstration.

Table 6.1-2: Summary of Control Strategies and NO_x/VOC Estimated 2007 Reductions for the HGA Attainment Demonstration

Type of Measure	Description	NO_x	VOC
EXISTING FEDERAL MEASURES			
Federal on-road	Included in the December 2000 revision	201	98
Federal area/non-road	Included in the December 2000 revision	8	35
	Federal Measures Total	209	133
STATE			
A. Base Measures (November 1999 SIP) **1. State Rules**			
Point Source NO_x	See revised Section 6.3.1	586 tpd	--
Emissions Banking and Trading Program	See revised Section 6.3.2	--	--
Inspection/ Maintenance	Included in the December 2000 revision	36.20 tpd	18.05
Construction Equipment Operating Restrictions	Repealed. See revised Section 6.3.4 Replaced by TERP Program (See new Section 6.3.21)	6.7 tpd	---
Cleaner Diesel Fuel	See revised Section 6.3.5	3.98 tpd on-road 2.69 tpd non-road	--
Commercial Lawn Equipment Operating Restrictions	Included in the December 2000 revision	.23 tpd NO_x shifted 12.4 tpd VOC shifted 4.6 tpd NO_x equivalent	--
VOC RACT	Included in the December 2000 revision	--	--
2. Local Measures			
VMEP	Included in the December 2000 revision	23	--
	Base Measures Total	**656.47**	**18.05**
B. Gap Measures **1. Federal Measures**			

Type of Measure	Description	NO_x	VOC
Energy Efficiencies	Included in the December 2000 revision	3.57	–
2. State Rules			
Accelerated Purchase of Tier 2/Tier 3 Diesel Equipment	Repealed. See revised Section 6.3.9 Replaced by new TERP Program (See new Section 6.3.21)	12.20 tpd	1.86 tpd
Speed Limit Reduction	Included in the December 2000 revision	12.33 tpd	1.76
Airport Reductions	Included in the December 2000 revision	5.09 tpd	--
California Spark-Ignition Engines	Included in the December 2000 revision	2.80 tpd	7.58
Vehicle Idling Restrictions	See revised Section 6.3.16	0.48 tpd	0.19
Gas-fired Water Heaters, Small Boilers, And Process Heaters	Included in the December 2000 revision	0.50 tpd	--
Stationary Diesel Engines	See New Section 6.3.20	1.00	--
2. Local Measures			
TCMs	Included in the December 2000 revision	1.06 tpd	2.13
	Gap Measures Total	39.03	13.52
	Equivalent NO_x reduced as a result of VOC reductions	1.14	
	Gap	96	
	Remaining gap to fill	56	

6.2 VOC RULE CHANGES (No change from December 2000 revision)

6.3 NO_x RULE CHANGES

The commission commits to conducting modeling in the future to evaluate the effects of the difference in controls now required in the point source rules. The point source NO_x control strategy as adopted on December 6, 2000 had an associated NO_x emission reduction of 595 tpd. While the current revisions to the point source NO_x rules (See Section 6.3.1) are now expected to reduce NOx by 586 tpd, the effect of this increase is counterbalanced by reductions enacted by the Texas Legislature requiring the permitting of grandfathered facilities in the East/Central Texas. The Legislature requires grandfathered sources in this region to reduce emissions of NO_x by approximately 50%. The commission believes that the current revision will provide similar air quality benefits to the December 6, 2000 SIP revision for several reasons:

- First, overall, NO_x emissions in East and Central Texas will be significantly lower under the current SIP than under the December 6, 2000 SIP revision.
- Second, ozone production efficiency at the sources affected by the recent legislation is expected to be very high, based on recently published results from an ozone study conducted in the Nashville, TN area by the Southern Oxidant Study. Results from the TexAQS indicate that ozone production at Reliant's W. A. Parish power plant is 3 to 5 times lower than what is expected from the rural grandfathered sources. No data is currently available on ozone production efficiency at other Reliant units, but it is expected to be somewhat higher than that at the Parish facility.

- Third, the increased NO_x emissions will occur at peaking units, which generate most of their emissions in the afternoon, at least during the ozone season. Modeling has shown that afternoon emissions are less important in ozone formation than are morning emissions (at least for construction and lawn-care activities).

In any case, the revised ESAD is more cost-effective in terms of cost per ton of NOx than the ESAD in the December 6, 2000 SIP revision, and result in a very large reduction in emissions. Detailed modeling will be required to quantitatively assess the overall effect of these two compensating changes to the emissions inventory. The commission will address this issue during the first phase of the mid-course review.

6.3.1 Point Source NO_x Rules

The amendments require new stationary gas turbines and duct burners at minor sources of NO_x in HGA to meet emission specifications in order to reduce NO_x emissions and ozone air pollution. In addition, the amendments improve implementation of the existing Chapter 117 by correcting typographical errors, updating cross-references, clarifying ambiguous language, adding flexibility, amending requirements to achieve the intended emission reductions of the program, and deleting the exemption for small (ten megawatts (MW) or less) electric generating units which are registered under a standard permit. Finally, the amendments revise the emission specifications for attainment demonstrations (ESADs) for electric utilities and landfill gas-fired stationary engines, revise the emission reduction schedule for sources other than electric utilities, and provide for alternate ESADs in the event that the commission's continuing scientific assessment of the causes of and possible solutions to HGA's ozone nonattainment status results in a determination that attainment can be reached with fewer NO_x emission reductions from point sources concurrent with additional emission reduction strategies.

6.3.2 Emissions Cap and Trade Program

The amendments to the emissions cap and trade rules provide additional planning options to affected industries during the five-year period that allocations under the cap and trade program are reduced to their final levels. The schedule for full implementation and the final level of allocations are unaffected. The amendments do not affect the April 1, 2007 date of final allocation levels nor does it increase final allocations and they still achieve the final emission reductions as required by the SIP. The amendments add two incremental steps to the devaluation, in respect to emission allowances, of banked discrete emission reduction credits (DERC)s and extend for two years the date at which DERCs are devalued to a ratio of ten DERCs to one allowance. Use of DERCs continue to be limited to 10,000 per year beginning January 1, 2005. The commission extended this flexibility to preserve as much credit as possible for those industries that have made emission reductions while still achieving the anticipated environmental benefits of the cap by 2007. The amendments allow participants in the program additional

options for the permanent sale of allowances, an extension of the period to request deviations from allocation methods, and additional time to make final trade reports after the end of a control period.

6.3.3 (No change from December 2000 revision)

6.3.4 Construction Equipment Operating Use Restriction

On December 6, 2000, the commission adopted a rule to implement an operating-use restriction program requiring that heavy-duty diesel construction equipment rated at 50 horsepower and greater be restricted from use between the hours of 6:00 a.m. through 12:00 p.m., April 1 through October 31, beginning April 1, 2005. The basis for the rule is that emissions of NO_x, a key ozone precursor, are delayed until later in the day, thus limiting ozone formation.

In May 2001, the 77th Legislature of the State of Texas passed SB 5. Section 18 of SB 5 required the commission to submit a SIP revision to the EPA, deleting this rule, as well as the accelerated purchase requirement (see Section 6.3.9), from the SIP no later than October 1, 2001. The diesel emission reduction incentive program contained in SB 5 (see Section 6.3.21) will replace these rules and result in reductions in excess of the reductions expected from the rules that were repealed. Therefore, the NO_x reductions previously claimed in the HGA attainment demonstration SIP will be achieved through an alternate but equivalent federally enforceable mechanism.

In the December 6, 2000 HGA SIP, the state took credit for 6.7 tpd NO_x from the heavy-duty diesel operating restriction rule. This credit, which appeared in Table 6.1-2 of the referenced HGA SIP revision, has been deleted and replaced by the new TERP Program.

6.3.5 Cleaner Diesel Fuel

This strategy implements a state LED fuel program requiring diesel fuel producers and importers, beginning April 1, 2005 to ensure that all diesel fuel used in the HGA, BPA, and DFW ozone nonattainment areas, and in an additional 95 East and Central Texas counties for both on-road and non-road use does not exceed 500 ppm sulfur, contains less than 10.0% by volume of aromatic hydrocarbons, and has a minimum cetane number of 48. Alternative diesel fuel formulations that achieve equivalent emission reductions may also be used. The state LED fuel program also requires that, beginning June 1, 2006, the sulfur content be reduced to 15 ppm sulfur in both on-road and non-road diesel fuel in the HGA, BPA, and DFW ozone nonattainment areas, and in an additional 95 East and Central Texas counties. The fuel required by the state LED fuel program will have a lower aromatic hydrocarbon content and a higher cetane number in each gallon of diesel than required by current federal regulations for on-road diesel.

The state LED fuel program lowers NO_x emissions from diesel fueled compression-ignition engines in the affected areas. Because NO_x emissions are precursors to ground-level ozone formation, reduced emissions of NO_x will result in ground-level ozone reductions. By 2007, the state LED fuel program will reduce NO_x emissions from on-road vehicles and non-road equipment in the affected regional area by 16.32 tpd, of which 6.67 tpd of reductions will be achieved in the HGA ozone nonattainment area.

The state LED fuel program requires LED fuel for both on-road and non-road use in the eight counties in the HGA ozone nonattainment area, which comprise Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties; the three counties of the BPA ozone nonattainment area, which comprise Hardin, Jefferson, and Orange Counties; the four counties of the DFW ozone

nonattainment area, which comprise Collin, Dallas, Denton, and Tarrant Counties; and 95 additional East and Central Texas counties comprising Anderson, Angelina, Aransas, Atascosa, Austin, Bastrop, Bee, Bell, Bexar, Bosque, Bowie, Brazos, Burleson, Caldwell, Calhoun, Camp, Cass, Cherokee, Colorado, Comal, Cooke, Coryell, De Witt, Delta, Ellis, Falls, Fannin, Fayette, Franklin, Freestone, Goliad, Gonzales, Grayson, Gregg, Grimes, Guadalupe, Harrison, Hays, Henderson, Hill, Hood, Hopkins, Houston, Hunt, Jackson, Jasper, Johnson, Karnes, Kaufman, Lamar, Lavaca, Lee, Leon, Limestone, Live Oak, Madison, Marion, Matagorda, McLennan, Milam, Morris, Nacogdoches, Navarro, Newton, Nueces, Panola, Parker, Polk, Rains, Red River, Refugio, Robertson, Rockwall, Rusk, Sabine, San Jacinto, San Patricio, San Augustine, Shelby, Smith, Somervell, Titus, Travis, Trinity, Tyler, Upshur, Van Zandt, Victoria, Walker, Washington, Wharton, Williamson, Wilson, Wise, and Wood counties.

The state LED fuel program requires diesel fuel producers and importers that provide fuel to the affected area to register with the commission. In addition, the state LED fuel program requires diesel fuel producers and importers to test fuel samples for compliance and keep records of the test results. Diesel fuel producers and importers are also required to submit a report to the commission for compliance on each blend batch and a quarterly summary report of the results from the fuel testing. All parties in the fuel distribution system (producers, importers, pipelines, rail carriers, terminals, truckers, and retailers, except those acting as a common carrier) are required to keep records of product transfer documents for two years. Retail fuel dispensing outlets are exempt from all of the state LED fuel program's testing and recordkeeping requirements except for the keeping of product transfer documents. Diesel fuel producers that submit to the state by January 2003 an emissions reductions plan, which includes a substitute fuel strategy and which is approved by the state and the EPA no later than May 2003 containing a substitute fuels strategy providing reductions in NO_x emissions equivalent to the state LED fuel program, will be exempted from the requirements of the state LED fuel program.

SECTION 211(C)(4)(C) WAIVER REQUEST

Section 211(c)(4)(A) of the FCAA prohibits states from prescribing or attempting to enforce any “control or prohibition” of a “characteristic or component of a fuel or fuel additive” if the EPA has promulgated a control or prohibition applicable to such characteristic or component under section 211(c)(1). EPA regulates diesel fuel used in on-road applications in Title 40 CFR Section 80.29. Section 211(c)(4)(C) provides an exception to this prohibition for a nonidentical state standard contained in a SIP where the standard is “necessary to achieve” the primary or secondary NAAQS that the SIP implements. EPA can approve a SIP provision as necessary if the Administrator finds that “no other measures exist and are technically possible to implement, but are unreasonable or impracticable.” Therefore, Texas is submitting this revision to the SIP as adequate justification and is requesting from EPA a waiver from Section 211(c)(4)(A) of the FCAA to implement a state LED fuel program in the areas defined in this SIP revision. Texas is requesting this waiver for the state regulation of on-road diesel fuel only, since EPA does not regulate diesel fuel used in non-road applications and as such, no waiver is required.

Waiver Requirements for Alternative Fuel Specifications

Under Section 211 (c)(4)(C) of the FCAA, EPA may approve a non-identical state fuel control as a SIP provision, if the state demonstrates that the measure is necessary to achieve the national primary or secondary NAAQS that the plan implements. EPA can approve a state fuel requirement as necessary only if no other measure exists that would bring about timely attainment, or if other measures exist but are unreasonable or impracticable.

If a state decides to pursue a state fuel requirement, the state must submit a SIP revision adopting the state fuel control and apply for a waiver from federal preemption. The state must include in its petition specific information showing the measure is necessary to meet the ozone NAAQS, based on the statutory requirements for showing necessity. The waiver request must:
Identify the quantity of reductions needed to reach attainment of the NAAQS;

- Identify possible other control measures and the quantity of reductions each would achieve;
- Explain in detail, with adequate factual support, which of those identified control measures are considered unreasonable or impracticable; and
- Show that even with the implementation of all reasonable and practicable measures, the state would need additional emissions reductions for timely attainment, and the state fuel measure would supply some or all of such additional reductions.

Determining Whether Other Measures are Unreasonable or Impracticable
In determining whether ozone control measures are unreasonable or impracticable, reasonableness and practicability are determined in comparison to the state-specific fuel control program.

While the basis for finding unreasonableness or impracticability is in part comparative, the state still must provide solid reasons why the other measures are unreasonable or impracticable and must demonstrate these reasons with adequate factual support. Reasons why a measure might be unreasonable or impracticable for a particular area include, but are not limited to, the following:

- Length of time to implement the measure;
- Length of time to achieve ozone reduction benefits;
- Degree of disruption entailed by implementation;
- Other implementation concerns, such as supply issues;
- Costs to industry, consumers, or the state;
- Cost-effectiveness; and
- Reliance on commercially unavailable technology.

A strong justification for finding a measure unreasonable or impracticable might rely upon the combination of several of these reasons.

THE NEED FOR THE STATE LOW EMISSION DIESEL PROGRAM
The commission has developed a NO_x control strategy consisting of a state LED fuel program that it believes is an essential element in the control strategy package needed for the HGA ozone nonattainment area to be able to demonstrate attainment of the ozone NAAQS. The fuel that is required by the state LED fuel program is a low aromatic hydrocarbon/high cetane diesel fuel which is required for use by both on-road and non-road diesel fueled compression-ignition engines in the HGA, BPA, and DFW ozone nonattainment areas and in an additional 95 East and Central Texas counties. The state LED fuel program was originally developed as a NO_x control strategy for the DFW ozone nonattainment area, and state regulations were adopted to implement this strategy in the DFW area. The state LED fuel program developed for this SIP revision is an expansion of the DFW program, but with additional requirements.

The commission's current understanding, based upon national studies as well as the commission's own studies, is that ozone must be controlled at two levels: the regional level and the urban level. Historically, the FCAA has limited states to addressing the ozone problem at the local level. Recently, however, this

has begun to change. The EPA has started to incorporate the findings of the OTAG, the SOS, and the advice of stakeholders (e.g., the FACA Subcommittee on Ozone, Particulate Matter, and Regional Haze Implementation) into recent policy guidance, encouraging states to factor regional reductions into their control plans.

On a national level, the OTAG study and its findings are particularly noteworthy. OTAG was established by the EPA to work with states in the eastern portion of the country to develop strategies to address the regional ozone problem. Among the group's determinations were that ozone is pervasive; ozone and the compounds that form it are transported both at lower levels of the atmosphere and aloft from one day to the next; and reductions of ozone precursors over a large area are beneficial in lowering regional background levels of ozone.

The commission's own studies have provided evidence that there is regional transport of ozone and ozone precursors in Texas, and that regional reductions of ozone precursors are beneficial. The commission's own modeling studies have shown that pollutant sources across Texas contribute to regional background levels of ozone, and that regional reductions of ozone precursors will lower the regional ozone background levels. These studies and upper air monitoring have found that regional air pollution should be considered when studying air quality in Texas' ozone nonattainment areas. This work is supported by the OTAG study which is the most comprehensive attempt ever undertaken to understand and quantify the transport of ozone. Both the commission and OTAG study results point to the need to take a regional approach, such as that described in the regional control strategy adopted by the commission, to control air pollutants.

Lowering regional background ozone through a regional strategy will serve three purposes. It will give existing nonattainment areas the flexibility to design optimal local control strategies to help them attain the 1-hour and 8-hour ozone standards. It will help areas which are currently close to violating the standards to avoid actually violating. And, over the longer term, it will help keep the developing areas of the state from ever violating the standards.

The regional aspect of the state LED fuel program was developed to provide LED fuel for use in areas of the state that could potentially have a negative air quality impact on current ozone nonattainment areas, near nonattainment areas, and future areas of concern. For example: the HGA ozone nonattainment area currently needs every possible emission reduction to demonstrate attainment; the BPA nonattainment area's attainment goals are heavily influenced by transport from HGA; the DFW ozone nonattainment area is also impacted by transport and has little leeway to handle additional emissions based on their current attainment demonstration modeling; and several near-nonattainment areas for the new 8-hour standard are seeking immediate reductions to preclude a nonattainment area designation. All of these areas will benefit from the reductions attributed to the regional aspect of the state LED fuel program.

The main attractiveness of the fuel-based strategy is that it has a more immediate impact than other controls. Once the fuel is in the marketplace, it begins having an immediate air quality impact as both old and new vehicles and non-road equipment begin using the new fuel.

The fuel required by the state LED fuel program was chosen based upon the following reasons:

- Emissions performance;
- Effect on advanced technology vehicles and engines;
- Impacts on non-road emissions;

- Modeling;
- Distribution;
- Transport; and
- Length of time needed to achieve benefits.

Emissions Performance

State and federal modeling has shown that reductions in NO_x continue to contribute to reductions in ozone. The use of LED fuel will reduce emissions of NO_x from diesel fueled compression-ignition engines in the eight county HGA ozone nonattainment area. The regional implementation of LED fuel for on-road use will help reduce emissions in the HGA ozone nonattainment area from on-road vehicles that are transiting the area but fueling outside of the nonattainment area counties. The LED fuel is also beneficial in that NO_x emission reductions will be seen in all diesel fueled compression-ignition engines in the HGA ozone nonattainment area - both old and new and from on-road and non-road applications.

Effect on Advanced Technology Vehicles and Engines

Through the NLEV program and agreements between the heavy-duty engine manufacturers and EPA, vehicle and engine manufacturers have made a commitment to introduce cleaner vehicles and engines to the nation earlier than what would have been required by the FCAA. The NO_x reductions from this federal action will not be enough to get Texas where it needs to be in relation to overall air quality. Improvements in diesel fuel quality alone will not be enough. However, an improvement in diesel fuel quality as the result of a state LED fuel program, combined with the advanced vehicle and engine technology, will bring Texas closer to achieving its overall air quality goals. In addition, the state LED fuel program will benefit engine retrofit efforts in the HGA, BPA, and DFW ozone nonattainment areas by providing lower sulfur diesel fuel to these areas beginning June 2006.

Impacts on Emissions from On-road Vehicles and Non-road Engines

By 2007, the state LED fuel program will reduce NO_x emissions from on-road vehicles and non-road equipment in the regional area by 16.32 tpd, of which 6.67 tpd of reductions will be achieved in the HGA ozone nonattainment area.

Modeling

The commission contracted with ERG to estimate the on-road and non-road NO_x emissions benefits associated with adopting the LED rule for the HGA, BPA, and DFW areas, the affected 95 East and Central Texas counties, as well as the state as a whole, for a typical ozone summer day in 2007. The modeling performed by ERG for this SIP revision assumed that state LED fuel will be similar to California diesel fuel (CA diesel) in terms of the specifications (sulfur content, aromatic content, and cetane). Thus the emission benefits for the state LED fuel (compared to CA diesel) are based upon the switch from current Federal diesel (industry standard) to CA diesel.

Modeling Methodology for the HGA and DFW Ozone Nonattainment Areas

Diesel fuel benefits were evaluated relative to industry average on-road diesel fuel, as provided in EPA's HDEWG report. ERG compared the regression equations generated under the HDEWG study with those from the European Auto Oil study. Given similar inputs, these models tend to agree in their NO_x predictions, with less than a 2.0% difference. Selecting the HDEWG model, NO_x reductions are predicted to be 5.7% for on-road engines with electronic controls (i.e., 1990 and later models for the most part). Note that the European Auto Oil equations estimated a 4.1% NO_x reduction for the same engines.

Also note that pre-1990 engine benefits were estimated using CARB test data from 1988. While this data set is thin, it is the only data available for estimating aromatics effects in pre-electronic control engines (estimated at 7% for NO_x). Therefore, ERG relied on this estimate for the older portion of the on-road fleet as well as the entire non-road diesel fleet.

On-Road Modeling Methodology for Statewide and for the 95-county Region plus the BPA Ozone Nonattainment Area

ERG developed baseline emission estimates for heavy-duty diesel vehicles using MOBILE5b, and county-specific inputs as well as projected vehicle miles traveled estimates for these vehicles. Resulting emissions were adjusted by the LED benefit estimate developed for the Dallas nonattainment area rulemaking. The following summarizes ERG's methodology and assumptions used to estimate ton per day NO_x reductions for this measure.

ERG developed individual MOBILE5b input files for the 95 counties in order to develop baseline NO_x emission inventories for each area. ERG used existing data sources to develop the baseline emission inventories. Table 6.3-1 summarizes the data sources used for each of the key input parameters.

Table 6.3-1. Data Sources for Statewide and 95-county Region Inventory Development

Input Parameter	Source
Vehicle registration distributions	1997 TxDOT records, by county
Average vehicle speed (excluding Travis, Hays, Williamson, and Bexar counties)	By county, from TTI COAST Modeling Project
Travis and Williamson County speeds	1996 TTI Conformity Modeling
Bexar County speed	1995 TTI Conformity Modeling
Hays County speed	Assumed equal to Comal County (due to I-35 location and proximity to major urban areas)
VMT per day (2007)	By county from E.H. Pechan Tier 2 Study for EPA, projected from HPMS data
HDD VMT fraction	By county from E.H. Pechan Tier 2 Study for EPA, projected from HPMS data

With the exception of the county-specific registration and speed inputs, ERG used default MOBILE5b settings, with the introduction of the new HDD emission standards in 2004. Once HDD gram per mile emission factors were estimated for each county, these were combined with HDD VMT estimates to determine total NO_x tpd emissions for the region as a whole (116 tpd).

County-specific data for the remaining counties in the western part of the state are quite limited, due to the lack of conformity and related modeling efforts for this region. Therefore, ERG developed an alternative approach for estimating NO_x inventories for these counties. The three counties in the BPA ozone nonattainment area (Hardin, Jefferson, and Orange) have also been included in this analysis.

ERG used the MOBILE5b input files from E.H. Pechan's National Tier 2 analysis for this effort. These input files contained detailed registration distributions for each region. Pechan grouped together counties with similar roadway, vehicle, and speed profiles for their analysis. Table 6.3-2 summarizes the county groupings used by Pechan to generate representative NO_x emission factors.

Table 6.3-2. Pechan's County Groupings for MOBILE5b Inputs

Representative County	Counties Represented
El Paso	El Paso only
Hardin	Hardin only
Jefferson	Jefferson only
Orange	Orange only
Anderson	All other "western" counties

ERG obtained the representative input files from Pechan in order to develop appropriate emission factors. However, these files were developed for use in post-processing with roadway specific speed data not currently available to ERG. Therefore, ERG ran each of the Pechan input files at 33.1 and 54.0 mph, the respective low and high speeds seen in the 95-county region data set, to "bracket" the likely emission factors for these counties. Table 6.3-3 summarizes the emission factors associated with the low- and high-end speeds, for each county grouping.

Table 6.3-3. Grams per Mile as a Function of Low/High Speed Assumption, by County Group

Representative County	Low Speed g/mi	High Speed g/mi
El Paso	7.13	9.53
Hardin	6.98	9.32
Jefferson	6.76	9.03
Orange	7.50	10.02
Anderson	6.70	8.95

As with the previous analysis, the Pechan input files accounted for the effect of the 2004 HDD engine standards.

Once obtained, the g/mi values were combined with Pechan's 2007 VMT estimates for each county to generate tpd values for NO_x from HDD vehicles. The resulting value for all 147 counties was 89.35 tpd.

Using a previous analysis, ERG estimated the NO_x reductions expected from adopting the California diesel fuel specifications in various Texas nonattainment areas. The specifications for Texas LED are essentially identical to the CARB specifications for the purposes of NO_x estimation. Therefore, ERG used the previous estimate of a 5.7% NO_x reduction to determine expected tpd benefits for the different regions. It was noted that pre-1990 mechanically-controlled engines were estimated to achieve a 7.0% reduction. However, given the small amount of total heavy diesel VMT attributable to these engines in 2007, ERG did not differentiate the benefit estimate by model year, but simply applied the 5.7% reduction uniformly across the entire inventory.

It is important to note that these benefit estimates are independent of the fuel sulfur level. Sulfur level only has an impact on NO_x emissions when catalysts are in place. At this time, EPA and automakers do not believe that advanced NO_x catalysts will be required to meet the upcoming 2004 emission standards. Therefore, fuel sulfur level was not considered in this modeling analysis.

Non-road Modeling Methodology for the BPA Ozone Nonattainment Area and Additional 95-County Region

ERG developed baseline emission estimates for HDD engines using EPA's draft Non-road model for each county. Resulting emissions were adjusted by the LED benefit estimate developed for the Dallas nonattainment area rulemaking. The following summarizes ERG's methodology and assumptions used to estimate ton per day NO_x reductions for this measure.

The current non-road emission inventories for the HGA and DFW nonattainment areas are based on EPA's NEVES study from 1991 (with the exception of construction, commercial marine, and airport GSE, which were recently revised using bottom-up survey data.). However, the NEVES study did not provide emissions estimates for attainment areas. Therefore, ERG relied upon EPA's draft Non-road model to generate NO_x inventories for non-road diesel engines operating in the 95-county area. Non-road has the ability to allocate statewide equipment population estimates to the county level.

The following Non-road equipment categories were evaluated for diesel engines in each county:

- Construction
- Agricultural
- Commercial
- Industrial
- Lawn and Garden
- Logging

The following categories were excluded from the non-road analysis because their aggregate NO_x emissions from diesel engines in the 95-county area were estimated by Non-road to be substantially less than 1 tpd: recreational marine, airport GSE, and recreational vehicles.

ERG's recent survey of construction equipment in the HGA area found a significant overestimation of equipment population estimates in the default Non-road files. Equipment populations were overestimated by a factor of 2 to 3, depending upon engine type. A similar overestimation was subsequently found for the DFW area. Similar overestimations of construction equipment population estimates for the 95 counties were also anticipated to occur using the non-road model. Therefore, ERG scaled the default statewide construction equipment population file downward to match the HGA survey totals when allocated back to the 8-county HGA area. ERG then used this adjusted statewide file to estimate a baseline emission inventory for diesel construction equipment in each of the 95 counties.

There is no bottom-up engine population survey available for many of the other equipment categories, such as agricultural and commercial. The level of uncertainty associated with Non-road's default population estimates for these categories is unknown. Since the Non-road population estimates were developed using the same database as was used for the construction sector, it is anticipated that default populations for these sectors are also overestimated. Therefore, ERG chose to estimate emissions inventories for these other categories using both the Non-road default populations as well as population files scaled downward in accordance with the HGA construction survey findings. For this later estimate, ERG used the ratio of total diesel construction equipment from the HGA survey and the default Non-road population estimates for the same area - 58%. In this way, ERG obtained a range for NO_x emissions in the 95-county area for these other equipment categories.

Table 6.3-4 summarizes the results of the non-road emissions inventory calculation for the 95-county area.

Table 6.3-4. 2007 Non-road NO_x Emission Inventory for 95-County Region

Equipment Category	NO_x Estimate, tpd*
Construction	51.4
Agricultural	43.1 – 74.2
Commercial	4.2 – 7.2
Industrial	8.9 – 15.4
Lawn and Garden	4.2 – 7.2
Logging	1.7 – 2.9
Total	**113.5 – 158.4**

* Low estimate based on 42% reduction from non-road default

Using a previous analysis, ERG estimated the NO_x reductions expected from adopting the California diesel fuel specifications in various Texas nonattainment areas. The specifications for Texas LED are essentially identical to the CARB specifications for the purposes of NO_x estimation. Therefore, ERG used the previous estimate of a 7% NO_x reduction to determine expected tpd benefits for the 95-county region. It was noted that advanced electronically-controlled engines are estimated to achieve a 5.7% reduction with Texas LED. However, given the small amount of electronically-controlled engines likely to be in the fleet in 2007, ERG did not differentiate the benefit estimate by model year, but simply applied the 7% reduction uniformly across the entire inventory.

It is important to note that these benefit estimates are independent of the fuel sulfur level. Sulfur level only has an impact on NO_x emissions when catalysts are in place. At this time, EPA and engine manufacturers do not believe that advanced NO_x catalysts will be required to meet the upcoming Tier 2 and Tier 3 emission standards for non-road engines. Therefore, fuel sulfur level was not considered in this modeling analysis. However, diesel fuel sulfur level could have a significant impact on aftermarket NO_x reduction systems, which are often fouled by exposure to higher sulfur levels.

As described in this section, modeling has indicated that by 2007, the state LED fuel program will reduce NO_x emissions from on-road vehicles and non-road equipment in the regional area by 16.32 tpd, of which 6.67 tpd of reductions will be achieved in the HGA ozone nonattainment area. These reductions are necessary for the HGA area to demonstrate attainment with the ozone NAAQS within the time frame prescribed by the EPA.

Distribution

A regional LED fuel requirement facilitates distribution. The regional coverage area for on-road use will create a large enough market to ease the costs of distribution. Supplies can be co-mingled in the pipeline, trading can take place, and tracking compliance will be simplified. Since the DFW and HGA ozone nonattainment areas already distribute a federal RFG, and the state's low-RVP Gasoline is already distributed to the 95 East and Central Texas county regional area, diesel producers and importers will be able to use the current distribution system to distribute state LED fuel to the affected areas beginning in 2006 when the sulfur in LED is limited to 15 ppm for the HGA, BPA, and DFW ozone nonattainment areas and 95 East and Central Texas counties.

A regional LED fuel requirement also reduces non-compliant fuel usage within the nonattainment areas from out-of-area refueling by pass-through truck traffic. According to data shown on a 1997 truck traffic flow map published by TxDOT, over 10,000 trucks per day traverse the HGA nonattainment area. In addition, according to a Texas Department of Transportation report, "Effect of the North American Free Trade Agreement on the Texas Highway System, December 1998," the volume of truck traffic through the HGA nonattainment area directly associated with NAFTA commerce ranges between 1001 and 2500 trucks per day. Therefore, regional coverage for on-road use of LED will ensure that higher volumes of pass-through truck traffic will be refueling with LED within the state and will be using this fuel when traveling within the state's nonattainment areas.

Transport

Air pollution knows no boundaries. Federal and state studies have shown that pollution from one area can affect ozone levels in another area. Regional air pollution should be considered when studying air quality in Texas' ozone nonattainment areas. This work is supported by the findings of the OTAG study, which is the most comprehensive attempt ever undertaken to understand and quantify the transport of ozone. Both the commission and the OTAG study results point to the need to take a regional approach to control air pollutants, such as that prescribed in the state LED fuel program.

The regional implementation of LED fuel will result in reductions of NO_x emissions in the surrounding counties and help reduce the amount of NO_x being transported into the HGA, BPA, and DFW ozone nonattainment areas. As modeling has shown that HGA ozone and ozone precursor transport has the potential to impact areas as far away as DFW, the benefits from reduced HGA peak ozone concentrations have the potential to positively impact other nonattainment and near-nonattainment areas.

In addition to the current 1-hour ozone nonattainment counties, Texas also has several areas that are facing potential nonattainment status under the new 8-hour ozone standard. These areas will benefit not only from reduced ozone and ozone precursor transport, but also from the immediate reduction of NO_x emissions in their local area from the use of LED fuel.

Length of Time Needed to Achieve Benefits

The most important aspect of using the state LED fuel program is that the benefits are seen immediately. Once the state LED fuel program begins, emission reductions begin for both old and new vehicles, as well as from non-road engines that use the fuel. The regional coverage area required by the state LED fuel program ensures NO_x emission reductions significant enough to have an immediate impact on the air quality in the HGA ozone nonattainment area.

EMISSION REDUCTIONS NEEDED FOR ATTAINMENT OF THE NAAQS

The HGA ozone nonattainment area will need to ultimately reduce NO_x by more than 750 tpd to reach attainment with the 1-hour ozone NAAQS. In addition, a VOC reduction of about 25% will have to be achieved. The state LED fuel program will contribute to attainment and maintenance of the 1-hour ozone NAAQS in the HGA area. The state LED fuel program also may contribute to a successful demonstration of transportation conformity in the HGA area. Assessment of emissions inventory data has also shown that over 20% of the NO_x emissions in the HGA area come from mobile sources. As such, the control strategy package for the HGA ozone nonattainment area needs to include strategies that have an immediate impact on mobile sources. The state LED fuel program will have an immediate impact. In order for HGA to demonstrate attainment in 2007, monitored ozone concentrations in the HGA area must

show compliance with the ozone NAAQS for the three-year period 2005–2007. By 2007, the state LED fuel program will reduce NO_x emissions from on-road vehicles and non-road equipment in the regional area by 16.32 tpd, of which 6.67 tpd of reductions will be achieved in the HGA ozone nonattainment area.

EVALUATION OF OTHER CONTROL MEASURES

The commission has analyzed other control measures for reasonableness and practicability of implementation to meet the attainment deadline. This included evaluating on-road mobile sources, non-road mobile sources, area, and point sources. A complete listing of these control strategy measures is provided in Section 6.1. A listing of 202 potential control strategy measures, identifying why certain measures were considered unreasonable or impracticable, is provided in Appendix L.

The commission determined that all but 17 of the 202 control measures evaluated were either already done in Texas or were unreasonable or impracticable to demonstrate attainment by the 2007 deadline. The state LED fuel program was among the 17 control measures determined by the commission to be reasonable, practicable, and capable of being implemented in time to demonstrate attainment. A complete listing of the control measures determined by the commission to be essential to demonstrate attainment by the 2007 deadline is provided in Table 6.1-2.

CONCLUSIONS

By 2007, the state LED fuel program will reduce NO_x emissions from on-road vehicles and non-road equipment in the regional area by 16.32 tpd, of which 6.67 tpd of reductions will be achieved in the HGA ozone nonattainment area, and is a vital component of the overall NO_x emissions reduction strategy for the HGA ozone nonattainment area. Modeling has shown that without the emission reductions achieved by the state LED fuel program, it will not be possible for the HGA ozone nonattainment area to demonstrate attainment with the NAAQS within the time frame prescribed by EPA. Therefore, the commission finds that the state LED fuel program is essential to the timely attainment of the 1-hour ozone NAAQS in the HGA ozone nonattainment area.

6.3.6 - 6.3.8 (No change from December 2000 revision)

6.2.9 Accelerated Purchase of Tier 2/Tier 3 Non-road Compression-Ignition Equipment

On December 6, 2000 the commission adopted a rule implementing an accelerated purchase program requiring the owners or operators of diesel-powered construction, industrial, commercial, and lawn and garden equipment rated at 50 hp and greater to replace their affected equipment with newer Tier 2 and Tier 3 equipment, with the amount and timing of reductions depending on the hp rating of the engine fleet.

In May 2001, the 77th Legislature of the State of Texas passed SB 5. Section 18 of SB 5 required the commission to submit a SIP revision to the EPA, deleting this rule, as well as the construction equipment operating use restriction (see Section 6.3.4), from the SIP no later than October 1, 2001. The diesel emission reduction incentive program contained in SB 5 (see Section 6.3.21) will replace these rules and result in reductions in excess of the reductions expected from the rules that were repealed. Therefore, the NO_x reductions previously claimed in the HGA attainment demonstration SIP will be achieved through an alternate but equivalent federally enforceable mechanism.

In the December 6, 2000 HGA SIP, the state took credit for 12.2 tpd NO_x from the Tier 2/Tier 3 equipment accelerated purchase rule. This credit, which appeared in Table 6.1-2 of the referenced HGA SIP revision, has been deleted and replaced by the new TERP Program.

6.3.10 - 6.3.15 (No change from December 2000 revision)

6.3.16 Vehicle Idling Restrictions

The amendments to the idling limitations rules contain a new exemption which clarifies who is responsible for complying with the provisions of Chapter 114 in situations that involve a rented or leased vehicle operated by a person not employed by the owner of the vehicle. The clarification exempts the owner of a rented or leased vehicle from responsibility for compliance with the Chapter 114 requirements and directs the responsibility in such instances to the operator of the vehicle.

6.3.17 - 6.3.19 (No change from December 2000 revision)

6.3.20 Stationary Diesel Engines and Dual-Fuel Engines

These rules require owners and operators of stationary diesel or dual-fuel engines in HGA to meet new emission specifications and operating restrictions in order to reduce NO_x emissions and ozone air pollution. The emission limits result in an estimated NO_x reduction of approximately one tpd in HGA. A summary of the requirements is as follows:

- Starting or operating any stationary diesel or dual-fuel engine for testing or maintenance between the hours of 6:00 a.m. and noon is prohibited, beginning April 1, 2002, except for specific manufacturer's recommended testing requiring a run of over 18 consecutive hours; or to verify reliability of emergency equipment (e.g., emergency generators or pumps) immediately after unforeseen repairs. Routine maintenance such as an oil change is not considered to be an unforeseen repair.
- New stationary diesel engines which operate $100 hours per year in other than emergency situations are subject to:
    - emission specifications which are based on EPA's Tier 1, Tier 2, and Tier 3 emission standards for non-road diesel engines listed in 40 CFR §89.112(a), Table 1, and in effect at the time of installation; and
    - the mass emissions cap and trade program of Chapter 101, Subchapter H, Division 3 if they are located at a site where the collective design capacity to emit NO_x is $10 tpy.

- Existing stationary diesel engines which operate $100 hours per year are subject to:
    - emission specifications which are based on an uncontrolled level of 11.0 grams per horsepower-hour (g/hp-hr), or for engines which are modified, reconstructed, or relocated, the emission specifications are based on EPA's Tier 1, Tier 2, and Tier 3 emission standards for non-road diesel engines listed in 40 CFR §89.112(a), Table 1, and in effect at the time of modification, reconstruction, or relocation; and
    - the mass emissions cap and trade program of Chapter 101, Subchapter H, Division 3 if they are located at a site where the collective design capacity to emit NO_x is $10 tpy.

- New stationary diesel engines which operate <100 hours per year in other than emergency situations are required to meet the Tier 1, Tier 2, and Tier 3 emission standards for non-road diesel engines in effect at the time of installation.

- Existing stationary diesel engines which operate <100 hours per year but are modified, reconstructed, or relocated are required to meet the Tier 1, Tier 2, and Tier 3 emission standards for non-road diesel engines in effect at the time of modification, reconstruction, or relocation.

6.2.21 Voluntary Incentive Program

In May 2001 the 77th Legislature of the State of Texas passed SB 5, which establishes the Texas Emissions Reduction Program to provide grants and other financial incentives for emission reductions and alternatives to certain components of the SIP. SB 5 authorized the commission to operate the emission reduction program, manage the funds collected and allocated under the bill, submit the provisions of the bill as a revision to the SIP, and delete the accelerated purchase requirement and construction equipment operating use restriction requirements from the SIP by October 1, 2001.

One of the provisions of SB 5 establishes the Diesel Emissions Reduction Incentive Program, modeled after the Carl Moyer program in California, under which grant funds are provided to offset the incremental costs of projects that reduce NO_x emissions from heavy-duty diesel trucks and construction equipment in the nonattainment and near-nonattainment areas of the state.

Photochemical modeling will be performed according to the schedule outlined in Chapter 7, as part of the mid-course review to be submitted to EPA by May 1, 2004. This modeling is expected to show that the emission reductions from the withdrawn rules are preserved by the new voluntary incentive program rule, and that attainment of the 1-hour ozone standard is demonstrated for the HGA area.

Legislative fiscal estimates indicate that SB 5 will generate approximately $133 million per year. The money is to be distributed, according to the legislation, in this way:

- 72% for diesel reduction programs
  - Not more than 3% of this 72% for infrastructure projects
  - Not more than 15% of this 72% for on-road diesel purchases
- 10% for light-duty purchases and lease incentives
- 7.5% for energy efficiency programs
- 7.5% for new technology and research, and
- 3% for administration.

The commission will use the diesel reduction program to replace the emissions lost by removal of the construction equipment operating use restriction and the accelerated purchase requirements. Seventy two percent of the bill's funding is dedicated to diesel programs. The commission proposes to set aside 10% of this funding for non-regional projects that may not meet a localized allocation scheme. With the remaining money the commission proposes to make up the emission reductions from the repealed rules.

The construction equipment operating use restriction in the HGA SIP was responsible for 6.7 tons per day of NOx. Tier 2/3 was responsible for 12.20 tons per day of NOx. In addition, the HGA SIP has a 56 ton gap in emission reductions necessary to demonstrate attainment in the HGA area. The commission

proposes to replace 20 tons of this 56 ton gap with diesel programs from Senate Bill 5. If additional reductions occur the commission will take credit for those reductions in the SIP.

In order to equate dollars from SB 5 with emission reductions to replace the two programs and 20 tons of the gap, the commission has made the following assumptions. First, the commission has assumed that projects will cost, on average, $5,000 per ton of NOx reduced. Second, the commission has assumed that projects will last, on average, 5 years. Using these assumptions, it will take $14.2 million to fund the replacement of the construction equipment operating use restriction, the accelerated purchase requirement, and 20 tons of the gap in Houston. In addition, the commission is dedicating $5.9 million to make up the loss of the regulations in the DFW area. The remaining money would be split out between all the areas, with HGA and DFW getting additional money based on these metrics: first, the 2000 population values, second the 8-hr design value, and third the non-road inventory.

6.3.22 Equivalent NO_x Reduced as a Result of VOC Reductions

EPA indicated that they would be willing to consider quantifying VOC measures as part of the reductions necessary to demonstrate attainment in the HGA area. Therefore, the commission developed the following ratios from the modeling in order to determine what the equivalent NO_x reductions would be.

For on-road mobile sources, a 50 tpd VOC reduction yields a reduction in the gap of 4.7 tpd NO_x. Thus, for on-road mobile the ratio is 50/4.7 = 10.6 or about 10 to 1. For low-level point sources and area/non-road sources, a 50 tpd VOC reduction reduces the gap by 3.8 tpd NO_x, so the ratio for these sources is 50/3.8 = 13.2 or about 13 to 1.

The VOC reductions from the on-road gap measures (see Table 6.1-2) equal 4.08 tpd. The VOC reductions from non-road measures equal 9.44 tpd for a total of 13.52 tpd. Using the 10 to 1 ratio, the NO_x equivalents are .41 for on-road sources (4.08/10). Using the 13 to 1 ratio, the NO_x equivalent for non-road sources is .73 (9.44/13) for a total of 1.14 tpd.

CHAPTER 7: FUTURE ATTAINMENT PLANS

The development of the attainment demonstration SIP for the HGA area has proved to be an extremely challenging effort, due to the magnitude of reductions needed for attainment and the shortage of readily available control options. Several leading-edge, innovative control technologies are now approaching an advanced state of development due to the role played by Texas stakeholders and others in aggressively pursuing new ozone control technologies. As promising as these new technologies may be, however, they alone are not yet adequate to bring the HGA area into attainment. Ideally, this attainment demonstration would rely upon technical solutions that provided the cleanest possible automobiles, trucks, ships, locomotives, aircraft, construction equipment, etc., within a few years' time. Unfortunately, the current state of technology, coupled with the inevitable lag time to achieve significant equipment turnover, prevents a purely technical solution from being a reality by 2007, the attainment year. For this reason, the commission must implement measures that rely on behavioral changes, in addition to technological controls.

7.1 ENFORCEABLE COMMITMENTS

The commission believes that additional enforceable commitments are necessary to complete a fully approvable attainment demonstration which will show attainment in the HGA area by November 2007. . EPA has approved the use of enforceable commitments as a mechanism for identifying potential control strategies and associated anticipated reductions under limited circumstances with certain restrictions.

In its review of the 1994 SCAQMD attainment demonstration SIP (62 FR 1155-57, 117-82), EPA stated:

> "The CAA requires that SIPs include enforceable control measures sufficient to meet rate-of-progress milestones and provide the reductions needed for attainment by the applicable CAA deadline. Where it is infeasible for a state to accomplish the necessary regulatory adoption in the short term, we have recognized that this requirement can be satisfied, to some extent, by enforceable commitments to adopt regulations in the future, since these commitments can be enforced in court by EPA or citizens.
>
> In view of the magnitude of reductions required in the South Coast and the fact that SCAQMD and CARB have already adopted in regulatory form more stringent measures than are included in most other SIPs, we approved the 1994 Ozone SIP despite its heavy reliance on commitments to adopt regulations."

EPA stated its support for enforceable commitments in the December 16, 1999 proposed conditional approval and disapproval of the attainment demonstration SIP for the HGA ozone nonattainment area.

> "EPA has recognized that in some limited circumstances, it may be appropriate to issue a full approval for a submission that consists, in part, of an enforceable commitment. Unlike the commitment for conditional approval, such an enforceable commitment can be enforced in court by EPA or citizens. In addition, this type of commitment may extend beyond one year following EPA's approval action. Thus, EPA may accept such an enforceable commitment where it is infeasible for the state to accomplish the necessary action in the short term." 64 FR 70548, 70550 (1999).

The following table outlines the enforceable commitments the commission has made in order to have a full attainment demonstration for the HGA area which shows attainment of the ozone standard by November 2007. These commitments are also discussed throughout this chapter.

Table 7.1-1 Enforceable Commitments

Commitment	**Where the commitment can be found**
The commission commits to perform a mid-course review for the HGA area (including evaluation of all modeling, inventory data, and other tools and assumptions used to develop this attainment demonstration	April 2000 SIP revision
The commission commits to submit the mid-course review as a SIP revision to EPA by May 1, 2004	April 2000 SIP revision
The commission commits to perform new mobile source modeling for the HGA area, using EPA's MOBILE6, within 24 months of the model's official release; and that if a transportation conformity analysis is to be performed between 12 and 24 months after EPA's official release of MOBILE6, transportation conformity will not be determined until Texas submits an MVEB which is developed using MOBILE6 and which EPA finds adequate	April 2000 SIP revision
The commission commits to adopt measures that achieve at least 56 tpd of NOx emission reductions in the HGA area. (The December 2000 SIP submission shows that an additional 56 tpd of NOx reductions are needed to show attainment of the 1-hour ozone NAAQS).	May 2001 proposed revision Also in Sections 7.1 and 7.6 of this revision
The commission has identified potential measures that could achieve the reductions identified in the previous commitment without requiring additional limits on highway construction	May 2001 proposed revision Also in Section 7.1 of this revision
The commission commits to adopt measures that achieve 25% of the 56 tpd additional NOx reductions necessary and submit these adopted measures to EPA as a SIP revision by December 2002	May 2001 proposed revision Also in Section 7.6 of this revision
The commission commits to adopt measures that achieve the remaining additional NOx reductions needed to show attainment and submit these adopted measures to EPA as a SIP revision by May 1, 2004	May 2001 proposed revision Also in Sections 7.1 and 7.2 of this revision

The commission commits to adopt the measures needed for the shortfall NOx reductions as expeditiously as practicable	May 2001 proposed revision Also in Section 7.1 of this revision
The commission commits that the compliance dates for these adopted measures needed for the shortfall NOx reductions will be as expeditious as practicable	May 2001 proposed revision Also in Section 7.1 of this revision
The commission commits to submit any revised shortfall calculation (as opposed to the 56 tpd shortfall number) to EPA for approval. EPA's approval is required whether the commission's shortfall number is higher or lower than the presently-identified shortfall number of 56 tpd	May 2001 proposed revision Also in Sections 7.1 and 7.2 of this revision
The SIP contains a list identifying to-be-considered measures with an estimated range of projected emissions reductions. The range must provide a reasonable certainty that enough of these identified measures, if adopted, would achieve the 56 tpd of NOx reductions	May 2001 proposed revision Also in Sections 7.6 and 7.8 of this revision
The commission commits to concurrently revise the MVEBs and submit them to EPA as a revision to the attainment SIP if additional controls reduce on-road motor vehicle emissions	May 2001 proposed revision Also in Section 7.1 of this revision

If the science supports its development, the commission is committed to developing an enforceable plan to minimize releases of reactive hydrocarbon emissions and the emissions of chlorine. To the extent that the science confirms the benefit from this program then it is the intent of the commission to implement such a program through a SIP revision which will first offset NOx reductions from industrial sources down to the 80% (535 tpd) level. The commission, in its discretion, may allocate any additional benefit beyond 80% to other SIP strategies and/or to the point source NOx control strategy. Based upon current analysis this 80% from utility and non-utility sources would result in a total reduction of not less than 535 tpd of NOx emissions from industrial sources in the HGA area.

The commission also commits to conducting modeling in the future to evaluate the effects of the difference in controls now required in the point source rules. The point source NO_x control strategy as adopted on December 6, 2000 had an associated NO_x emission reduction of 595 tpd. While the revisions to the point source NO_x rules (See Section 6.3.1) are now expected to reduce NO_x by 586 tpd, the effect of this increase is counterbalanced by reductions enacted by the Texas Legislature requiring the permitting of grandfathered facilities in the East/Central Texas. The Legislature requires grandfathered sources in this region to reduce emissions of NO_x by approximately 50%. The commission believes that the current revision will provide similar air quality benefits to the December 6, 2000 SIP revision for several reasons:

- First, overall, NO_x emissions in east and central Texas will be significantly lower under the current SIP than under the December 6, 2000 SIP revision.

- Second, ozone production efficiency at the sources affected by the recent legislation is expected to be very high, based on recently published results from an ozone study conducted in the Nashville, TN area by the Southern Oxidant Study. Results from the TexAQS indicate that ozone production at Reliant's W. A. Parish power plant is 3 to 5 times lower than what is expected from the rural grandfathered sources. No data is currently available on ozone production efficiency at other Reliant units, but it is expected to be somewhat higher than that at the Parish facility.
- Third, the increased NO_x emissions will occur at peaking units, which generate most of their emissions in the afternoon, at least during the ozone season. Modeling has shown that afternoon emissions are less important in ozone formation than are morning emissions (at least for construction and lawn-care activities).

In any case, the revised ESAD is more cost-effective in terms of cost per ton of NO_x than the ESAD in the December 6, 2000 SIP revision, and result in a very large reduction in emissions. Detailed modeling will be required to quantitatively assess the overall effect of these two compensating changes to the emissions inventory. The commission will address this issue during the first phase of the mid-course review.

As was discussed in Chapter 3 of the December 2000 revision, the modeling resulted in a 141 ppb peak ozone level. This correlated to a gap calculation of 91 tpd NO_x equivalent. However, an additional five tpd has been added to the gap to address the diesel pull-ahead strategy that was included in the December 2000 revision. EPA has indicated that the state cannot take credit for the five tpd NO_x reductions associated with the diesel pull-ahead strategy because the excess emissions were not included in the emissions inventory, therefore the state cannot take credit for reducing them. The five tpd have therefore been added to the gap as additional reductions that the commission will address during the mid-course review process. The gap control measures adopted in December 2000 along with the stationary diesel engine rule included in this revision, result in NO_x reductions of 40 tpd, which leaves a total remaining gap of 56 tpd.

The commission commits to adopt measures necessary to achieve at least 56 tpd of NO_x emission reductions in the HGA area above and beyond those reductions already identified by the control measures listed in Chapter 6, Table 6.1-2. Additionally, as the commission completes the mid-course review process, as outlined in Section 7.2, it may show that the HGA area needs more or fewer tpd of NO_x emission reductions for attainment by November 15, 2007. Should the mid-course review show that more or fewer reductions are necessary, the commission will submit the revised reduction calculation to EPA for approval. The SIP revision submitted in May 2004 will account for those additional reductions above and beyond the 56 tpd commitment if the mid-course review shows they are necessary for attainment.

The commission further commits to submit to the EPA adopted rules as SIP revisions, achieving at least the 56 tpd of NO_x emission reductions as expeditiously as practicable but no later than May 2004. The implementation of the measures will be as expeditious as practicable but no later than the beginning of the ozone season of 2007.

If the commission adopts additional control measures to reduce on-road motor vehicle emissions as a SIP revision, the commission will concurrently revise the motor vehicle emissions budget(s) for the SIP and submit such revised budget(s) to EPA as a revision to the SIP. However, this does not mean that the MVEBs contained in this revision are not fully approvable, adequate, and sufficient for transportation

conformity purposes. With regard to on-road mobile source control measures, the state understands from EPA that only technology-related measures, such as I/M, cleaner fuels, and use restrictions/incentives may be included. Measures that could limit future highway construction, such as growth restrictions, may not be included. Furthermore, none of the on-road mobile source control measures identified in Section 7.5.1 of this SIP limit highway construction.

As shown in Table 7.1-1 the commission has identified 56-124 tpd of potential NO_x reductions from new technologies and programs which the commission commits to evaluating and adopting as they become more certain and available.

Table 7.1-2 Potential NO_x Reductions to Fill the Shortfall

NO_x Gap	96 tpd
Gap Measures from December 2000 revision and proposed stationary diesel engine rule	- 40 tpd
Total Gap Shortfall	= 56 tpd
Phase I mid-course review measures	14-20 tpd
Phase II mid-course review measures	+42-104 tpd
Total tons identified through innovative programs	**= 56-124 tpd**

The commission believes that this plan in its totality, including the adopted measures identified in Chapter 6 plus the process described in this chapter, will achieve the 1-hour ozone standard in the HGA area by 2007.

7.2 MID-COURSE REVIEW

As has been EPA's legal position since 1975 and the commission's policy, the SIP can be revised to adjust requirements, based upon new information, technology, or science, provided the ultimate goal of the SIP is achieved and all requirements of the federal act are met. The mid-course review is a well- defined approach that incorporates this policy. In order to ensure that the HGA area is in attainment by 2007 and that the controls to get there are the most cost-effective, technology-based solutions possible, the commission has committed to performing a mid-course review (see the commission's enforceable commitment adopted in April 2000). The mid-course review process has already begun and will continue, ultimately resulting in a SIP revision submitted to EPA by May 1, 2004. There are planned opportunities throughout the process, as described in the following pages, to incorporate the latest information and to make decisions. This effort will involve a thorough evaluation of all modeling, inventory data, and other tools and assumptions used to develop the attainment demonstration. It will also include the ongoing assessment of new technologies and innovative ideas to incorporate into the plan.

This chapter includes a detailed overview of the entire mid-course review process. It begins with an analysis of all reasonably available control measures for both VOC and NO_x. It then discusses the expected potential actions over the coming months. Next, the anticipated results from the Texas 2000

study as well as other improvements and enhancements to the science that we expect are described. Finally, there is a discussion about the incorporation of these enhancements, and of the technologies which have been developed and are undergoing testing, during two phases: one ending in 2002, and the other by mid- 2004.

As promising as these new technologies may be, however, they alone are not yet fully developed enough to bring the HGA area into attainment. There are test programs already initiated evaluating all of these new technologies which will provide the commission with the necessary information to base decisions on during the full continuum of the mid-course review. Ideally, this attainment demonstration would rely upon technical solutions that provided the cleanest possible automobiles, trucks, ships, locomotives, aircraft, construction equipment, etc., within a few years' time. Unfortunately, the current state of technology, coupled with the inevitable lag time to achieve significant equipment turnover, prevents a purely technical solution from being a reality by 2007, the attainment year.

For this reason, the commission must implement measures that rely on behavioral changes, in addition to technological controls. The task of attaining the federal ozone standard within the schedule mandated by the FCAA leaves little choice but to leave no stone unturned in the search for additional reductions. The commission is willing to consider any and all alternatives to the attainment demonstration rules, as long as the reductions are achieved in the necessary quantity and within the proper time frame to guarantee attainment.

A problem with identifying alternative control strategies is federal preemption, prescribed by the FCAA, in controlling on-road and non-road vehicles, ships, locomotives, and aircraft, among other sources. As a result of these preemption requirements, Texas is prohibited from effectively addressing all of the sources of air pollution that must be reduced if attainment is to be achieved. This situation conflicts with the FCAA's presumed intention of having federal controls act in cooperation with state and local measures to reach attainment of air quality standards. For this reason, the state emphatically calls on EPA to accelerate its activities, which also happen to be mandated by the FCAA, in promulgating emission controls for these sources.

Furthermore, the commission asserts that the science today supports that the reductions embodied in this plan to occur by 2005 are a necessary step towards attaining the standard. Beyond that, the commission believes performance of the full mid-course review analysis may redetermine the extent to which additional reductions must occur. As noted previously, the commission commits to submitting to EPA for approval any revised shortfall calculation. Also in Section 7.1 the commission committed to adopting any additional measures necessary to achieve these reductions and submitting the adopted rules with an attainment demonstration SIP to EPA no later than May 1, 2004.

The commission believes it has identified sufficient potential reductions from new technology and programs in excess of those necessary to reach attainment. These excess reductions represent sufficient backstop measures should some technologies prove to be not as effective as anticipated. The commission also believes EPA has sufficient authority under the FCAA to ensure the state follows through with its commitments and that the identification of additional backstop measures is unnecessary.

Future Economic Growth: The commission is committed to developing an approvable attainment demonstration that achieves the significant reductions necessary to ensure attainment of the ozone

standard in the HGA by 2007 and yet still maintains a robust economic growth. As a part of the ongoing review between now and May 2004, the commission will continue to evaluate the ability to modify the SIP to incorporate additional reductions from federal programs and new technologies beyond 2007. These changes will lead to necessary revisions to the control strategies, particularly with regards to the allocations issued under the Cap and Trade program, to allow for growth in all economic sectors.

Federal Responsibilities: In order to accomplish everything necessary for a successful mid-course review, EPA will play a significant role, particularly with regards to three areas.

- **Certification** - There are a number of new technologies which EPA needs to certify. EPA's certification process has historically been cumbersome and time consuming. EPA needs to streamline this process such that the technologies that are being developed and proven can be ready for regulatory development prior to the mid-course review. EPA must complete this process prior to May 1, 2004 for as many technologies as possible. EPA must work hand in hand with the commission and stakeholders to expedite the certification and verification processes. Additionally, EPA has to certify the reduction potential from all certified technologies. This too is a time consuming process that needs to be refined and streamlined.

- **National Regulatory Changes** - EPA is contemplating a number of regulatory changes. However, historically EPA has not operated with the same constraints states must face in developing approvable attainment demonstrations. In order for the commission to have a sound technology-based SIP by 2004, EPA must move expeditiously with their programs and ensure reductions are occurring prior to the 2007 attainment date. EPA needs to work with other federal agencies (DOE, FAA, FERC, DOAg) to ensure the programs are comprehensive and address all sources of emissions controlled by the federal government.

- **New Technological Advances** - Currently states are being placed in a position of fostering the development of new technologies for use in attainment demonstration SIPs. EPA must put resources towards the development of new technologies at the national level if states stand a chance of developing technology-based solutions to the attainment issues in their cities.

7.3 RACM ANALYSIS

In its efforts to pursue additional control measures that could be implemented through the mid-course review process, the commission began by doing the following: 1) conducting a VOC analysis to determine if there were additional VOC controls that could be put in place to achieve an equivalent of the necessary NO_x reductions; 2) conducting a NO_x analysis to determine if there were additional NO_x controls that the commission had not already considered; and 3) evaluating those strategies that could be developed through rulemaking within six months of the December 2000 revision, such as measures already being considered in other states. The following sections outline the commission's analysis of these areas.

7.3.1 VOC Point and Area Source Analysis

EPA's September 2000 comment letter indicated that they would be willing to consider quantifying additional VOC measures as part of the reductions necessary to demonstrate attainment in the HGA area. Therefore the commission conducted additional technical analysis to determine what the VOC to NO_x ratio would be in order to evaluate the feasibility of pursuing additional VOC regulations.

Calculation of Model Response to VOC Reductions

While the control strategies described in the December 2000 SIP revision are primarily NO_x-based, previously-conducted sensitivity analyses have shown that peak ozone also responds to reductions of emissions of VOC. Some rules designed to reduce NO_x emissions also reduce VOC emissions, but some such rules may increase VOC emissions. Thus VOC changes need to be accounted for when evaluating NO_x reduction strategies. Additionally, rules which reduce VOC emissions alone may be used to supplement or replace NO_x rules in some cases. When the rules are modeled directly, the VOC reductions are accounted for and the response of the model to these rules is reflected in the model output. In cases where the VOC rules are not modeled, such as gap measures, it is useful to determine *a priori* what response would be expected from a given level of VOC emission reduction.

To test the model's response to reductions of VOC, a series of three sensitivity analyses were conducted. These analyses were designed as variations of the revised control strategy reported in Section 3.8 of the December 2000 SIP revision.[1] The three sensitivity analyses were developed by removing 50 tpd of VOC emissions from, respectively, low-level point, area/non-road mobile, and on-road mobile sources. The change in peak ozone from the control strategy with no additional VOC reductions then provides a measure of the model's response to VOC reductions in a controlled, future case. Table 7.3-1 shows peak modeled ozone on each of the four primary episode days for the control case and the three sensitivities.

Table 7.3-1 Peak Modeled Ozone for Future Control Case and Three VOC Reduction Scenarios

Case	Peak Modeled Ozone (parts/billion)			
	Sept. 8th	Sept. 9th	Sept 10th	Sept. 11th
Future Control Case	140.4	128.3	134.3	129.8
Future Control Case minus 50 tpd on-road mobile source VOC	139.9	127.9	133.1	129.3
Future Control Case minus 50 tpd area/non-road mobile source VOC	140.0	127.9	133.6	129.3
Future Control Case minus 50 tpd low-level point source VOC	140.0	128.0	134.1	128.8

In Table 7.3-1 it is seen that on the 8th, 9th, and 10th, on-road mobile source VOC reductions are the most effective in reducing peak ozone (on the 9th, on-road reductions tied with area/non-road reductions), while

[1]After these analyses were completed, the modeled control strategy was modified so that the control strategy reported here differs slightly from that reported in Section 3.8 of the December 2000 revision. Specifically, the control strategy reported here reduced non-EGF point sources by 90% instead of the 88% reported in Section 3.8. Also, here the 23 tpd of VMEP reductions were distributed as 2/3 on-road and 1/3 non-road instead of using the revised distribution described in Section 3.8. Because these changes were very minor, the analyses described here were not re-run with the final revised control strategy.

on the 11th, the low-level point source VOC reductions proved to be the most effective (probably because the 11th was a Saturday with overall less traffic). Area/non-road reductions tend to lie between on-road and point source reductions in effectiveness.

Table 7.3-2 shows the calculated gap (in tpd of NO_x) for each of the above model runs, using the relation derived in Section 3.8.

Table 7.3-2: Calculated Shortfall for Future Control Case and Three VOC Reduction Scenarios

Case	Shortfall (gap) in tons/day of NO_x			
	Sept. 8th	Sept. 9th	Sept 10th	Sept. 11th
Future Control Case	88.8	38.3	88.5	53.3
Future Control Case minus 50 tpd on-road mobile source VOC	84.1	34.1	73.7	47.8
Future Control Case minus 50 tpd area/non-road mobile source VOC	85.0	34.1	79.7	47.8
Future Control Case minus 50 tpd low-level point source VOC	85.0	35.1	85.9	42.4

From Table 7.3-2 it is easy to see that reducing on-road mobile source VOC emissions by 50 tpd results in a reduction in the gap of 4.7 tpd on September 8th. Similarly, on this day reducing 50 tpd of either low-level point source or area/non-road mobile source VOC emissions reduces the gap by 3.8 tpd. So for this day, 50/4.7 = 10.6 tpd of on-road mobile source VOC reduction will reduce the gap by one tpd of NO_x, and 50/3.8 = 13.2 tpd of either area/non-road mobile source or low-level point source VOC reduction will reduce the gap by one tpd of NO_x. Table 7.3-3 lists the tons of VOC reduction required to reduce the gap by one tpd of NO_x for each of the three scenarios for all four primary episode days.

Table 7.3-3: Tpd of VOC Required to Reduce Shortfall by One tpd of NO_x

Case	TPD of VOC Required to Reduce Shortfall by One TPD of NO_x			
	Sept. 8th	Sept. 9th	Sept 10th	Sept. 11th
Future Control Case minus 50 tpd on-road mobile source VOC	10.6	11.9	3.4	9.1
Future Control Case minus 50 tpd area/non-road mobile source VOC	13.2	11.9	5.6	9.1
Future Control Case minus 50 tpd low-level point source VOC	13.2	15.6	19.2	4.6

Because September 8th was considered to be the controlling day in the December 2000 SIP revision, the values calculated for this day will be used when considering VOC/NO_x equivalences. Note, however,

that on September 10th both on-road mobile and area/non-road mobile source VOC reductions are much more effective in reducing the gap than they were on any of the other days, while on the 11th, low-level point source VOC reductions are much more effective in reducing the gap than on any of the other three days.

Due to the magnitude of reductions required to demonstrate attainment, commission staff established a threshold such that any VOC measure that could provide at least one ton of equivalent NO_x would be worthy of pursuit. This threshold was initially recommended by EPA staff. Commission staff agreed that it was a reasonable recommendation. Since 10-13 tpd of VOC emission reductions are necessary to achieve the equivalent of one tpd of NO_x reductions, even measures that achieve small amounts of cost-effective VOC reductions will not achieve cost-effective ozone reductions. Therefore, to advance the attainment date using VOC measures that achieve less than one tpd of NO_x would require an intensive and costly effort for the remaining potentially affected numerous small sources in light of the level of technology available today. Figures 7.3-1 and 7.3-2 show the VOC emissions breakdowns that the commission used in its analysis.

Figure 7.3-1 - 8-County HGA Non-Road and Area Source Emissions
2007 Future Base Case for Wednesday, September 8th
(tons per day)

VOC Total: 283.4 tons per day

Area Sources (171.6 tpd)

The largest area source categories are:

Consumer/Commercial Solvents 24.1 tpd

Architectural Coatings 21.4 tpd

Gasoline Refueling and Transport 14.2 tpd

Graphic Arts 12.6 tpd

Oil and Gas Operations 10.7 tpd

Auto Refinishing 10.0 tpd

Municipal Landfills 7.4 tpd

Dry Cleaning 4.9 tpd

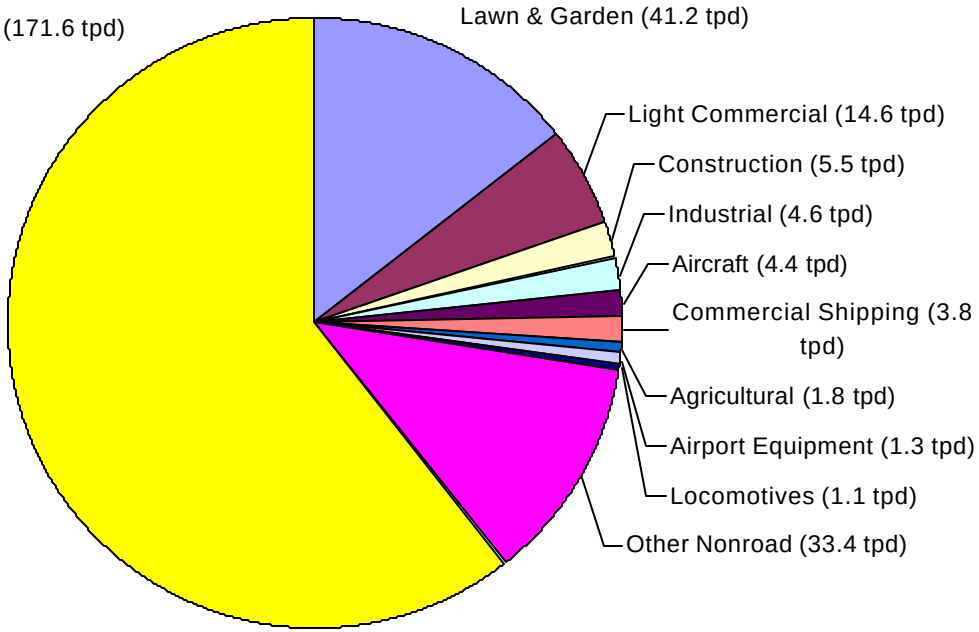
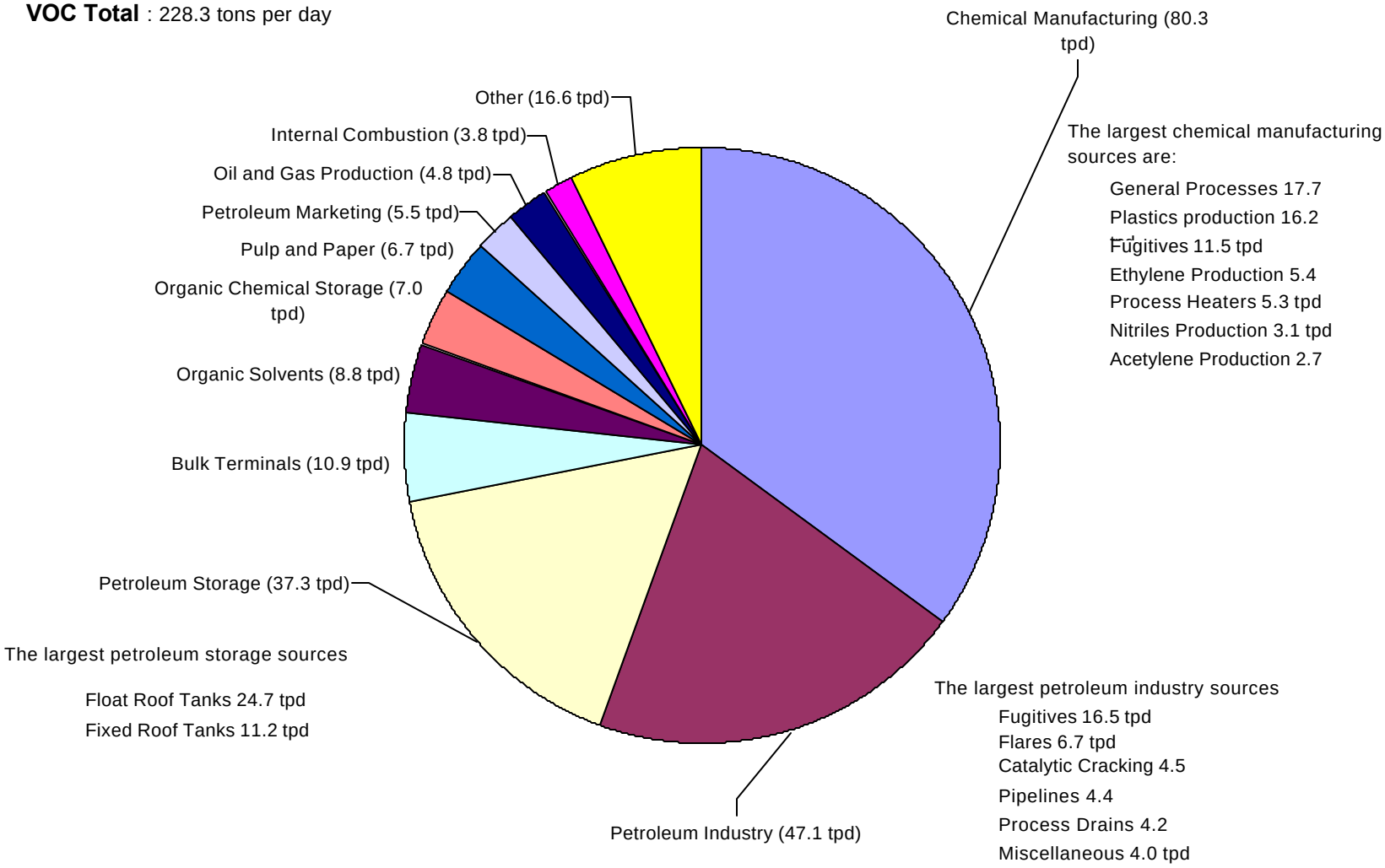


Figure 7.3-2 - 1997 8-County HGA Point Source VOC Emissions by SIC

VOC Total : 228.3 tons per day



Point Sources

The commission staff sorted the VOC point source emissions in HGA by SCC. Analysis of this data revealed that the vast majority of VOC point source emissions in HGA are associated with chemical manufacturing (80.3 tpd), petroleum refining (47.1 tpd), and VOC storage (37.3 tpd). The remaining source categories have VOC emissions of less than 11 tpd and were not analyzed further because each category represents far less than 1 tpd of NO_x equivalent reductions.

Within the chemical manufacturing category, subcategories include general processes (SCC 301800xx, 301820xx, and 301830xx) and plastics production (SCC 301018xx). The emissions in these SCCs are already subject to the Chapter 115 general vent gas and SOCMI vent gas rules (§§115.120-115.129), the industrial wastewater rules (§§115.140-115.149), the fugitive emissions monitoring rules (§§115.352-115.359), as well as the new SOCMI batch process rules (§§115.160-115.169) which were adopted as part of the HGA Attainment Demonstration SIP in December 2000. The remaining subcategories within the chemical manufacturing category have VOC emissions of less than 6 tpd and were not analyzed further because each category represents far less than 1 tpd of NO_x equivalent reductions.

Within the petroleum refining category, the largest subcategory, fugitive emissions (SCC 306888xx), has VOC emissions of 16.5 tpd. The emissions in this SCC are already subject to the Chapter 115 fugitive emissions monitoring rules (§§115.352-115.359). The next largest subcategory within the petroleum refining category, flares, are VOC emission control devices and represent 6.7 tpd of VOC emissions. The remaining subcategories within the petroleum refining category have VOC emissions of less than 5 tpd and were not analyzed further because each category represents far less than 1 tpd of NO_x equivalent.

The VOC storage category represents 37.3 tpd of VOC emissions. The commission staff conducted a detailed RACT analysis of this category in 1995. For storage tanks, the commission staff evaluated the effect of making the following changes (identified in EPA's 1994 storage tank ACT document) to the commission's Chapter 115 storage tank rules (§§115.112-115.119):

(1) lowering the vapor pressure exemption level to 0.5 psia;
(2) upgrading at tank turnaround of vapor-mounted primary seals on internal floating roof tanks;
(3) installation at tank turnaround of secondary seals on external floating roof tanks which previously had been exempt from secondary seal requirements;
(4) 95% control efficiency for add-on control devices; and
(5) installation of gasketed seals.

The analysis showed that up to the following emission reductions (in tons per year) could be achieved in HGA for each of these five controls:

(1) 272.41
(2) 177.12
(3) 192.99 (mechanical primary seals) + 22.89 (liquid-mounted primary seals) + 144.82 (vapor-mounted primary seals) = 360.70
(4) 4.88

(5) N/A (Information on deck fitting gaskets not available without conducting a very time-intensive study of the paper copies of each individual emission inventory (EI) in the files. Based upon best professional judgement and existing technology it was assumed that these losses are insignificant.)

TOTAL: 272.41 + 177.12 + 360.70 + 4.88 = 815.11 tpy, or approximately 815.11/365 = 2.2 tpd.

Although the analysis was based on the EI data available in 1995, storage tank emissions have remained relatively constant. Also, the commission staff analyzed the worst-case scenario (i.e., conservative assumptions), so 2.2 tpd is the maximum that could possibly be achieved. Based upon best professional judgement and existing technology it is likely that the actual reductions would be up to perhaps half that, or around 1.1 tpd.

In summary, the vast majority of HGA point source VOC emissions are already subject to Chapter 115 rules. While additional emission reductions could be achieved in the various categories, these would not be significant VOC reductions and therefore not cost-effective based on existing technology and when converted to the equivalent NO_x reductions. Additionally, while some measures are effective in controlling VOCs, they are not as proportionally effective in controlling ozone as compared to NO_x controls. Therefore, the commission does not believe it is appropriate to pursue these reductions at this time. However, in the future the commission may pursue additional emission reductions of certain highly reactive VOCs, particularly as episodic releases from HGA point sources, if those reductions are determined to be necessary to reach attainment with the ozone NAAQS. Also, any VOC reductions that occur as a result of implementing new NO_x technologies or programs will be quantified and credited towards the SIP.

Area/Non-road Sources

The commission staff sorted the VOC area source emissions in HGA by source category. Analysis of this data revealed that the primary VOC area/non-road source emission categories in HGA are consumer and commercial products (24.1 tpd), architectural coatings (21.4 tpd), vehicle refueling (14.2 tpd), graphic arts (12.6 tpd), oil and gas (10.7 tpd), and vehicle refinishing (10 tpd). The remaining source categories have VOC emissions of less than 2 tpd and were not analyzed further because each category represents far less than 1 tpd of NO_x equivalent reductions.

Consumer and commercial products are subject to a national rule which had a final compliance date of December 10, 1998 for most products and December 10, 1999 for FIFRA products. Similarly, architectural coatings are subject to a national rule which had a final compliance date of September 11, 1999. Vehicle refueling is subject to the Chapter 115 Stage II vapor recovery rules (§§115.240-115.249). Graphic arts sources are subject to the Chapter 115 flexographic and rotogravure printing rules (§§115.432-115.439) as well as the offset printing rules (§§115.440-115.449) which were implemented as part of the HGA Attainment Demonstration SIP in December 2000. The oil and gas category is already subject to the Chapter 115 storage tank rules (§§115.112-115.119), the general vent gas rules (§§115.120-115.129), the industrial wastewater rules (§§115.140-115.149), the VOC transfer rules (§§115.211-115.219), and the fugitive emissions monitoring rules (§§115.352-115.359). The vehicle refinishing category is subject to the Chapter 115 vehicle refinishing rules (§§115.421-115.429).

In summary, the vast majority of HGA area source VOC emissions are already subject to Chapter 115 rules and/or federal rules. While additional emission reductions could be achieved in the various

categories, these would not be significant VOC reductions and therefore not cost-effective based on existing technology, and when converted to the equivalent NO_x reductions. Additionally, while some measures are effective in controlling VOCs, they are not as proportionally effective in controlling ozone as compared to NO_x controls. Therefore, the commission does not believe it is appropriate to pursue these reductions at this time. However, in the future the commission may pursue additional emission reductions of certain highly reactive VOCs from HGA area sources if those reductions are determined to be necessary to reach attainment with the ozone NAAQS. Also, any VOC reductions that occur as a result of implementing new NO_x technologies or programs will be quantified and credited towards the SIP.

7.3.2 NO_x Point Source Analysis

EPA provided the commission with a copy of approved NO_x reasonably available control measures for evaluation and requested that the commission analyze the list to determine that there are no additional NO_x controls that the commission had not already considered. Table 7.1-5 contains the NO_x strategies that were contained in EPA's list. The commission reviewed the list and determined that one of the following scenarios applies to all but one of the sources on the list:

- 1) adopted state rule, permit, or federal measure achieves the level of control achieved by the technologies listed in EPA's *Serious and Severe Ozone Nonattainment Areas: Information on Emissions, Control Measures Adopted or Planned, and Other Available Control Measures*;
- 2) the source is not found in the area, mobile, or point source inventory for the 8-county area;
- 3) the source is contributing an amount of NO_x emissions which is so small that additional regulations would be essentially of no benefit to the attainment demonstration based on either: the cost effectiveness of implementing controls; lack of existing technology; the fact that additional controls would not accelerate attainment; and/or it would require the regulation of numerous small sources that would be impractical to enforce; or
- 4) the source is a candidate for a short term measure.

The numerical notation in the last column of the table indicates which of these scenarios applies to each source. Footnotes have been added to a few categories to provide additional information about why additional regulations would be unnecessary at this time.

Based upon this review the commission determined that one category of sources warranted additional control to meet the Reasonable Available Control Measure threshold. The category, identified as 409 & 410 on the following table, is the Internal Combustion Engine - Oil category. The commission developed a rule to address this category as part of this SIP revision. See Chapter 6, Section 6.2.20 for a description of the rule. The estimated reduction is about 1 tpd.

As described both in Chapters 6 and 7 of this SIP, the reductions required from electric utilities has been revised from 93.5% to 90%. However, the commission has done a preliminary analysis and determined that this is still a RACM level of controls. Additionally, the commission was presented with a sound argument from industry that the 93.5% reductions that were originally required far exceed what is reasonably achievable.

Table 7.3-4 EPA's List of NO_x Reasonably Available Control Measures - Area/Point Sources

	SOURCE CATEGORY	CONTROL TECHNOLOGY	
282	Boilers and Process Heaters in Petroleum Refineries	NO_x emission limit + Approved Alternative Emission Control Plan + Continuous NO_x stack monitoring	1
283	Cement Kilns	Continuous monitoring and recording of NO_x emissions + NO_x emission limit	2
284	Electric Power Generating Systems	Selective Catalytic Reduction	1
285	Glass Melting Furnaces [5]	NO_x emission limit + Continuous NO_x monitoring from unit + Alternative Emission Control Plan	1
286	Industrial, Institutional and Commercial Boilers, Steam Generators, and Process Heaters	NO_x emission limit, methods to meet the limit is not specified	1
287	Large Water Heaters and Small Boilers	NO_x emission limit + Compliance Certification Program for equipment manufacturers + Retrofit Compliance Certification Program	1
288	Natural-Gas-Fired, Fan-Type Central Furnaces[1]	NO_x emission limit	3
289	Nitric Acid Units	NO_x emission limit	1
290	Refinery Flares[2]	Adoption of a Flare Monitoring and Recording Plan	3
291	Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters	NO_x emission limit, methods to meet the limit is not specified	1
292	Stationary Gas Turbines	Continuous in-stack NO_x and oxygen monitoring system + Selective Catalytic Reduction	1
293	Stationary Internal Combustion Engines	NO_x emission limit	1
294	Adipic Acid Manufacturing	Thermal Reduction	2
295	Adipic Acid Manufacturing	Extended Absorption	2
296	Agricultural Burning[3]	Seasonal Ban (Ozone Season)	3
297	Ammonia - Natural Gas-Fired Reformers	Low NO_x Burners + Flue Gas Recirculation	2
298	Ammonia - Natural Gas-Fired Reformers	Oxygen Trim + Water Injection	2
299	Ammonia - Natural Gas-Fired Reformers	Low NO_x Burners	2
300	Ammonia - Natural Gas-Fired Reformers	Selective Catalytic Reduction	2
301	Ammonia - Natural Gas-Fired Reformers	Selective Non-Catalytic Reduction	2
302	Ammonia Production; Feedstock Desulfurization	Low NO_x Burners + Flue Gas Recirculation	2
303	Asphaltic Concrete; Rotary Dryer; Conversion Plant	Low NO_x Burners	3

304	By-Product Coke Manufacturing; Oven Underfiring	Selective Non-Catalytic Reduction	3
305	Cement Manufacturing - Dry	Selective Non-Catalytic Reduction - NH3 Based	2
306	Cement Manufacturing - Dry	Mid-Kiln Firing	2
307	Cement Manufacturing - Dry	Low NO_x Burners	2
308	Cement Manufacturing - Dry	Selective Non-Catalytic Reduction - Urea Based	2
309	Cement Manufacturing - Dry	Selective Catalytic Reduction	2
310	Cement Manufacturing - Wet	Selective Catalytic Reduction	2
311	Cement Manufacturing - Wet	Low NO_x Burners	2
312	Cement Manufacturing - Wet	Mid-Kiln Firing	2
313	Ceramic Clay Manufacturing; Drying	Low NO_x Burners	2
314	Coal Cleaning-Thermal Dryer; Fluidized Bed	Low NO_x Burners	2
315	Commercial, lnstitutional Incinerators	Selective Non-Catalytic Reduction	1
316	Conv. Coating of Product; Acid Cleaning Bath	Low NO_x Burners	3
317	Fiberglass Manufacturing; Textile-Type Fiber; Recup Furnaces	Low NO_x Burners	2
318	Fluid Catalytic Cracking Units; Cracking Unit	Low NO_x Burners + Flue Gas Recirculation	1
319	Fuel Fired Equipment; Furnaces; Natural Gas	Low NO_x Burners	1
320	Fuel Fired Equipment; Process Heaters, Propane Gas	Low NO_x Burners + Flue Gas Recirculation	1
321	Gas Turbines - Jet Fuel	Selective Catalytic Reduction + Water Injection	2
322	Gas Turbines - Jet Fuel	Water Injection	2
323	Gas Turbines - Natural Gas	Steam Injection	1
324	Gas Turbines - Natural Gas	Selective Catalytic Reduction + Low NO_x Burners	1
325	Gas Turbines - Natural Gas	Selective Catalytic Reduction + Steam Injection	1
326	Gas Turbines - Natural Gas	Selective Catalytic Reduction + Water Injection	1
327	Gas Turbines - Natural Gas	Low NO_x Burners	1
328	Gas Turbines - Natural Gas	Water Injection	1
329	Gas Turbines - Oil	Selective Catalytic Reduction + Water Injection	2
330	Gas Turbines - Oil	Water Injection	2
331	Glass Manufacturing - Container[5]	Cullet Preheat	1
332	Glass Manufacturing - Container[5]	Low NO_x Burners	1

333	Glass Manufacturing - Container[5]	Selective Catalytic Reduction	1
334	Glass Manufacturing - Container[5]	Oxygen-Firing	1
335	Glass Manufacturing - Container[5]	Electric Boost	1
336	Glass Manufacturing - Container[5]	Selective Non-Catalytic Reduction	1
337	Glass Manufacturing - Fiat	Low NO_x Burners	2
338	Glass Manufacturing - Fiat	Oxygen-Firing	2
339	Glass Manufacturing - Fiat	Selective Non-Catalytic Reduction	2
340	Glass Manufacturing - Fiat	Electric Boost	2
341	Glass Manufacturing - Fiat	Selective Catalytic Reduction	2
342	Glass Manufacturing - Pressed	Oxygen-Firing	2
343	Glass Manufacturing - Pressed	Selective Catalytic Reduction	2
344	Glass Manufacturing - Pressed	Cullet Preheat	2
345	Glass Manufacturing - Pressed	Electric Boost	2
346	Glass Manufacturing - Pressed	Selective Non-Catalytic Reduction	2
347	Glass Manufacturing - Pressed	Low NO_x Burners	2
348	IC Engines - Gas, Diesel, LPG	Selective Catalytic Reduction	1
349	IC Engines - Gas, Diesel, LPG	Ignition Retard	1
350	ICI Boilers - Coal/Cyclone	Selective Catalytic Reduction	2
351	ICI Boilers - Coal/Cyclone	Natural Gas Reburn	2
352	ICI Boilers - Coal/Cyclone	Coal Reburn	2
353	ICI Boilers - Coal/Cyclone	Selective Non-Catalytic Reduction	2
354	ICI Boilers - Coal/FBC	Selective Non-Catalytic Reduction - Urea	2
355	ICI Boilers - Coal/Stoker	Selective Non-Catalytic Reduction	2
356	ICI Boilers - Coal/Wall	Selective Non-Catalytic Reduction	1
357	ICI Boilers - Coal/Wall	Selective Catalytic Reduction	1
358	ICI Boilers - Coal/Wall	Low NO_x Burners	1
359	ICI Boilers - Coke	Selective Catalytic Reduction	1
360	ICI Boilers - Coke	Low NO_x Burners	1
361	ICI Boilers - Coke	Selective Non-Catalytic Reduction	1
362	ICI Boilers - Distillate Oil	Low NO_x Burners + Flue Gas Recirculation	1
363	ICI Boilers - Distillate Oil	Low NO_x Burners	1
364	ICI Boilers - Distillate Oil	Selective Catalytic Reduction	1

365	ICI Boilers - Distillate Oil	Selective Non-Catalytic Reduction	1
366	ICI Boilers - Liquid Waste	Low NO_x Burners	1
367	ICI Boilers - Liquid Waste	Selective Catalytic Reduction	1
368	ICI Boilers - Liquid Waste	Selective Non-Catalytic Reduction	1
369	ICI Boilers - Liquid Waste	Low NO_x Burners + Flue Gas Recirculation	1
370	ICI Boilers - LPG	Low NO_x Burners + Flue Gas Recirculation	2
371	ICI Boilers - LPG	Low NO_x Burners	2
372	ICI Boilers - LPG	Selective Non-Catalytic Reduction	2
373	ICI Boilers - LPG	Selective Catalytic Reduction	2
374	ICI Boilers - MSW/Stoker	Selective Non-Catalytic Reduction - Urea	2
375	ICI Boilers - Natural Gas	Selective Catalytic Reduction	1
376	ICI Boilers - Natural Gas	Oxygen Trim + Water Injection	1
377	ICI Boilers - Natural Gas	Low NO_x Burners + Flue Gas Recirculation	1
378	ICI Boilers - Natural Gas	Selective Non-Catalytic Reduction	1
379	ICI Boilers - Natural Gas	Low NO_x Burners	1
380	ICI Boilers - Process Gas	Oxygen Trim + Water Injection	1
381	ICI Boilers - Process Gas	Selective Catalytic Reduction	1
382	ICI Boilers - Process Gas	Low NO_x Burners + Flue Gas Recirculation	1
383	ICI Boilers - Process Gas	Low NO_x Burners	1
384	ICI Boilers - Residual Oil	Low NO_x Burners + Flue Gas Recirculation	1
385	ICI Boilers - Residual Oil	Selective Non-Catalytic Reduction	1
386	ICI Boilers - Residual Oil	Low NO_x Burners	1
387	ICI Boilers - Residual Oil	Selective Catalytic Reduction	1
388	ICI Boilers- Wood/Bark/Stoker	Selective Non-Catalytic Reduction - Urea	1
389	Industrial Coal Combustion	RACT to 50 tpy (Low NO_x Burners)	2
390	Industrial Coal Combustion	RACT to 25 tidy (Low NO_x Burners)	2
391	Industrial Incinerators	Selective Non-Catalytic Reduction	1
392	Industrial Natural Gas Combustion	RACT to 25 tpy (Low NO_x Burners)	1
393	Industrial Natural Gas Combustion	RACT to 50 tpy (Low NO_x Burners)	1
394	Industrial Oil Combustion	RACT to 25 tpy (Low NO_x Burners)	1
395	Industrial Oil Combustion	RACT to 50 tpy (Low NO_x Burners)	1
396	In-Process Fuel Use; Bituminous Coal; General	Selective Non-Catalytic Reduction	2

397	In-Process Fuel Use; Natural Gas; General[4]	Low NO_x Burners	3
398	In-Process Fuel Use; Residual Oil; General[4]	Low NO_x Burners	3
399	In-Process; Bituminous Coal; Cement Kiln	Selective Non-Catalytic Reduction - Urea	2
400	In-Process; Bituminous Coal; Lime Kiln	Selective Non-Catalytic Reduction - Urea	1
401	In-Process; Process Gas; Coke Oven Gas	Low NO_x Burners	1
402	In-Process; Process Gas; Coke Oven/Blast Furnaces	Low NO_x Burners + Flue Gas Recirculation	2
403	Internal Combustion Engines - Gas	Ignition Retard	1
404	Internal Combustion Engines - Gas	Air-to-Fuel Ratio	1
405	Internal Combustion Engines - Gas	Air-to-Fuel Ratio + Ignition Retard	1
406	Internal Combustion Engines - Gas	L-E (Medium Speed)	1
407	Internal Combustion Engines - Gas	L-E (Low Speed)	1
408	Internal Combustion Engines - Gas	Selective Catalytic Reduction	1
409	Internal Combustion Engines - Oil	Selective Catalytic Reduction	4
410	Internal Combustion Engines - Oil	Ignition Retard	4
411	Iron & Steel Mills - Annealing	Low NO_x Burners + Selective Catalytic Reduction	1
412	Iron & Steel Mills - Annealing	Selective Catalytic Reduction	1
413	Iron & Steel Mills - Annealing	Low NO_x Burners	1
414	Iron & Steel Mills - Annealing	Low NO_x Burners + Selective Non-Catalytic Reduction	1
415	Iron & Steel Mills - Annealing	Selective Non-Catalytic Reduction	1
416	Iron & Steel Mills - Annealing	Low NO_x Burners + Flue Gas Recirculation	1
417	Iron & Steel Mills - Galvanizing	Low NO_x Burners + Flue Gas Recirculation	2
418	Iron & Steel Mills - Galvanizing	Low NO_x Burners	2
419	Iron & Steel Mills - Reheating	Low NO_x Burners + Flue Gas Recirculation	1
420	Iron & Steel Mills - Reheating	Low NO_x Burners	1
421	Iron & Steel Mills - Reheating	LEA	1
422	Iron Production; Blast Furnace; Blast Heating Stoves	Low NO_x Burners + Flue Gas Recirculation	2
423	Lime Kilns	Selective Catalytic Reduction	1
424	Lime Kilns	Low NO_x Burners	1
425	Lime Kilns	Selective Non-Catalytic Reduction - Urea Based	1
426	Lime Kilns	Selective Non-Catalytic Reduction - NH 3 Based	1

427	Lime Kilns	Mid-Kiln Firing	1
428	Medical Waste Incinerators	Selective Non-Catalytic Reduction	1
429	Municipal Waste Combustors	Selective Non-Catalytic Reduction	2
430	Natural Gas Production; Compressors	Selective Catalytic Reduction	1
431	Nitric Acid Manufacturing	Selective Catalytic Reduction	1
432	Nitric Acid Manufacturing	Extended Absorption	1
433	Nitric Acid Manufacturing	Selective Non-Catalytic Reduction	1
434	Open Burning[3]	Episodic Ban (Daily Only)	3
435	Plastics Products; Specific; (ABS) Resin	Low NO_x Burners + Flue Gas Recirculation	1
436	Primary Copper Smelters; Reverb Smelting Furnace	Low NO_x Burners + Flue Gas Recirculation	2
437	Process Heaters - Distillate Oil	Low NO_x Burners + Selective Catalytic Reduction	1
438	Process Heaters - Distillate Oil	Low NO_x Burners + Selective Non-Catalytic Reduction	1
439	Process Heaters - Distillate Oil	Low NO_x Burners	1
440	Process Heaters - Distillate Oil	Ultra Low NO_x Burners	1
441	Process Heaters - Distillate Oil	Selective Catalytic Reduction	1
442	Process Heaters - Distillate Oil	Selective Non-Catalytic Reduction	1
443	Process Heaters - Distillate Oil	Low NO_x Burners + Flue Gas Recirculation	1
444	Process Heaters - LPG	Low NO_x Burners	1
445	Process Heaters - LPG	Ultra Low NO_x Burners	1
446	Process Heaters - LPG	Selective Catalytic Reduction	1
447	Process Heaters - LPG	Low NO_x Burners + Selective Catalytic Reduction	1
448	Process Heaters - LPG	Selective Non-Catalytic Reduction	1
449	Process Heaters - LPG	Low NO_x Burners + Flue Gas Recirculation	1
450	Process Heaters - LPG	Low NO_x Burners + Selective Non-Catalytic Reduction	1
451	Process Heaters - Natural Gas	Selective Non-Catalytic Reduction	1
452	Process Heaters - Natural Gas	Ultra Low NO_x Burners	1
453	Process Heaters - Natural Gas	Selective Catalytic Reduction	1
454	Process Heaters - Natural Gas	Low NO_x Burners + Selective Non-Catalytic Reduction	1
455	Process Heaters - Natural Gas	Low NO_x Burners	1
456	Process Heaters - Natural Gas	Low NO_x Burners + Flue Gas Recirculation	1
457	Process Heaters - Natural Gas	Low NO_x Burners + Selective Catalytic Reduction	1

458	Process Heaters - Other Fuel	Low NO_x Burners + Flue Gas Recirculation	1
459	Process Heaters - Other Fuel	Low NO_x Burners	1
460	Process Heaters - Other Fuel	Selective Non-Catalytic Reduction	1
461	Process Heaters - Other Fuel	Ultra Low NO_x Burners	1
462	Process Heaters - Other Fuel	Low NO_x Burners + Selective Non-Catalytic Reduction	1
463	Process Heaters - Other Fuel	Selective Catalytic Reduction	1
464	Process Heaters - Other Fuel	Low NO_x Burners + Selective Catalytic Reduction	1
465	Process Heaters - Process Gas	Low NO_x Burners + Selective Catalytic Reduction	1
466	Process Heaters - Process Gas	Low NO_x Burners + Selective Non-Catalytic Reduction	1
467	Process Heaters - Process Gas	Low NO_x Burners + Flue Gas Recirculation	1
468	Process Heaters - Process Gas	Low NO_x Burners	1
469	Process Heaters - Process Gas	Selective Non-Catalytic Reduction	1
470	Process Heaters - Process Gas	Ultra Low NO_x Burners	1
471	Process Heaters - Process Gas	Selective Catalytic Reduction	1
472	Process Heaters - Residual Oil	Low NO_x Burners + Flue Gas Recirculation	1
473	Process Heaters - Residual Oil	Selective Non-Catalytic Reduction	1
474	Process Heaters - Residual Oil	Low NO_x Burners + Selective Non-Catalytic Reduction	1
475	Process Heaters - Residual Oil	Ultra Low NO_x Burners	1
476	Process Heaters - Residual Oil	Low NO_x Burners + Selective Catalytic Reduction	1
477	Process Heaters - Residual Oil	Low NO_x Burners	1
478	Process Heaters - Residual Oil	Selective Catalytic Reduction	1
479	Sand/Gravel; Dryer	Low NO_x Burners + Flue Gas Recirculation	2
480	Secondary Aluminum Production; Smelting Furnaces/Reverb	Low NO_x Burners	2
481	Solid Waste Disposal; Government; Other Incinerator; Sludge	Selective Non-Catalytic Reduction	1
482	Space Heaters - Distillate Oil[1]	Low NO_x Burners + Flue Gas Recirculation	3
483	Space Heaters - Distillate Oil[1]	Selective Catalytic Reduction	3
484	Space Heaters - Distillate Oil[1]	Selective Non-Catalytic Reduction	3
485	Space Heaters - Distillate Oil[1]	Low NO_x Burners	3
486	Space Heaters - Natural Gas[1]	Low NO_x Burners	3
487	Space Heaters - Natural Gas[1]	Low NO_x Burners + Flue Gas Recirculation	3

488	Space Heaters - Natural Gas[1]	Selective Non-Catalytic Reduction	3
489	Space Heaters - Natural Gas[1]	Selective Catalytic Reduction	3
490	Space Heaters - Natural Gas[1]	Oxygen Trim + Water Injection	3
491	Starch Manufacturing; Combined Operations	Low NO_x Burners + Flue Gas Recirculation	2
492	Steel Foundries; Heat Treating Furnaces	Low NO_x Burners	1
493	Steel Production; Soaking Pits	Low NO_x Burners + Flue Gas Recirculation	2
494	Sulfate Pulping - Recovery Furnaces	Low NO_x Burners + Flue Gas Recirculation	1
495	Sulfate Pulping - Recovery Furnaces	Selective Non-Catalytic Reduction	1
496	Sulfate Pulping - Recovery Furnaces	Selective Catalytic Reduction	1
497	Sulfate Pulping - Recovery Furnaces	Oxygen Trim + Water Injection	1
498	Sulfate Pulping - Recovery Furnaces	Low NO_x Burners	1
499	Surface Coating Operation; Coating Oven Heater;Natural Gas	Low NO_x Burners Measure	2
500	Utility Boilers	Selective Catalytic Reduction	1
501	Ammonia Plants	Controls based on those for process heaters and industrial boilers	2
502	Cement Kilns	Require combustion controls and post-combustion controls (SNCR) to achieve reductions of up to 70 percent on certain processes	2
503	Gas Turbines	Limits for turbines burning natural gas at 25-42 ppm and as low as 9-15 ppm.+ limits for turbines burning distillate oil at 65 ppm or below, and as low as 25-42 ppm..	1
504	Glass Furnaces[5]	Combustion modifications, process changes and post-combustion controls (SNCR) + RACT limits of 5.3-5.5 lbs NO_x/ton of glass removed with limits as low as 4.0 lb NO_x/ton of glass removed + coordinate installation of controls with routine furnace rebuilds	1
505	Industrial and Commercial Boilers	Limits for boilers larger than 100 mmBtu/hr at levels of 0.t 5 lb/mmBtu or below for coal and 0.05 lb/mmBtu for oil and gas + limits for mid-size boilers between 50-100 mmBtu/hr at 0.10 lb/mmBtu for gas, 0.12 lb/mmBtu for distillate oil and 0.30 lb/mmBtu for residual oil, 0.38 lb/mmBtu for coal + boilers smaller than 50 mmBtu/hr make annual "tune-ups" to minimize excess air	1
506	Iron and Steel Mills	Low NO_x burners and FGR for reheat furnaces + SCR and low NO_x burners for annealing furnaces + low NO_x burners and FGR for galvanizing furnaces	1

507	Kraft Pulp Mills	Industrial boilers regulated same as Industrial and Commercial Boilers + SNCR for recovery boilers + lime kilns regulated same as Cement Kilns	1
508	Medical Waste Incinerators	Controls similar to those for municipal waste combustors	1
509	Municipal Waste Combustors	EPA's regulation for large, existing MWCs emitting more than 250 tons/day + more stringent limits (e.g., 30-50 ppmv) or shorter averaging periods (e.g., 8-hr average).	2
510	Nitric and Adipic Acid Plants	Consider a standard of 2.0 lbs NO_x/ton of nitric acid produced, representing approximately 95% control. Even lower standards are achievable using SCR. The nation's four adipic acid plants are already regulated at over 80% efficiency.	1
511	Open Burning[3]	Restrict open burning on days when ozone exceedances are expected + reduce the amount of refuse burned by recycling municipal waste or mulching agricultural and landscaping waste	3
512	Organic Chemical Plants	Controls on industrial boilers and process heaters for these sources	1
513	Petroleum Refineries	Regulate refinery boilers and process heaters like other industries + regulate fluid catalytic cracking units by controlling CO boilers + SNCR or low NO_x burners on tail gas incinerators	1
514	Process Heaters	Limits of 0.036 lb/mmBtu for gas and 0.05 lb/mmBtu for other liquid fuels+ limits same as mid-sized industrial boilers for gas, distillate oil and residual oil-fired units 515 Reciprocating Internal Combustion Engines Limits for rich-burn gas-fired engines between 0.4-0.8 g/bhp-hr, for lean-burn engines as low as 0.5-0.6 g/bhp-hr and for diesel engines at 0.5-1.1 g/bhp-hr.	1
515	Reciprocating Internal Combustion Engines	Limits for rich-burn gas-fired engines between 0.4-0.8 g/bhp-hr, for lean-burn engines as low as 0.5-0.6 g/bhp-hr and for diesel engines at 0.5-1.1 g/bhp-hr.	1
516	Residential Space and Water Heaters	Set limit on new sources of 0.09 lbs//mmBtu of heat output + incentives to replace older space and water heaters	1, 3
517	Utility Boilers	T-fired and wall-fired coal units emissions of 0.15 lb/mmBtu or below + oil and gas units emissions of 0.05 lb/mmBtu + emission rates based on energy output	1
518	NO_x RACT Rules	States' NO_x RACT rules	1
519	Nitric/adipic acids	Nitric acid - 2.3 lb/ton extended adsorption; Adipic acid - 7.4 lb/ton extended adsorption	1
520	Availability/Extent of NO_x Controls		1

521	IC Engines	Lean burn - LEC 2 gm/bhp-hr & Rich Burn - SNCR 2 gm/bhp-hr & Diesel - SCR 2 gm/bhp-hr	1
522	NESCAUM Utility Report		1
523	Gas Turbines	Turbines >25 MW: Wet injection + SCR - 9 ppm (0.04 lb/mm Btu & 8-25 MW: Low NO_x combustion - 42 ppm	1
524	Process heaters (revised)	NG - ULNB 0.05 lb/mm Btu / Oil - ULNB 0.14 lb/mm Btu	1
525	Cement	Production procedures + SCR	2
526	Non-utility boilers	Natural gas - LNB + FGR 0.10 lb/mmBtu & Residual oil - LNB + FGR 0.15 lb/mmBtu & Stoker coal - SNCR 0.22 lb/mmBtu	1
527	Utility boilers	Gas / oil - SCR 0.08 lb/mmBtu	1
528	Glass[5]	Pressed / blown - LNB 13 lb/ton & Container - LNB 6 lb/ton & Flat - SNCR 9.5 lb.ton	1
529	Iron and Steel	Reheat furnace - LNB + FGR 0.2 lb/mmBtu & Annealing furnace - LNB 0.5 lb/mmBtu & Galvanizing furnace - LNB + FGR 0.5 lb/mmBtu	1
530	Phase II MARAMA/NESCAUM Utility Boiler		1
531	Utility Boilers	Natural Gas - 0.2lb/mmBtu; Liquid Fossil Fuel - 0.3 lb/mmBtu; Subituminous Coal - 0.5 lb/mmBtu; Lignite - 0.8 lb/mmBtu; Bituminous Coal - 0.6 lb/mmBtu	1
532	Nonutility Boilers	Natural Gas and Distillate Oil - Low heat release rate - 0.10 lb/mmBtu; High heat -0.20 lb/mmBtu Residual Oil - Low heat release rate - 0.3 lb/mmBtu; High heat release rate - 0.4 lb/mmBtu Coal - Mass Feed Stoker - 0.5 lb/mmBtu; Spreader Stoker and FBC - 0.6 lb/mmBtu; Pulverized Coal - 0.7 lb/mmBtu; Lignite - 0.6 lb/mmBtu	1
533	Municipal Waste Combustors (Began operation between 12/20/89 and 9/20/94)	180 ppm at 7% oxygen	2
534	Municipal Waste Combustors (After 9/20/94)	180 ppm at 7% oxygen; after first year of operation - 150 ppm at 7% oxygen	2
535	Medical Waste Incinerators	250 ppmv	1
536	Nitric Acid Plants	3.0 lb/ton of acid produced	1
537	Gas Turbines	Detailed equations 40 CFR 60.332	1

[1]These sources are not in high use on days conducive to ozone formation

[2] There is no additional technology available at this time to allow for additional controls

[3] The commission has already established reasonable controls on burning through its Chapter 111 rules

[4] Theses sources are contributing an amount of NO_x emissions which is so small that additional regulations would be essentially of no benefit in helping to accelerate attainment

[5] A RACM level of control is being instituted for glass plants since one significant source in the inventory has been issued a permit requiring oxygen firing

7.3.3 VOC and NO_x Mobile Source Analysis

EPA provided the commission with a copy of approved VOC and NO_x reasonably available mobile source control measures for evaluation. The commission reviewed this list to determine whether there were additional mobile source controls that the commission had not already considered. Table 7.3-5 contains the mobile source strategies that were contained in EPA's list. The commission reviewed the list and determined that all strategies on the list are either 1) already in place or will be in place as a result of the December 2000 SIP revision, or 2) not being considered because the amount of associated emissions is so small based upon existing technology that additional regulations would be infeasible or would not advance attainment for the area. Staff has added a numerical notation in the last column of the table to indicate which of these scenarios applies to each strategy.

Table 7.3-5 EPA's List of VOC & NO_x Reasonably Available Control Measures - Mobile Sources

565	Highway Vehicles - Gasoline	Transportation Control Package	1
566	Highway Vehicles - Gasoline	Federal Reformulated Gasoline	1
567	Highway Vehicles - LD Gas Trucks	Tier 2 Standards	1
568	Highway Vehicles - LD Gasoline	High Enhanced I/M	1
569	Highway Vehicles - LD Gasoline	Fleet ILEV	2
570	Non-road Gasoline Engines	Federal Reformulated Gasoline	1
571	Accelerated Vehicle Retirement	Implement an accelerated vehicle retirement, or "scrappage" program in conjunction with an I/M program	1
572	California Low-Emission Vehicles	Adopt the California LEV program	2
573	Clean-Fuel Fleets	Adopt a CFFV program, if one is not already required. Where a CFFV program is required, increase its reduction potential by purchasing more CFFVs than called for in any year, purchasing vehicles that meet stricter emission standards than those required, or purchasing vehicles in advance, before requirements take effect. Areas encourage non-covered fleets to participate and/or require the purchase of ILEVs where fleet requirements from the Energy Policy Act are applicable.	1
574	Employee Commute Options	In areas not already required to implement an ECO program, evaluate the potential emission reductions to be achieved by implementing such a program and consider its implementation to achieve additional reductions and stabilize mobile source emissions.	1
575	Motor Vehicle Inspection and Maintenance	Implementation of IM240 in areas not required to adopt such a program, in that IM240 tests for NO_x and inspection and requires repairs accordingly. Augmenting the program by expanding geographic coverage, increasing maintenance of model year and vehicle class coverage and pre-1981 stringency rate, conducting inspections annually and/or setting tighter cutpoints.	1

576	Non-road Vehicles and Engines	In addition to EPA's regulations on 50-hp and above non-road diesel engines, explore scrappage programs. among others, for near-term reductions and to increase turnover of these sources, particularly for construction equipment.	1
577	Reformulated Gasoline and Diesel Fuel	Opt into the federal program or utilize Section 211 (c)(4) authority to adopt a state program, including the California RFG program or one focused on fuel properties (e.g., reducing sulfur content of fuel). Adopt reformulated diesel fuel requirements, including the California reformulated diesel program, to achieve additional reductions from diesel engines.	1
578	Transportation Control Measures[1]	Evaluate the potential effectiveness of TCMs based upon the particular needs and circumstances of a given area, emphasizing pricing strategies, such as parking management, traffic flow improvements and road pricing.	1
601	Accelerated Vehicle Retirement	Accelerated vehicle retirement, or "scrappage," program in conjunction with an I/M program.	1
602	Accelerated Vehicle Retirement	Consider implementing an accelerated vehicle retirement, or "scrappage" program in conjunction with an I/M program.	1
603	California Low-Emission Vehicles	Adopt the California low-emission vehicle program	2
604	Clean-Fuel Fleets	Adopt a clean-fuel fleet vehicle (CFFV) program and increase its reduction potential by expanding the use and performance of CFFVs	1
605	Motor Vehicle Inspection and Maintenance	Augment basic or enhanced Inspection and Maintenance (I/M) programs by expanding vehicle coverage	1
606	Non-road Vehicles and Engines	In addition to EPA's regulations on 50-hp and above non-road diesel engines, explore scrappage programs. among others, for near-term reductions and to increase turnover of these sources, particularly for construction equipment.	1
607	Non-Road Vehicles and Engines	Achieve reductions from lawn and garden equipment and recreational vessels	1
608	Reformulated Gasoline	Opt into the federal reformulated gasoline program	1

609	Transportation Control Measures Employee Commute Options[1]	Employee Commute Options program	1
611	Conversion to Alternative Fueled Vehicles Program	Tax credits or deductions to for conversion to or purchase of alternative fueled vehicles and alternative fuel stations Arizona DEQ	1

[1]The Houston area has initiated a broad range of TCMs, including the following: computerized traffic management, arterial traffic management, bicycle/pedestrian projects, intersection improvements, high capacity transit way project, park and ride lots, port projects, and downtown to dome light rail project. These measures achieve a 1.1 tpd NO_x reduction.

HGAC has also sponsored a commute solutions program which is listed in the VMEP portion of the SIP. They have committed to achieve a reduction in VMT through expansion of the following programs: regional mass transit, carpooling, van pooling, mass transit with commuter service (includes park and ride lots and fixed route circulators that connect with existing Metro services and shuttles), guaranteed ride home, teleworking, parking management, biking and walking to work, flex time, and compressed work weeks.

HGAC will also explore the following measures to achieve projected reductions in VMT: ride share, expanded carpools, new/expanded park and ride, station cars, parking cash-out, unbundling of SOV park , and private transit services.

Taken together HGAC has committed to achieve 1.8 tpd reduction in NO_x and 1.2 tpd reduction in VOC through the commute solutions program. They have also included 0.3 tpd emission reduction in NO_x due to smart growth initiatives and 0.5 tpd for signal light timing, for a total of 3.8 tpd. Given the wide range of strategies that are already included in the SIP, the commission feels that reasonably available TCMs are being implemented and further TCMs are either economically infeasible or do not advance the attainment date.

7.3.4 Short Term Commitments (12/00 – 10/01)

Short term measures consist of ideas which surfaced as a part of the analysis of all of the comments and which staff identified during the review of all reasonably available control measures. These include ideas that other states, including California, are pursuing. They are considered short term because they are strategies that the commission had anticipated could be adopted by the late summer 2001 timeframe and submitted to EPA prior to its scheduled proposed approval of the SIP in October 2001. This timeframe also allowed the commission to respond to any legislative action. The commission has analyzed several ideas , which are grouped in the categories noted below.

1) California Not to Exceed Standards

The California Air Resources Board has adopted supplemental emissions certification tests for heavy-duty diesel engines during model years 2005 and 2006. These test requirements are designed to fill a gap in the federal certification requirements, between 2004, when the current heavy-duty engine manufacturer Consent Decree expires, and 2007, when the next round of national HDD standards go into effect.

The commission submitted a letter of support to California and, as allowed under FCAA Section 177, plans to adopt the same requirements for the HGA area in order to help encourage engine manufacturers to adopt a single engine design for the entire country. This measure was not included in this revision due to administrative delays with the California program. However, the commission is scheduled to take action on the proposal to adopt California's rule by reference in October 2001. If and when any final action is taken by the commission on this rule, it will be submitted to EPA.

2) *NO_x controls*

During the review of EPA's reasonably available control measures the commission determined that one source category warranted additional controls to meet the Reasonable Available Control Measure threshold. The category is the Internal Combustion Engine - Oil category. See Chapter 6, Section 6.2.20 for a description of the rule. The estimated reduction is about 1 tpd.

3) *Legislative Direction*

As anticipated,the Texas Legislature took an active role in providing additional tools that were not previously available for the state to use in achieving the goal of clean air. The actions included the development of the TERP program, and the requirement that industrial sources which were previously grandfathered from permitting requirements now must obtain significant NOx emission reductions. More information on both of these actions is included in Chapter 6 of this revision.

7.4 BUILDING THE SCIENCE (12/00 - 5/04)

The combination of unique meteorological conditions and the large industrial complex along the upper Texas Gulf coast has presented challenges in modeling ozone episodes in the area. The rapid formation of ozone at a limited number of monitors has been particularly difficult to duplicate in the existing photochemical models. This phenomenon was observed several times during the Texas 2000 Air Quality Study (TexAQS). It is anticipated that TexAQS, the most comprehensive and successful air quality study conducted to date in the U.S., with over 40 research organizations and over 250 scientists, will provide a large part of the scientific basis for reassessing the ozone problem in the HGA ozone nonattainment area. The commission has a long history of supporting enhancements to the models and associated tools and input data, and has made improving the science and tools supporting SIP development for Texas areas a top priority in the coming years. The commission is committed to working in cooperation with affected

parties to ensure the modeling used to develop effective control strategies for the area will use the most current scientific information to replicate high ozone episodes in the area. Table 7.4-1 provides a description of specific tasks from TexAQS that the commission plans to incorporate into the photochemical model for Texas.

Subsequent subsections describe the building of the science for the two planned phases of the mid-course review. The first phase involves the modeling of an episode occurring during the Texas 2000 Air Quality Study. The second phase involves the modeling of two additional new episodes, updated modeling of the 2000 episode, and updated modeling of the September 1993 episode. Schedules for the technical work involved in the two phases are included. The schedules outlined in Sections 7.5 and 7.6 specify dates by which the commission believes sufficient new information will be available to conduct a reassessment. However, the work evaluating all the pieces is a continual process. To the extent that a new piece of information or technology is available sooner than the anticipated schedule, and has a potential to impact the strategy in a significant manner, the commission will make whatever adjustments are necessary.

Table 7.4-1 Potential Contributions from the Texas 2000 Air Quality Study toward Building the Science

Topic	Description	Enhancements Having Potential Benefit for Mid-Course Review
Enhancements to the State-of-the-Science in Photochemical Modeling		
Role of Chlorine in Ozone Formation	Analyses of the reaction products of chlorine and certain hydrocarbons have been carried out by the University of Miami to determine the importance of chlorine in the atmospheric chemistry affecting the site on each day of the study. Preliminary results from in situ smog chamber tests, conducted during the study at the La Porte airport, show the potential effect of chlorine in accelerating ozone formation in the Texas Gulf Coast area.	The University of Miami is conducting additional analyses to calculate the contribution of chlorine to ozone impacting the La Porte airport site. (Available March 2001) The chemical mechanism of the photochemical model being used by the commission is being modified by a commission contractor to account for the role of chlorine emissions in enhancing ozone formation in the coastal area. (Available November 2001)
Aged Air Mass Chemistry	As an air mass ages, reactions that are not accounted for in the current chemical mechanisms may become important. Land/sea breeze regimes, typical of the Texas Gulf Coast area, can bring emissions transported out of the area in the early morning back into the area in the afternoon as aged compounds that mix with fresh emissions. Fixed site measurements at La Porte and the Williams Tower, and from three airborne laboratory aircraft, show evidence of aged air masses in the Houston area.	Chemical analysis and data validation are continuing. An extensive data set will result. NOAA and DOE scientists will evaluate the data to determine whether the products of photochemical reactions are adequately represented in the research grade models they use. Evaluation of the adequacy of current regulatory models to predict and handle aged air mass reactions will need to be arranged (responsibility currently undetermined; available March 2002). Depending on this evaluation, the regulatory photochemical models' chemical mechanisms may then need to be modified to account for the effect of aged air mass components on ozone formation (Responsibility currently undetermined. If task is necessary, available December 2002).

Topic	Description	Enhancements Having Potential Benefit for Mid-Course Review
Rapid Ozone Formation Due to Large Amounts of Reactive Hydrocarbons	The research level sites at the La Porte airport and the Williams Tower, as well as the NOAA, DOE, and TNRCC aircraft measured exceptional rates of ozone formation in the Houston and Gulf Coast area, and indicated the presence of large amounts of emissions of reactive hydrocarbon species from industrial sources.	Research grade chemical reaction mechanisms will be exercised to determine if the measured species account for the rapid formation of ozone. SOS, NOAA, and DOE scientists will run the research-grade models. If the measured species account for the rapid ozone formation, the mechanisms in the regulatory models will be tested to determine if they adequately represent the process (responsibility currently undetermined; available February 2002). If the mechanisms in the regulatory models are not adequate, they will need to be modified or replaced. (Responsibility currently undetermined. If necessary, available December 2002).
Enhancements to the State-of-the-Science in Meteorological Modeling		
MM5	Extensive data from radar profilers, acoustic sounders, weather balloon sites, surface networks, and the NOAA and DOE aircraft are available from the intensive study period for checking the performance of MM5 in generating meteorological fields for photochemical modeling.	Check MM5 performance when it is run in retrospective mode for the entire Texas 2000 Air Quality Study period (available February 2002) (responsibility currently undetermined) As a result of the MM5 testing, enhancements may be made to MM5, the input data to MM5, or both. (Responsibility is currently undetermined; available August 2002).

Topic	Description	Enhancements Having Potential Benefit for Mid-Course Review
Heat Island Effect	During the study, a thermal mapping project of Houston was conducted using specially instrumented NASA aircraft. In addition, NOAA collected ground-based data to "ground truth" the NASA data.	The ground-based data are being analyzed by NOAA. It is not yet determined who will analyze the NASA aircraft data. The data will be compared with the initial results from MM5 for the period of the thermal mapping in order to determine whether the meteorological model produced the correct heat island signature. Work will be performed under the first part of the MM5 item immediately above. (Responsibility is currently undetermined; available February 2002). Results of the heat island task may lead to the need for further enhancements to MM5. (Responsibility is currently undetermined. If necessary, available August 2002).
Emissions Inventory Improvements		
Hourly Point Source Emissions for Selected Episodes	For episodes selected from the period of the Texas 2000 Air Quality Study, the largest emitting sources in portions of the modeling domain will be asked by the commission to supply detailed, speciated hourly emissions inventory data.	The hourly emissions will be compiled by the TNRCC emissions inventory staff. These emissions will be important for the photochemical modeling due to the dependence of ozone formation on the timing of emissions. (Hourly inventory available September 2001)
Unscheduled, Nonuniform, and Unquantified Emissions	VOC data were obtained at the La Porte airport, from the Williams Tower, and from NOAA, DOE, and TNRCC aircraft.	One of the study's tasks will be to investigate the potential extent of unscheduled, nonuniform, and unquantified emissions through a comparison of the surface, tall building, and aircraft data with the hourly point source emissions inventory data described above. NOAA and DOE will carry out analyses to determine whether the measured VOCs in the air are accounted for in the hourly emissions inventory. Results of these analyses may indicate that there are missing sources in the inventory that need to be determined, or sources which need to be better refined chemically, spatially or temporally. (Responsibility is currently undetermined; first results available September 2002)

Topic	Description	Enhancements Having Potential Benefit for Mid-Course Review
Large Amounts of Reactive Hydrocarbons	Measurements obtained by NOAA and DOE show that the Houston and Gulf Coast area are characterized by large amounts of emissions of reactive hydrocarbon species from industrial sources. Data are available from VOC analysis at the La Porte airport, the Williams Tower, and the NOAA, DOE, and TNRCC flying laboratories.	NOAA and DOE will make comparisons of the ambient data with the ozone season emission inventories currently available, as well as the hour-specific inventories that will be available from the study. The results of the comparison will help determine whether the emissions inventory from industrial sources fully account for all the reactive hydrocarbons actually present. If not, substantial additional work may be required to resolve the discrepancies and improve the emissions inventory inputs to the photochemical model (Responsibility is currently undetermined. First results available September 2002).

7.5 PHASE I MODELING : NEW EPISODE (FROM TEXAS 2000 AIR QUALITY STUDY)

The goal of the first phase of the mid-course review is to better understand the two components of the Houston-Galveston nonattainment area's ozone problem. The first component is routine ozone formation such as that seen in other cities. The second component is comprised of features unique to the area, commonly referred to as "spikes". Stakeholders have expressed their belief that the latter phenomenon is caused by episodic releases of highly reactive VOCs. In the first phase of the mid-course review, the commission intends to gain a full enough understanding of these two components to determine if the current level of point source NO_x controls are warranted.

Although there are a number of criteria for ozone episode selection for modeling, there are two important criteria on which the commission has been placing special emphasis. First, a well defined "flow reversal",or land/sea breeze case, should be modeled, as this type of episode is often associated with very high ozone in the Texas Gulf Coast area. An episode also needs to be modeled from a period during which enhanced emissions, air quality, and meteorological data are available, such as the period during the intensive Texas 2000 Air Quality Study. From the period of the study, the commission selected an episode (August 25 through September 1, 2000) that exhibits well defined flow reversal characteristics during a portion of the episode.

The modeling of the 2000 episode will incorporate available enhancements to the state-of-the-science with updated data and assumptions. These enhancements will be discussed in subsequent subsections. Projected tasks and schedules for the modeling of the 2000 episode are summarized in Table 7.5-1.

Table 7.5-1 Schedule for First Phase of the Mid-Course Review Process - Modeling of the August-September 2000 Episode

Task	Start Date	Completion Date
Definition and Application of "Spikes" Events		
Develop definition of "spike" event	May 1, 2001	November 30, 2001
Analyze ambient monitoring data to determine whether the ozone problem can be separated into components, and if so, analyze it in the context of the components.	November 1, 2001	March 1, 2002
Enhancements to photochemical model		
Upgrade to model's chemical mechanism to account for chlorine chemistry (from results of Texas 2000 Air Quality Study)	January 1, 2001	November 30, 2001
Fine Scale Photochemistry	March 1, 2002	March 31, 2002
Enhancements to base case emissions inventory		
Updated non-road mobile source inventory	December 1, 2000	February 28, 2002
Biogenics updates	January 1, 2001	February 28, 2002

Task	Start Date	Completion Date
Updated area source inventory	January 1, 2001	February 28, 2002
Enhancements to future case inventory	January 1, 2001	March 31, 2002
Enhancements to meteorological modeling	January 1, 2001	February 28, 2002
Analysis of the effects of the following factors on "spike" events		
Chlorine	May 2001	June 2003[1]
Upsets	May 2001	June 2003[1]
Routine Non-Uniform Emissions	May 2001	June 2003[1]
Reactivity of Compounds	May 2001	June 2003[1]
Photochemical modeling		
Base case modeling	March 1, 2002	March 31, 2002
Future base case modeling	April 1, 2002	April 30, 2002
Future case modeling of control scenarios	May 1, 2002	May 31, 2002
Assess results of modeling of routine ozone formation in conjunction with level of understanding to date of the causes of "spike" events. If the science supports it, propose appropriate best management practices and an alternative NO_x reduction down to the 80% (535 tpd) level from utility and non-utility sources.	June 1, 2002[2]	November 30, 2002[2]

[1]Activities will be conducted throughout the full continuum of the mid-course review process.
[2]For the rule development task, the start date indicates the approximate date that the rules would be proposed, and the completion date indicates the approximate date that the rules would be adopted.

The following items were originally scheduled to be included in this first phase of the mid-course review process. Due to the shift in focus to spike analyses, these items are being delayed to the second phase of the mid-course review process. To the extent that they can be completed on an earlier schedule they will be re-added to the Phase I list.

- Incorporation of Process Analysis - originally scheduled to be completed by July 31, 2001
- Software revised by TTI (to couple MOBILE6 with travel demand model) - originally scheduled to be completed by November 30, 2001
- Updated mobile source inventory based on MOBILE6 - originally scheduled to be completed by February 28, 2002

A more detailed description of these tasks can be found in Section 7.4.

7.5.1 Definition and Analysis of Spikes

The TNRCC recently began an intensive effort to examine unique air quality aspects of the Houston-Galveston-Brazoria nonattainment area – commonly referred to as ozone "spikes". Many policymakers and stakeholders have expressed concerns regarding the role that ozone "spikes" might play in determining ozone design values and control strategies. This work is anticipated to be done by March, 2002:

- Develop a robust statistical definition of ozone "spikes";
- Evaluate spike events from the 1998-2000 design value period;
- Analyze "spike" events to determine probable source regions and causes.

Application of spike analysis to episode days

Once the commission has a robust definition of spikes the commission will apply that definition to the episode being modeled and validate the modeling with respect to the routine portion of the ozone formed during this time period.

7.5.2 Enhancements to the State-of-the-Science of Photochemical Modeling

One of the major enhancements to the state-of-the-science in photochemical modeling that the commission believes can be made in time for the modeling of the August-September 2000 episode is an upgrade to the photochemical model's chemical mechanism to account for chlorine chemistry. This enhancement will occur largely from results of the Texas 2000 Air Quality Study. The role of chlorine in ozone formation, as well as the upgrade to the model's chemistry, are discussed in more detail in Table 7.5-1.

Another enhancement involves Fine Scale Photochemistry. In currently conducted modeling, it is assumed that emissions and reactions are distributed uniformly within individual grid cells. This works well in most situations, but the situation in eastern Harris County is somewhat unique. In eastern Harris County, VOCs and NO_x are emitted from a variety of industrial sources in close proximity to one another and to several monitoring sites. This may lead to situations where sub grid-scale chemical reactions cause high ozone readings at monitors in the area but which are beyond the resolution of the modeling as currently conducted. To enhance the model's ability to handle episodic releases and generally address this issue, we will investigate the use of very high resolution sub-domains over eastern Harris County, as well as seek other approaches.

7.5.3 Enhanced Base Case Inventory

The base case inventory for the August-September 2000 episode will be based on new or revised emissions models, emissions and activity data for specific sources or types of sources (including for the period of the episode), and other updated information and procedures.

Point Sources

As noted in Table 7.5-1, for the 2000 episode, large emitting point sources in the Houston-Galveston area are being asked by the commission to supply detailed, speciated hourly emissions inventory data. These emissions will be important for the photochemical modeling due to the dependence of ozone formation on the timing of emissions. Other tasks or activities that will be involved in the updating of point source emissions are as follows:

- Update of emission factors:

Emission factors continue to be updated by the EPA. As these factors are updated, the commission requires industry to use the latest factors in updating their emissions inventories. Staff reviews the calculations and ensures the latest and consistent factors are used.

C Point Source Database (PSDB) tasks:
Comparisons will be made between the PSDB and the Toxic Release Inventory to locate under-reporting of hazardous air pollutants and to correct the data. Comparisons will also be made between the PSDB and other databases such as the EPA's acid rain database to detect possible discrepancies. The acid rain database will also provide day-specific emissions.

- Update of Highly Reactive VOC Emissions Inventory

As stated above it is crucial that the industrial point sources supply accurate, detailed, speciated, hourly VOC emissions data.

Area and Mobile Sources

Enhancements expected to be made to the area and mobile source components of the emissions inventory should result in emissions estimates more reflective of local conditions and better spatial allocation of emissions. Enhancements to the emissions will be accomplished with the use of newly released EPA computer models for providing estimates and projections of emissions, more local emissions source activity data developed from Emissions Inventory Improvement Program (EIIP) prescribed survey methods, special studies, and better use of Geographic Information System tools for estimation and allocation of emissions on a location specific basis. The following are several of the planned emissions inventory improvement projects that should benefit the modeling of the August-September 2000 episode.

C Implementation of EPA's new non-road mobile source emissions model, NONROAD:

This model provides an improved technique for analysis of local non-road equipment emissions activity. While the draft version of this model has been initially used in conjunction with the analysis of construction equipment emissions, broader use of the model with other local equipment activity and load factors (based on local survey data) is expected.

C Incorporation of EIIP-recommended survey methods for significant area source categories:

While many of the current area source category emissions are based on EPA's top-down method of allocating national data to States based on surrogates such as employment, the use of EIIP local survey methods can significantly improve emissions data. The commission will be working with expert contractors to identify categories most likely to benefit from local surveys and, based on survey findings, will update emissions data accordingly. If time allows, identification of source categories upon which to focus improvements will also consider information developed from the Texas 2000 Air Quality Study in cases where significant discrepancies are revealed between the existing emissions inventory data and ambient samples taken during the study. The commission expects to conduct surveys for at least two area source categories by the fall of 2001.

C Enhancements to biogenics inventory:

Although considerable enhancements have been made to the Texas biogenics emissions inventory through field and other studies, additional work needs to be conducted to further enhance this inventory. A task which is projected to be completed in time to benefit the modeling of the August-September 2000 episode is the improvement of solar radiation data needed as input to biogenics models.

Offshore Sources

Offshore emissions are created by point and area sources such as shipping, oil and gas operations, recreational boating, and the transfer of liquids from one vessel to another. The commission plans to investigate ways for enhancing the offshore inventory. Available enhancements will be incorporated into the inventory for the modeling of the August-September 2000 episode.

7.5.4 Enhanced Future Case Inventory

An updated future base case inventory for 2007 will be developed for the August-September 2000 episode. The future point source inventory will incorporate the latest available EPA emission factors and Point Source Data Base emissions, coupled with the most current growth assumptions in point sources. Mobile source emissions will be estimated using the available version of the MOBILE model and travel demand modeling results for the future year. Wherever possible, local municipal planning data will be used to estimate the magnitude and spatial extent of future emissions from area and non-road sources. For use with area and non-road source emissions projections, the EPA recently released an updated version of the Emissions Growth Analysis System (EGAS), which incorporates a more recent and robust set of economic forecast data for application to emission source activity data.

7.5.5 Enhancements to the State-of-the-Science in Meteorological Modeling

The commission plans to use the Fifth-Generation National Center for Atmospheric Research/Penn State Mesoscale Model (MM5) to develop meteorological fields for the modeling of the August-September 2000 episode. This meteorological model incorporates state-of-the-science enhancements over previously used meteorological models.

The commission is currently working to evaluate the performance of MM5 in the Texas Gulf Coast area and to make enhancements to MM5. One such enhancement involves "hydrological-meteorological coupling", whereby a hydrological model will be coupled with MM5 to allow the model to simulate the effect rainfall and runoff have on temperature and wind fields.

7.5.6 Rule Development

By June 2002, the commission will assess the results of the modeling conducted, with the enhancements discussed above. In conjunction with this information, the commission will assess its understanding of the causes of “spike” events. As a result of the efforts to define a spike and the connection of the cause and effect of the factors contributing to spike events and to the extent the science supports it, the commission will propose a suite of best management practices for industry to mitigate the unplanned releases of highly reactive VOCs. In addition, the commission will determine if the understanding of the science with regard to these two components is sufficient to support an alternative NO_x reduction level, down to the 80% level (535 tpd) from utility and non-utility sources. The commission, in its discretion, may allocate any additional benefit beyond 80% to other SIP strategies and/or to the point source NO_x control strategy.

Based upon current analysis, this 80% from utility and non-utility sources would result in a total reduction of not less than 535 tpd NO_x emissions from industrial sources in the HGA area.

7.6 PHASE I CONTROL MEASURES - 2002

As stated in Section 7.1, the commission commits to adopt measures necessary to achieve at least 56 tpd of NO_x emission reductions in the HGA area above and beyond those reductions already identified by the control measures listed in Chapter 6, Table 6.1-2. To demonstrate progress towards the 56 tpd commitment, the commission intends to evaluate the following measures and to adopt, by November 2002, sufficient measures in order to achieve at least 25% of the 56 tpd needed. The commission intends to fulfill this commitment through the adoption of the TERP program, which is explained in more detail in Chapter 6, Section 6.3.21. These measures will be submitted as a revision to the SIP, along with any resulting revision to the motor vehicle emissions budgets, to EPA no later than December 31, 2002.

Table 7.6-1 Estimated Reductions from Phase I Mid-Course Review Commitments - 2002

Measure	Estimated Reductions (tpd)
Texas Emission Reduction Plan Program, which includes the following components: • Rebates for new purchases of on-road vehicles • Grant program for new non-road equipment • Grant program for re-powers of heavy-duty on-road and non-road vehicles • Grant program for retrofits/add-ons of on-road and non-highway diesel vehicles/engines • Grant program for demonstration projects • Grant program for use of qualifying fuel • Grant program for infrastructure projects • Energy Efficiency	14-20
TOTAL REDUCTIONS IN 2002	**14-20**

Rebates for New Purchases of On-road Vehicles

This program offers financial incentives to consumers who purchase or lease certain new light-duty motor vehicles. The eligible vehicles have been certified by the EPA according to emission standards that are more stringent than those required by federal law for the average light-duty motor vehicle. The incentives apply to any eligible light-duty motor vehicle that meets the required standards, regardless of the fuel used to power the engine. The purchase or lease incentives are offered statewide, subject to the availability of funding.

This program also offers financial incentives that cover the incremental costs of purchasing or leasing certain new heavy-duty motor vehicles (vehicles over 10,000 lbs. GVWR). Eligible vehicles have been certified by the EPA according to emission standards that are more stringent than those required by federal law. These incremental costs are reimbursable for any eligible heavy-duty motor vehicle that

exceeds the standards, regardless of the fuel used to power the engine. Cost reimbursements are offered statewide subject to the availability of funding.

Leases and New Purchases of Non-Road Equipment
This category is for the lease or new purchase of non-road equipment of at least 50 horsepower and offering less emissions of NOx, as an alternative to the lease or purchase of a higher-emission diesel equipment. Non-road equipment leased or purchased under this program may be fueled by diesel or an alternative fuel, and the equipment must be a replacement or be acquired in lieu of equivalent higher-emission diesel-powered equipment. A lease must be for at least 12 months and the expected useful life of a new purchase must be at least five years to be eligible for funding.

Repower and Retrofit/Add-on of On-Road Heavy-Duty Vehicles and Non-Road Equipment
This category is for the replacement of diesel engines with lower-emission diesel or alternative fuel engines and for the purchase and installation of retrofit and add-on technology to reduce the NOx emissions on a diesel engine currently installed on an eligible on-road heavy-duty vehicle or non-road piece of equipment. The expected life of the equipment and/or engine after the repower or retrofit/add-on must be at least five years in order to be eligible for funding.

Infrastructure Projects
This category may include projects to replace existing infrastructure or install new infrastructure for dispensing qualifying fuel or providing electricity for use by motor vehicles, on-road light-duty and heavy-duty vehicles, and non-road equipment, where the use of such infrastructure will result in reductions in the emission of NOx in affected counties. Although there is no requirement for achieving a minimum percentage reduction in NOx emissions, infrastructure projects must still meet the cost-effectiveness requirement of $13,000/ton of NOx reduced to receive funding and will require evidence that reductions will be achieved in the affected counties. The expected life of the infrastructure must be at least five years in order to be eligible for funding.

Use of Qualifying Fuel
This category is for the incremental costs of the use of qualifying fuel in a motor vehicle, on-road light duty or heavy duty vehicle, or non-road equipment. Incremental cost is the difference in cost between the qualifying fuel and standard on-road or off-road diesel fuel that would otherwise be used.

Demonstration of New Technology
This category includes projects to demonstrate practical low-emission retrofit technologies, repower options, and advanced technologies for on-road heavy-duty diesel vehicles (over 10,000 lbs. GVWR) and non-road diesel equipment (at least50 horsepower). Projects under this category may include demonstration of:

- Use of retrofit, repower, and add-on technologies to reduce emissions from the existing stock of heavy-duty diesel vehicles and non-road diesel equipment; and
- Use of advanced technologies, including use of qualifying fuels, for new engines and vehicles that produce very-low or zero emissions NOx, including stationary and mobile fuel cells, which could replace the use of higher-emission diesel.

Energy Efficiency

This category, which will be administered by the Public Utilities Commission, includes the retirement of materials and appliances that contribute to peak energy demand to ensure the reduction of energy demand, peak loads, and associated emissions of air contaminants.

7.7 PHASE II MODELING : TWO ADDITIONAL NEW EPISODE(S) AND 1993 EPISODE

In the second phase of the mid-course review, the commission will make extensive use of the TexAQS data to develop a conceptual model of the portion of the ozone problem unique to the Houston-Galveston nonattainment area, including "spikes". Based on the conceptual model, the commission will assess whether or not controls already in place will be sufficient to bring the nonattainment area into attainment by 2007. If the controls already in place are determined to not be sufficient to mitigate the effects of the non-routine portion of the ozone problem, then additional controls will be developed.

As part of the second phase of the mid-course review, the commission plans to conduct modeling for two additional new episodes, as well as updated modeling of the September 1993 episode, to help ensure attainment. Further enhancements to the state-of-the-science, as available, and updated data and assumptions, will be incorporated as appropriate. It should be noted that although the August-September 2000 episode from the Texas 2000 Air Quality Study will be modeled during the first phase, the commission will likely conduct additional modeling of the 2000 episode during the second phase in order to incorporate any further enhancements to the state-of-the-science.

Projected tasks and schedules for the modeling of the episodes for the second phase are summarized in Table 7.7-1.

Table 7.7-1. Schedule for Second Phase of the Mid-Course Review Process - Modeling of Two Additional New Episodes, Updated Modeling of the 2000 Episode, and Updated Modeling of the 1993 Episode

Task	Start Date	Completion Date
Analysis of the effects of the following factors on "spike" events		
Chlorine	May 2001	June 2003
Meteorology	May 2001	June 2003
Upsets	May 2001	June 2003
Routine Non-Uniform Emissions	May 2001	June 2003
Reactivity of Compounds	May 2001	June 2003
Routine Emissions not Currently in the Emissions Inventory	June 2002	June 2003
Enhancements to photochemical model		
Incorporation of Process Analysis	ongoing	December 31, 2002
Upgrade to model's chemical mechanism, if warranted, to account for aged air mass chemistry (from results of Texas 2000 Air Quality Study)	March 1, 2002	December 31, 2002
Upgrade to model's chemical mechanism, if warranted, to account for rapid ozone formation due to large amounts of reactive hydrocarbons	March 1, 2002	December 31, 2002
Fine scale photochemistry (continuation from first phase)	January 1, 2003	April 30, 2003
Development of base case emissions inventory, including any enhancements		
Point source inventory	January 1, 2001	December 31, 2001
MOBILE6 released[1]		January 1, 2002
Software revised by TTI (to couple MOBILE6 with travel demand model)	January 1, 2002	March 31, 2002
Development of mobile source inventory based on MOBILE6	January 1, 2002	December 31, 2002
Non-road mobile source inventory	June 1, 2002	December 31, 2002
Tunnel study analysis	June 1, 2002	December 31, 2002
Area source inventory	June 1, 2002	December 31, 2002

Task	Start Date	Completion Date
Biogenics updates	June 1, 2002	December 31, 2002
Development of future case inventory for 2007	January 1, 2003	April 30, 2003
Development of meteorological modeling, including enhancements	June 1, 2002	December 31, 2002
Photochemical modeling		
Base case modeling	January 1, 2003	April 30, 2003
Future base case modeling	May 1, 2003	May 31, 2003
Future case modeling of control scenarios	June 1, 2003	October 31, 2003
Rule development of any new technologies, direct substitutions, changes due to scientific advances or additional legislative direction	November 1, 2003[2]	April 2004[2]

[1] EPA's currently projected release date is July 2001. The commission's assumed January 2002 release date allows additional time for resolving any issues that arise from the recent release of the courtesy copy of MOBILE6 to regulators and the regulated community.
[2]For the rule development task, the start date indicates the approximate date that the rules would be proposed, and the completion date indicates the approximate date that the rules would be adopted.

7.7.1 Analysis of possible causal factors of "spike" events

Based on the work in the first phase, the commission may continue its investigation of "spike" events with an analysis that focuses on possible causal factors associated with these events. At this time, we would anticipate investigating some or all of the following factors: chlorine chemistry, meteorology, upsets, routine non-uniform emissions, reactivity of compounds, and routine emissions not currently contained in emissions inventories submitted to the commission. In addition, the analysis should support rule development for the April 2004 SIP revision to control emissions contributing to "spike" influenced days, as determined through the analysis discussed in Section 7.1.

<u>Chlorine</u>

The chlorine molecule (Cl2) affects reactivity of VOC species in ozone formation by making the normally less-reactive VOC species, e.g. propane, highly reactive. This increased reactivity may in some cases help ozone concentrations to increase rapidly, leading to ozone "spikes". The commission has contracted with the University of Texas to improve the point and area source chlorine emissions inventories and to develop a chemical mechanism for incorporating chlorine reactions into CAM-x. A separate contractor is incorporating the chlorine mechanism developed by UT into CAM-x, and is testing it with the current August and September 1993 episodes, to see what effect chlorine has on modeled concentrations.

Also in the upcoming year, the commission will examine results from TexAQS 2000, while industry will provide a better point source chlorine emission inventory than exists currently. The commission will compare chlorine emissions from this inventory with ozone "spikes", wind directions, and chlorine reaction

product monitoring data from TexAQS 2000, in an attempt to see if a chlorine and ozone "spike" correlation can be observed.

Meteorology

Meteorology may play a role in producing ozone "spikes". For example, if the wind blows along the Houston Ship Channel for a few hours in the morning, then the air downwind will contain emissions from a large number of industrial sources and can potentially contain high concentrations of ozone. A shift in the wind direction can then carry this relatively narrow ozone plume across a monitor in a short time, resulting in an ozone "spike". The complex land-sea-bay breeze interactions seen in the Galveston Bay area may also contribute to the formation of ozone "spikes".

The commission may create back trajectories from monitors registering "spikes" to search for commonality in wind patterns and also to attempt to locate source areas upwind of the "spikes". Additional analyses could be conducted to search for correlation between weather patterns and the occurrence of ozone "spikes", particularly during the TexAQS intensive study period.

The commission could also use the state-of-the-science MM5 meteorological model to simulate the meteorology during the August-September 2000 TexAQS study period. By analyzing the simulated meteorology associated with any ozone "spikes" observed during this period, the commission might gain greater insight into the causes of these "spikes". Additionally, the commission could use the process analysis feature of the CAM-x model to facilitate these analyses.

Upsets

In some cases, ozone "spikes" may be linked to unplanned releases, or upsets. The sudden introduction of significant quantities of reactive hydrocarbons (or chlorine) could theoretically trigger dramatic increases in ozone concentrations. As has been done in the past year, the commission will compare upset release data, from the Upset Pilot Project currently being undertaken, against ozone "spike" data. On dates when a) upset releases occur, b) data on time, quantity, and species of release are available, and c) ozone "spikes" were observed, the commission will perform analyses to see if "spikes" were at all influenced by the upset releases.

Routine Non-Uniform Emissions

Emissions which are routine in nature can still vary dramatically from day-to-day or even hour-to-hour, the classic example being barge loading operations. While these emissions are included in the annual and ozone-season daily emissions reported to the commission, the inventory does not reflect the varying temporal characteristics of many sources. Some ozone "spikes" may be due to large releases from these types of sources, especially when several releases occur simultaneously.

Reactivity of Compounds

The photochemical reactivity of hydrocarbon species may be a major factor in producing ozone "spikes". Highly reactive compounds can cause very rapid rises in ozone concentrations such as those observed during the TexAQS.

Routine Emissions not Currently Contained in the Emissions Inventory

The commission will investigate possible discrepancies between the emissions inventory and ambient monitoring collected during the TexAQS study period and on a routine basis. Based on a comparison of monitored data and inventory information, the commission will work with industry to identify the sources of any significant discrepancies.

7.7.2 Enhancements to the State-of-the-Science of Photochemical Modeling

For the second phase episodes, enhancements are planned for the photochemical modeling in addition to those previously discussed for the modeling of the August-September 2000 episode. These additional enhancements, which will occur largely as a result of the Texas 2000 Air Quality Study, involve potential upgrades to the model's chemical mechanism to account for aged air mass chemistry, and upgrades to account for rapid ozone formation due to large amounts of reactive hydrocarbons. These enhancements are discussed in more detail in Table 7.4-1.

Another enhancement is the incorporation of "process analysis" into the photochemical model. Process analysis is a detailed accounting of all physical and chemical processes that contribute to the predicted concentration of ozone or other species in the photochemical modeling domain. Process analysis identifies the emission categories and source regions contributing to the modeled ozone concentration in each grid cell of the model. It also provides a detailed analysis of specific chemical processes simulated in the model application. As such, process analysis can contribute greatly to our understanding of how ozone is formed and transported. Process analysis is currently being incorporated into CAMx, the model being used by the commission.

7.7.3 Enhanced Base Case Inventory

Base case inventories incorporating the latest in the state-of-the science will be developed for the second phase episodes. Emissions updates will be made using new or revised emissions models, emission factors, emissions and activity data for specific sources or types of sources, and other updated information and procedures. The following are some anticipated additional enhancements that are not expected to be available for the first phase of the mid-course review.

<u>Point Sources</u>

As described in detail in Table 7.4-1, there will be several enhancements made to the point source inventory based on results from the Texas 2000 Air Quality Study. Enhancements that may benefit the second phase modeling involve unscheduled, nonuniform, and unquantified emissions and modification of emissions inventories to account for large amounts of reactive hydrocarbons. Other tasks or activities that will be involved in the updating of point source emissions were discussed previously with respect to the modeling of the August-September 2000 episode, and include an update of emission factors and a comparison of the PSDB to other databases.

<u>Mobile and Area Sources</u>

- Implementation of the EPA's new on-road mobile source emission factor model, MOBILE6:

  The commission plans to use the new on-road mobile source model, MOBILE6, for developing the mobile source emissions inventory for the second phase of the mid-course review.

The Texas Transportation Institute (TTI) will develop the computer software tools to allow this model to be run in conjunction with the local travel demand models used in urban areas for transportation planning. This will allow the development of travel link based running emissions and trip start and stop based emissions to be located at the trip beginnings and ends.

- Enhancements to biogenics inventory

  As noted in the discussion of the August-September 2000 episode, considerable enhancements have been made to the Texas biogenics emissions inventory through field and other studies. However, more work needs to be conducted to further enhance this inventory. A potentially very important biogenics task which may be conducted in time to benefit the second phase modeling is an evaluation of the response of plant species emissions to very high temperatures during the ozone season.

- Use of tunnel study data to help validate mobile source inventory:

  In addition to the enhancements discussed for the September 1993 episode, the mobile source inventory may be upgraded based on the results of a tunnel study conducted during the Texas 2000 Air Quality Study.

7.7.4 Revised Future Case Inventory

Future case inventories for 2007 will be developed for the second phase modeling. The future case inventories will be developed using the same procedures described for the modeling of the August-September 2000 episode.

7.7.5 Enhancements to the State-of-the-Science in Meteorological Modeling

As in the case of the August-September 2000 episode, the commission plans to use MM5 to develop meteorological fields for the modeling of additional episodes.

For the second phase modeling, enhancements to MM5 may be made in addition to those discussed previously. The Texas 2000 Air Quality Study provided extensive meteorological data which can be used for evaluating MM5 performance for the period of the study. Also during the Texas 2000 study, a heat island study was performed for the Houston area. Results from the heat island study will be used for further evaluating MM5 performance. Depending on the results of the MM5 performance testing using the above described data, enhancements may be made to this model. If available, the revised version(s) of MM5 will be used for the second phase modeling.

7.8 PHASE II CONTROL MEASURES - 2004

Table 7.8-1 Estimated Reductions from Phase II Mid-Course Review Commitments - 2004

Measure	Estimated Reductions*
Innovative Technology Measures	
Gasoline Additives	11-20

Diesel Emulsion	4-10
Commercial and Residential A.C. ozone reduction system	3-13
NO_x reduction systems	6-15
Diesel I/M	4-5
Additional Gasoline Sulfur Controls	1-2
Fuel Cells	1-5
Innovative Idea Measures	
Marine loading emissions	12-33
Episodic controls	
Reductions in VMT associated with commuting	
Pricing policies to encourage reductions in VMT	
Reductions at ports and airports	
Use of new technology and the internet to further reduce emissions	
Urban heat island/cool cities reductions	
Voluntary Stationary Emission Reduction Program	
Funding for transit programs	
Energy Efficiency Measures	
Economic Incentives	
Incentives for Cleaner Vehicles and/or Vehicle Fleets	
TOTAL REDUCTIONS IN 2004	42-103

*The commission recognizes the potential for overlap with the emission reductions targeted from some of these measures. The low range of the estimated reductions takes this into account. The commission is developing the proper protocol to assure that no double counting of reductions will occur.

Gasoline Additives

Fuel and engine performance have long been supplemented through a variety of additives. One of the first additives blended into gasoline at the pump as long ago as the 1920's was tetraethyl lead which resulted in a fuel commonly called leaded gas. The purpose of the lead was to 1) protect against very rapid wear of valve seats, and 2) reduce knock. Due to toxicity and because it will damage catalytic convertors, lead in gasoline has been prohibited in the U.S. for many years. Presently, cars designed for lead-free gas are built with hardened valve seats for more durability.

Currently, gasoline contains additives to reduce knock, inhibit corrosion and rust as well as improve performance. Further, performance additives include detergents, dispersants, anti-icers, combustion enhancers/modifiers, fluidizer oils and flow improvers.

As of January 1, 1995 all gasoline marketed in the United States must contain an EPA approved additive package with a detergent. Detergent in gasoline is critical to keep the fuel nozzles of injectors clear of varnish, gums and other deposits that can clog them. A clogged injector will result in incomplete combustion and then higher tail pipe emissions of raw hydrocarbons and so more pollution. In addition, detergents will minimize carbon deposits on valves, pistons and piston rings so the engine will operate more closely to its design capability and thereby emit fewer pollutants, and derive more potential energy from the gasoline consumed.

Research and development of gasoline additives is ongoing. The Infineum USA L.P. has developed a product called Vektron 6913 which, based on available evidence, seems to have a significant effect on NO_x emissions from gasoline powered vehicles. Vektron 6913 is registered with EPA as a gasoline additive containing a detergent. Historically gasoline additives blended in the fuel at the refinery have been used as anti-freeze and to enhance performance through reduction of carbon deposits and other harmful residues on fuel injectors, rings, pistons and valves.

Fleet tests with a variety of car and light truck models of various ages have indicated a 10% reduction in NO_x emissions as compared to results from use of RFG Phase 2 base gasoline as a control. A report entitled "Vektron 6913 Gasoline Additive NO_x Evaluation Fleet Test Program" prepared by the Southwest Research Institute of San Antonio details the research design and methods utilized for the study of Vektron 6913. Therefore, the commission feels it is reasonable to plan for the adoption of a gasoline additive strategy for the HGA area by 2004.

Air Conditioning

One of the control strategies proposed by the commission on August 9, 2000 was a requirement for ozone reducing technology in residential and commercial air conditioning units, supplied or installed after January 1, 2002. This new technology involves applying a paint-like coating to the surface of a heat exchanger (i.e., the outdoor coils and fins of an air conditioning condenser) to convert ozone-laden air, which passes across the coated surface, to oxygen.

Throughout the comment period the commission received indications that further analysis of this technology was necessary before a regulation was put into place. The commission has conducted a study at a test site in Houston, which was financed by the catalyst manufacturer, to determine the ozone reduction efficiency of this technology.

The commission is of the understanding that the catalyst manufacturer will work with the air conditioning manufacturers to conduct additional studies throughout the summer of 2001 and could be in a position of determining the efficacy of this technology early in 2004.

Diesel emulsion

Diesel emulsion fuel is an emergent fuel technology that relies on a water-in-fuel mixture to lower NO_x and PM emissions. The water content lowers flame temperature by absorbing latent heat in the combustion chamber, using the same principle of thermodynamics as injecting water into a turbine.

Additionally, the water slightly delays combustion which reduces particulate formation. There are three components to diesel emulsion fuels: 1) diesel fuel; 2) water, usually 10% to 20% by volume; and 3) a diesel emulsion additive which encapsulates the water in the fuel. The diesel emulsion fuel can be blended by the diesel emulsion fuel distributor or blended on site using a specialized blending unit.

The Lubrizol Corporation and Clean Diesel Technologies are two companies that are currently developing a diesel emulsion fuel. Lubrizol is working with the City of Houston and the Port of Houston on a variety of testing applications. Lubrizol is also currently involved in the EPA fuel registration process. Tier 1 health effects documentation has already been submitted to EPA by Lubrizol. The Tier 2 laboratory testing information has not yet been submitted to EPA. Until the emulsion is registered, Lubrizol is introducing its product into on-highway applications pursuant to the research, development and test exemption to the registration requirement. EPA registration is not required for off-highway applications.

Lubrizol's initial indications are that diesel emulsion could reduce NO_x by up to 30% and PM by up to 50%. Clean Diesel Technologies has estimated the NO_x reduction to be at least 20% with emulsion alone and up to 65% when the emulsion is combined with an after treatment device.

EPA OTAQ staff has indicated that registration of these emulsions for on-highway use should be complete within two to three years. Therefore, the commission feels it is reasonable to plan for the adoption of a diesel emulsion strategy for the HGA area by 2004.

Diesel NO_x Reduction Systems

This strategy would require owners or operators of on-road or non-road vehicles or equipment manufactured prior to model year 1997 having a heavy-duty on-road or non-road engine and fueled by gasoline, diesel, diesel emulsion fuel or any alternate fuel to use exhaust systems that will achieve an 80% reduction in NO_x emissions from what the engine would emit without the exhaust system. Examples of exhaust systems that could be used include NO_x adsorbers, methane catalysts, diesel oxidation catalysts, selective catalyst reduction, lean NO_x catalysts, and other exhaust after-treatment systems. Numerous other studies are also being conducted on various reduction systems. Some examples of such studies are described below.

The City of Houston is currently planning a diesel fuels and retrofit field demonstration. Baseline emissions testing is currently being completed on the 29 vehicles and equipment that constitute the City's diesel field demonstration.

Emissions testing of the retrofitted equipment will be conducted as soon as possible after the initial round of baseline emissions testing is completed. It is likely that most pieces of equipment will have used the retrofit and/or fuel options for several weeks prior to the retrofit emissions tests being conducted. At the time of the retrofit emissions tests, a determination will be made whether another baseline emissions test will be needed. If another baseline emissions test is required due to concerns about changes in engine performance or degradation, another retrofit emission test will be conducted to include data from points in the engine and exhaust cycles that sample from both pre- and post-retrofit devices. Thus, data will be available to determine if there are any significant variations in engine out pre-retrofit device emission, as well as the results of the emissions post-retrofit device. If warranted, the retrofit devices will be removed and another baseline test will be conducted. Any comparable issues with non-typical fuels will be handled similarly. This process will assure accurate, reliable results.

Given that the retrofit emission tests will be done as soon as possible after installation, there will only be a limited number of post-retrofit emissions tests which will be conducted after the 25% useful life requirement of the proposed EPA draft in-use testing protocol. Another round of selected post-retrofit emissions tests will be conducted toward the end of the field demonstration (May or June 2001) to obtain additional information on emissions for those devices with the highest usage or the most promising emission reductions.

Another study involves the Port of Houston. The Port will soon install SCR emission control devices from two different makers on gantries. These tests are being done to evaluate reliability and emissions. The Port will share their results once they are available, which they anticipate to be no later than early 2001.

Other studies and/or tests are also being conducted on other types of NO_x reduction systems by companies such as Daimler/Chrysler and Cummins Diesel. Contingent upon EPA expeditiously certifying the creditable reduction potential from this technology, the commission feels it is reasonable to plan for the adoption of a NO_x reduction system strategy for the HGA area by 2004.

Therefore, the commission feels it is reasonable to plan for the adoption of a NO_x reduction system strategy for the HGA area by 2004.

Diesel I/M

The commission hired a consultant to review the possible benefits of a heavy-duty diesel I/M program for the HGA area. The consultant reviewed in-use data from the National Renewable Energy Lab's alternative fuel vehicle database, from Southwest Research Institute, from the Colorado School of Mines, and from Parsons Engineering Science in Sydney, Australia. They also reviewed previous reports on the viability of HDD I/M, such as Radian's report to CARB done in 1989, and EF&EE's report to EPA done in 1998. From those sources the consultant developed the following conclusions.

Older vehicles with no NO_x control (model years 1989 and older) will not benefit significantly from I/M. They emit NO_x at inherently lower levels than their certification cutpoints. High NO_x emitters will undoubtedly occur in that technology group, but those will likely be few and far between. By 2007 vehicles in this age group have relatively low mileage accumulations and generate less than 10% of total HDDV NO_x emissions. Therefore, even if a benefit were feasible from these engines, absolute tpd reductions would be quite low due to ever decreasing activity.

For 1990-1998 model years, the data are highly influenced by the NO_x defeat devices. With that in mind the consultant assumed that a high-emitting vehicle in this age group would have emissions about the same level as the uncontrolled engines. The consultant believes that they would actually fail at higher NO_x levels than the uncontrolled engines, but this cannot be proven due to the defeat devices. Therefore, the in-use data show that repairing the high emitters to a cutpoint of 1.5 times the certification level would give approximately 8% reduction in fleet average emissions.

For 1999-2001 model years there is no in-use data to use at this time, so the same assumptions were applied as those in the 1990-1998 model year category.

For 2002-2007 model years (i.e. engines meeting the 2004 standards) the consultant referred to a recent report by Chris Weaver for EPA. Mr. Weaver estimated that all vehicles in this range would have EGR

as the main NO_x reduction strategy. He also estimated that about 20% of those vehicles would have an EGR system failure during their lifetime. Since the EGR systems will be a relatively new technology, and because engines will accumulate close to 40% of their lifetime mileage by age 6 (according to MOBILE5), a 10% aggregate fail rate through 2007 was assumed. As EGR will typically reduce engine-out NO_x by 50% in diesels, an I/M repair benefit of 50% per vehicle was assumed.

A by-model-year output from MOBILE5b was used for Harris County to estimate the gram per mile emission factors and the relative contribution of the different model year groups for this calculation. VMT was taken from TTI's latest estimates. Once benefits were estimated in tpd for Harris County, the benefits were extrapolated to the remaining counties using VMT ratios.

In addition, in-use testing of HDDVs will become especially important as the 2007 engines are introduced, due to their reliance on after-treatment devices. This will not impact I/M benefit estimates for the 2007 year, however.

Therefore, the commission feels it is reasonable to plan for the adoption of a Diesel I/M strategy for the HGA area by 2004.

Fuel Cells - based on NO_x analysis

A fuel cell can use hydrogen in either a liquid or compressed form and will yield zero toxic emissions with water as the by-product of generation. Hydrogen is abundant from any number or sources, many of which are regarded as renewable. Any fuel containing hydrogen is suitable with the use of a reformer to extract hydrogen from gasoline or methane, for example. Some emissions are produced, but are lower than from an internal combustion engine.

In addition to providing an alternative power for automobiles, fuel technology also has applications as a large stationary power source. The Port of Houston is in collaboration with the Houston Advanced Research Center, Reliant Energy, and Texaco Oil to conduct a fuel cell demonstration project. The pilot project will cost about $1.5 million.

Initially, one ship from the Carnival Cruise Lines will receive some electricity from a fuel cell as an alternative to running its diesel generators while docked. The fuel cell generator is on land and will provide 250 kilowatts of power, or about 1/25 of the five megawatts a cruise ship at port requires.

Pipeline natural gas is the fuel source and CO2 and water result from the generation of electricity. Full scale application is anticipated to begin in the third quarter of 2001 and initial results are expected late 2001. Measurement of electrical output, general performance and emissions to be conducted. Excess electrical production can be sold back to the local utility.

Therefore, the commission feels it is reasonable to plan for the adoption of a fuel cell strategy for the HGA area by 2004.

Dockside Emissions

Based on analysis of applicable statutes and regulations, the commission's Environmental Law Division has determined that dockside vessel emissions should be included in federal permit applicability determinations and are subject to full state NSR permit review.

The commission's Air Permits Division has developed a plan to address this issue. For federal permit applicability (Prevention of Significant Deterioration, Nonattainment, and Title V), their proposal is no different than current EPA guidance and regulations concerning vessel emissions. The plan would simply clarify those requirements. However, for state NSR, the plan significantly changes the current practice. Current practice is to evaluate dockside vessel emissions only for impacts review when onshore facilities are new or modified. A complete state NSR permit review will subject dockside vessel emissions to best available control technology review, maximum allowable emission limitations, monitoring, testing, and recordkeeping requirements, in addition to impacts review.

As a result of this plan, reductions in VOC emissions in all gulf coast counties should be expected.

Episodic Releases

Some portion of the emissions in the HGA area can be attributed to upset and maintenance activities. The extent of those emissions and any potential measures that can be put in place to help control those emissions is of great interest to the commission. The commission is currently conducting outreach workshops with the regulated community throughout Texas to help facilities start their own in-house program to reduce emissions from process upset and maintenance activities. This includes an explanation of the rules that were adopted by the commission in June 2000. These rules covered emission reporting, permit implications, and enforcement actions. The workshops also include discussions on the difference between upset emissions and emissions associated with maintenance activities.

As these regulations are implemented, and recordkeeping and reporting requirements become effective, the commission will begin to get a better understanding of the extent of the emissions and how we could begin to account for those emissions.

VMT Reduction Strategies

Examples of these measures include: 1) telecommuting; 2) creating satellite offices; 3) college and university traffic reduction strategies; 4) establishing a regional transit authority; and 5) requiring rental cars to be cleaner vehicles.

Pricing Policies to Encourage VMT Reductions

Examples of this type of policy includes: 1) an insurance pay-as-you-drive program in which the insurance rate is tied to the number of miles the vehicle is driven; 2) pay at the pump insurance which places a surcharge on each gallon of gasoline calculated to be equal to the current average cost of liability insurance; 3) location-efficient mortgages and tax incentives that reward homebuyers for locating in areas that minimize travel requirements; 4) parking cash-outs where employers can "cash out" the value of the free parking benefits they provide their employees so that employees who choose not to drive their own vehicles have more take home pay; 5) tax breaks for businesses locating near mass transit; and 6) placing taxes on parking spaces.

Reductions at Airports

Additional measures that could be implemented at airports include: 1) reducing idling on runways; and 2) imposing a fee on takeoffs during the busiest travel hours to decrease the congestion at these times.

Use of Technology to Help Reduce Emissions

There are many opportunities for increased use of the internet for transacting services that have previously required action in person, such as paying property taxes. Use of the internet could reduce commuting and provides the public with new conveniences.

Urban Heat Island/Cool Cities Program

Temperatures in heavily urbanized areas are higher than in rural areas due to the heat-retaining ability of urban surfaces such as asphalt, tar roofing, and concrete. Recent experiments and modeling studies have suggested that urban temperatures can be reduced by changing the reflectivity of roofs, pavements and other surfaces, and by planting trees on a large scale. Reducing the urban temperatures could affect the ozone concentrations.

Trees can affect ozone concentrations in several ways. The shade provided by trees cools urban surfaces, reducing the need for air conditioning, which could decrease electricity consumption and electrical power plant emissions. By intercepting sunlight with their leafy canopy, trees absorb solar energy that would otherwise cause surface temperatures to increase. The trees use the solar energy in photosynthesis, and also in evaporating water from their leaves, further cooling the air. The reduced urban temperatures can in turn decrease other emissions that are temperature-dependent, such as evaporative organic compound emissions from automobile gasoline tanks and biogenic emissions from trees themselves. Lower temperatures may also slow down the chemical reactions that create ozone. Leafy canopies also directly absorb ozone and nitrogen oxides in a process called dry deposition; increasing the tree cover could decrease ozone by increasing dry deposition.

In order to find out whether heat island reduction measures will decrease the formation of ozone, the land-atmosphere interactions must be modeled accurately, i.e., without as many simplifying assumptions. The commission may soon have access to a new tool and a new data set that will help capture the subtleties of the land-atmosphere interactions. The new tool will be a land surface model known as TOPLATS. The new data will be derived from a new urban forest study combining field surveys with sophisticated high resolution remote sensing data.

Voluntary Stationary Emission Reductions Program

On January 19, 2001 EPA issued guidelines for states that want to take credit for voluntary emission reduction efforts. The policy, which only applies to stationary sources, allows states to take credit for up to 3% of the reductions needed for a particular area. The major targets of this policy are small area sources that are not already regulated under the FCAA. The measures could be continuous, seasonal, for retail/consumer measures, or episodic.

Some examples of stationary source voluntary measures include: retail operators agreeing not to sell high emitting VOC products during the ozone season; no paint days during periods of high predicted ozone concentrations; programs to reduce electricity usage; and applying new or innovative emission reduction approaches such as pollution prevention or process changes to sources not currently required to be controlled. The commission will work with EPA and the HGA area to develop appropriate programs that could be incorporated into the plan.

Funding for Transit Programs

Any of the increased fees or taxes associated with the measures previously mentioned could also be used to help fund transit programs

Energy Efficiencies

In addition to energy efficiency measures associated with the TERP program, there are other measures which may become rules or other types of enforceable measures in the future to complete the attainment demonstration. Measures under consideration include: agreements with the air conditioner manufacturers to increase SEER ratings in lieu of the catalyst rule, SB 7 energy efficiency requirements, federal energy efficiency requirements for appliances including new or enhanced SEER requirements, smart growth or other similar initiatives, and emergency electricity generation.

Economic Incentives

In addition to economic incentive measures associated with the TERP program, there may be other measures which may become rules or other types of enforceable measures in the future to complete the attainment demonstration. Local stakeholders in the HGA area and other entities have expressed an interest in the creation of programs designed to provide incentives for the achievement of earlier and/or greater reductions than anticipated from currently proposed control measures. Such incentive programs could be effective technology-forcing tools to obtain substantial innovation and ozone reductions, in the most cost-efficient manner possible.

Incentives for Cleaner Vehicles and/or Vehicle Fleets

Examples of this type of incentive include: 1) tying annual auto registration fees to pollution levels so that individuals with cleaner vehicles would payer lower fees; 2) adjusting the sales tax on vehicles to a sharply graduated tax with a lower percentage tax charged to cleaner vehicles and a higher percentage on dirtier vehicles; and 3) waiving parking meter payments for low emitting vehicles.