EXECUTIVE SUMMARY

The purpose of this study was to evaluate recent historical emission and air pollution-related activity information for priority point source categories in the State of Texas to determine the primary factors influencing emission changes in this period (1992 to 2006) and to use this information to develop improved emission forecasts for future years. The analysis presented in this report focuses on the priority point source emission categories within Texas. Priority point source categories were identified based on 2006 criteria air pollutant (CAP) emissions. This report is organized by source category, with a separate chapter being devoted to each source category. The source categories are:

1. Electricity generating units (EGUs);
2. Cement Manufacturing;
3. Petroleum Refining;
4. Chemical Manufacturing; and
5. Gas Production.

One of the study products is growth and control factors for each of the priority source categories. The growth and control factors are developed with respect to a 2005 base year. The forecast period is from 2005 to 2020.

A. ELECTRICITY GENERATING UNITS (EGUs)

EGUs account for a large percentage of oxides of nitrogen (NO_x) and sulfur dioxide (SO_2) emissions in Texas. East Texas EGU heat input increased by 31 percent over the 1995 to 2006 period, while NO_x and SO_2 emissions decreased 60 percent and 22 percent, respectively, over these years. SO_2 emissions have been generally stable since 2000, while NO_x emissions have decreased each year since 1998. The emission reductions at a time of increasing fuel use were found to result from increased use of natural gas at the expense of coal and installation of additional emission controls (particularly for NO_x). SO_2 emission reductions in the region were found to be largely attributable to fuel switching.

EGU growth factors for 2005-2013 were developed using a combination of the *Annual Energy Outlook* (*AEO*) Electric Reliability Council of Texas (ERCOT) region-level fuel consumption projections, and county or unit-level generation forecasts available from ERCOT. Growth factors for 2014 through 2020 were developed by applying ERCOT regional fuel consumption growth rates from *AEO* to the 2013 growth factors. Growth factors for any Texas EGUs located in non-ERCOT regions reflect the overall ERCOT region fuel consumption forecasts from *AEO*. These growth factors account for the effects of projected fuel switching on emission rates.

Because the Texas Commission on Environmental Quality (TCEQ) has already developed a 2018 control factor file for EGUs, E.H. Pechan & Associates, Inc. (Pechan) did not provide EGU control factors in this report. Key factors and responses to consider for developing estimates of future EGU emission rates in Texas include the U.S. Environmental Protection Agency's (EPA's) Clean Air Interstate Rule (CAIR), renewable energy initiatives, and commitments by Energy Future Holdings (of which Luminant is a part) to reduce planned new coal-fired capacity in Texas and to reduce SO_2 and NO_x emissions at existing units.

B. CEMENT MANUFACTURING

Texas cement manufacturing capacity increased by 36 percent between 1992 and 2006, and production has increased 60 percent over the same period. Statewide NO_x emissions have also increased over the past 15 years, but significantly less than either capacity or production (25 percent). All of this emissions growth took place between 1992 and 2000. Two Midlothian cement manufacturers, Holcim and Texas Industries, both expanded production in 1999 and 2001, respectively, by adding new kilns. Since these new kilns have come on-line, NO_x emissions have been relatively constant. This is likely because newer, more efficient kilns are used first, which produce less emissions per unit of output than older technology kilns.

Pechan developed growth factors for cement manufacturing based on Texas-specific forecasts of cement production from the Portland Cement Association (PCA). The PCA estimates a 37.6 percent increase in Texas consumption for 2005-2020. Near-term growth factors take into account the ongoing plant expansion and modernization and expansion at the New Braunfels, Texas plant, and the fraction of the statewide growth that is expected to be captured at that plant in 2008 or 2009. From 2011 on, growth is applied to all counties with cement plants.

It was found that there are two factors which influence the future emissions path for cement manufacturing. The first is updating/refurbishing older cement kilns, and the second is regionally-based controls on emissions. Control factors were developed for the Dallas-Fort Worth (DFW) area based on all DFW kilns meeting lower emission limits in that area by 2011. For other Texas areas, changes in NO_x emissions will occur as older kilns are replaced by newer, lower NO_x emitting technology kilns. Since 13 of the 21 cement kilns in operation in 2006 were built between 1959 and 1972, kiln replacements/modifications are expected to increase. Some industrial sector models estimate that cement kiln lifetimes are about 40-45 years, but the kilns outside the DFW area may have economic factors that make it unlikely that these kilns will retire during a normal economic life.

C. PETROLEUM REFINING

Petroleum refining has been both growing and consolidating in Texas during the past 10 years. While 2 facilities closed between 1996 and 2006, several Texas refineries expanded during the same time period. Gross refinery inputs in Texas increased from 3.4 million barrels per day to more than 4.2 million barrels per day in 2004. Texas refinery volatile organic compound (VOC) emissions declined by 66 percent between 1992 and 2006. Similarly, NO_x emissions have been declining in Texas over the past 15 years, and the majority of this change has occurred in the Houston-Galveston-Brazoria (HGB) ozone nonattainment area.

Refining industry forecast information from the U.S. Department of Energy *AEO* for PAD District III shows 9 percent growth in activity between 2005 and 2020. However, the *AEO* forecast also shows that capacity additions in the region are expected in the next three years, and that the combined application of capacity additions and capacity utilization in Texas results in all production growth occurring by 2014.

The refinery industry control factor analysis was specific to the source categories with common emission and control characteristics for each of the key pollutants: VOC, NO_x, and SO_2. The general finding for VOC sources at refineries was that no post-2006 control factors be applied. For NO_x sources at refineries, the general finding was that future year emission rates would likely be at the lower of New Source Performance Standard (NSPS) or local regulation-required emission rates. This is true for both boiler and turbine emissions. For process heaters, because the full regulatory effect of the HGB area NO_x cap is not expected in the HGB area by 2005, an additional control factor is applied in 2008 and other projection years. The most important influence on refinery SO_2 emissions during the forecast period is the Department of Justice cases and settlements with refining companies. The refinery SO_2 sources that are affected by these refinery settlements are: fluid catalytic cracking units (FCCUs)/fluid coking units, process heaters, and boilers and flare gas recovery. Typical refinery settlement FCCU requirements include achieving added SO_2 emission reductions via a catalyst additive, or installing a wet gas scrubber, and/or hydro-treatment. Typical heater and boiler requirements include elimination of oil burning and restricting hydrogen sulfide concentrations in refinery fuel gas.

D. CHEMICAL MANUFACTURING

The chemical manufacturing industry analyses focused on sources that produce the following chemicals: polyethylene, polypropylene, ethylene, synthetic rubber, and acetic anhydride. Three of the priority chemicals experienced substantial reductions in VOC emissions over the historical analysis period: polyethylene, synthetic rubber, and ethylene, while emissions for the other two chemicals were relatively stable.

Pechan forecast emission activities for the priority chemicals (excluding acetic anhydride) by first forecasting Texas capacity per billion dollars of national gross domestic product (GDP), and then applying this forecasted relationship to forecasts of national GDP incorporated into the *AEO* 2009. The priority chemical 7.63 million pound capacity per billion dollar GDP value for each forecast year was adjusted to reflect the 0.25 percent per year decrease in this value that Texas experienced during 1992-2005. As EPA issues area source national emission standards for hazardous air pollutants (NESHAPs), these may further reduce future chemical manufacturing VOC emissions.

E. GAS PRODUCTION AND PROCESSING

The natural gas industry production and processing analysis found that Texas natural gas had relatively stable production increases from 1993-2004, but much faster growth over the last couple of years. This recent dramatic increase in natural gas production has occurred in the DFW ozone nonattainment area since 2001. The DFW trend reflects recent production of unconventional gas resources in the Barnett Shale region.

Pechan forecast natural gas production in 2008 based on the 2005-2008 change in actual county-level gas production available from the Railroad Commission of Texas. Natural gas production is price sensitive – making even short-term forecasts very uncertain. For post-2008 forecast years, Pechan developed natural gas production forecasts for each of these four key sub-regions to account for differences in expected activity growth.

1. Barnett Shale region counties;
2. Haynesville/Bossier Shale region counties;
3. Gulf Coast counties not in either the Barnett Shale or Haynesville/Bossier Shale region counties; and
4. All remaining counties.

Because forecast data sources were unavailable for natural gas processing, Pechan developed production/processing ratios from historical year data and multiplied these by the forecast gas production for each year to yield projected processing throughput.

Control factors for estimating forecast year VOC emission rates for this industry account for glycol dehydrator emission regulations for both natural gas production and processing source categories. In addition, Pechan incorporated the permitted Southern Union natural gas processing plant VOC emissions in the forecast.