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United States Government Accountability Office  
Washington, DC 20548

August 4, 2009

Congressional Addressees

Subject: *Air Pollution: Air Quality and Permitting of New Coal-Burning, Electricity-Generating Units in Central Texas*

Burning coal generates about 50 percent of the nation's electricity and produces air pollution that can pose a significant threat to human health and ecosystems. The Department of Energy (DOE) predicts that demand for electricity will increase nationally by 26 percent between 2007 and 2030, and DOE's Energy Information Administration projects that Texas's electricity demand will steadily increase through 2030. This increasing demand for electricity in Texas has in recent years led to proposals for 33 new coal-burning, electricity-generating units across the state.<sup>1</sup> Ten of these new units were proposed to be built in Central Texas, a region where 24 electricity-generating units, including coal-burning units, already operate. Data from DOE's Energy Information Administration show the 10 proposed coal-burning units would add nearly 10 percent to the state's electricity-generating capacity. However, these proposed units in Central Texas raised concerns about the potential impact on air quality in the region. Furthermore, one energy company's simultaneous submission of permit applications to the state for four coal-burning units to be built in Central Texas raised questions about whether the state permitting agency was required to consider the cumulative impact of all four units as part of the permit application review process.

The Clean Air Act requires the Environmental Protection Agency (EPA) to establish national ambient air quality standards for six pollutants to protect public health and welfare. These six pollutants, also known as criteria pollutants, are carbon monoxide, nitrogen dioxide, sulfur oxides, particulate matter, ozone, and lead. In Texas, ozone is the criteria pollutant of primary concern. States are primarily responsible for ensuring attainment and maintenance of national ambient air quality standards once EPA has established them. States submit state implementation plans to EPA for approval that provide for the attainment and maintenance of air quality standards. If the state fails to submit this plan, submits an inadequate plan, or fails to implement any requirement of the plan, the state could face ineligibility for federal highway funding and may also lose authority to implement Clean Air Act programs. Under the act, the plans include stricter pollution control measures for areas not meeting the national ambient air quality standards, known as nonattainment areas.

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<sup>1</sup>A power plant can have more than one coal-burning unit.

Steps that states and local governments are required to take under the act to control ozone pollution in nonattainment areas can include strict emission controls on new, modified, and existing industrial facilities; additional planning requirements for transportation sources; and vehicle emissions inspection programs.

Once EPA approves a plan, states are generally responsible for implementing the New Source Review and Prevention of Significant Deterioration provisions of the Clean Air Act. When new major sources of air pollution, such as power plants, are proposed, they must undergo New Source Review and, in areas that meet national air quality standards, a Prevention of Significant Deterioration review. New Source Review entails reviewing applications for the proposed power plants to establish emission limits and ensure they utilize appropriate air pollution control technologies. A Prevention of Significant Deterioration review ensures that the emissions from the source will not exceed maximum allowable increases for three of the criteria pollutants—nitrogen dioxide, sulfur oxides, and particulate matter—and that the source will not cause or contribute to a violation of the national air quality standards. Additionally, states generally issue permits for power plants under the Clean Air Act. In Texas, a Prevention of Significant Deterioration permit is issued prior to construction of a power plant and an operating permit shortly before it begins operation.<sup>2</sup> In this report, the term permit refers to the Prevention of Significant Deterioration permit unless stated otherwise.

We prepared this report in response to a congressional directive in the Joint Explanatory Statement accompanying the Consolidated Appropriations Act of 2008. This report provides information on (1) the current status of permitting coal-burning, electricity-generating units in Central Texas; (2) the process EPA and Texas use, under the Clean Air Act, to review permit applications for proposed new major sources of air pollution; and (3) what is known about air quality and respiratory health in Central Texas.

To respond to these objectives, we interviewed officials from EPA and the Texas Commission on Environmental Quality (TCEQ), the environmental agency for Texas, regarding (1) the status of coal-burning, electricity-generating units proposed to be built in Central Texas, (2) how the state implements federal and state laws and regulations in its permit application review process, and (3) air quality standards and monitoring. We reviewed relevant laws, regulations, and policies on federal and state permitting requirements for new major sources of air pollution and federal requirements related to air quality standards and monitoring. We also obtained and analyzed existing ambient air quality data reported by TCEQ and mortality rates from the Texas Department of State Health Services and the Centers for Disease Control and Prevention's National Center for Health Statistics' National Vital Statistics System, to determine current air quality and health conditions in Central Texas. We assessed the reliability of these data and determined that they were sufficiently reliable for the purposes of this report. For the purposes of our review, we defined "Central Texas" as the 20 Texas counties that fall within TCEQ Region 9—Bell,

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<sup>2</sup>Known as a Title V operating permit, this permit contains all existing federal Clean Air Act requirements, including the provisions of the Prevention of Significant Deterioration permit, applicable to the power plant.

Bosque, Brazos, Burleson, Coryell, Falls, Freestone, Grimes, Hamilton, Hill, Lampasas, Leon, Limestone, Madison, McLennan, Milam, Mills, Robertson, San Saba, and Washington counties. Because TCEQ is subject to ongoing litigation related to some of the recently permitted coal-burning units that fell under our review, we did not evaluate whether the permitting actions taken by EPA or TCEQ comply with the Clean Air Act or other relevant statutes, regulations, or guidance. We conducted our work from October 2008 to August 2009 in accordance with all sections of GAO's Quality Assurance Framework that are relevant to our objectives. The framework requires that we plan and perform the engagement to obtain sufficient and appropriate evidence to meet our stated objectives and to discuss any limitations in our work. We believe that the information and data obtained, and the analysis conducted, provide a reasonable basis for any findings and conclusions in this product. Enclosure I provides additional details on our objectives, scope, and methodology.

## **Summary**

Of the permit applications TCEQ has received in recent years for 10 coal-burning, electricity-generating units to be built in Central Texas, applications for 5 have been withdrawn, and TCEQ has issued draft or final permits for the remaining 5. Specifically, in February 2007, one energy company withdrew its simultaneously submitted permit applications for four new coal-burning units in Central Texas after facing opposition from environmental advocates, local government officials, and some Central Texas residents. The following year, after a change in ownership, a different energy company cancelled plans to build a coal-burning unit in Central Texas and withdrew its permit application. Currently, TCEQ has issued either a draft or final permit for five coal-burning units to be built in the region. Construction on two of these units is near completion, and they are scheduled to begin operations in late 2009. However, the five coal-burning units have faced legal and administrative challenges from environmental advocates, local government officials, and some Central Texas residents. These challenges have generally claimed that TCEQ's approval of the draft or final permits failed to comply with various Clean Air Act requirements. While some of the administrative and legal challenges have been settled, those that remain are in varying stages of resolution, and it is unclear when they will be resolved.

When EPA approved Texas's state implementation plan—a plan for attaining and maintaining national air quality standards—TCEQ became responsible for reviewing all permit applications and issuing permits for proposed new major sources of air pollution. An important component of the permit application process is the applicant's analysis of the proposed new source's likely effect on air quality. Specifically, for most criteria pollutants, applicants determine if the new source's emissions of those pollutants are likely to exceed EPA-established thresholds. If the applicants determine that emissions are not likely to exceed EPA thresholds, no further analysis is required. However, if emissions are likely to exceed threshold levels, the applicant is required to perform a more detailed analysis to assess the impact of emissions from the new source, as well as the impact of emissions from, for example, other sources located or being constructed nearby. Regarding EPA's

oversight of TCEQ's permitting procedures for new major sources, EPA said that the agency reviews most applications and draft permits and provides comments to TCEQ on most of them. According to EPA, although it tries to resolve differences with TCEQ, the state agency has at times issued permits with which EPA comments have disagreed. If EPA's review of a draft permit reveals that the permit does not comply with the Clean Air Act or the Texas state implementation plan, EPA officials said that, generally, EPA must utilize its authority under section 113 of the Clean Air Act to take an enforcement action. Under this authority, EPA may issue an order to stop construction of the new major source or can impose administrative penalties. In addition, EPA expressed concerns to TCEQ about permit application review problems that arose in 2006 when a company simultaneously submitted applications for four coal-burning units to be built in Central Texas. Specifically, EPA expressed a concern about the cumulative impact of the emissions from these units and said the impact on air quality from the new coal-burning units could not be accurately determined. TCEQ said that permit applicants were not required to perform an analysis to determine the cumulative impact of emissions from these units and that routine EPA modeling practices were followed for each of the applications.

Current data show Central Texas meets national air quality standards, but mortality rates from respiratory illnesses are slightly higher for the region than for the state or the nation. TCEQ operates an air quality monitoring network throughout the state, with two monitors currently in Central Texas that measure pollutant concentrations. Current TCEQ data show that Central Texas meets national air quality standards for all six criteria pollutants. However, ozone concentrations in the region are close to exceeding a new national ozone standard EPA issued in 2008. Research over the past 50 years has consistently found that exposure to ozone is linked to the development of respiratory illnesses such as asthma. Furthermore, recent studies have provided strong evidence that respiratory health effects associated with ozone—such as decreased lung function and premature mortality—can occur at ozone concentrations below the current standard. Regarding respiratory health in Central Texas, the most recent data available from the Texas Department of State Health Services and the National Center for Health Statistics show mortality rates from most respiratory illnesses are slightly higher for Central Texas than for the entire state of Texas or for the nation as a whole. Specifically, the region has higher mortality rates from certain chronic lower respiratory diseases, pneumonia and influenza, and lung cancer. These agencies do not draw links between these mortality rates and any specific cause of the respiratory illnesses.

## **Background**

In Texas, there are currently three ozone nonattainment areas based on EPA's 1997 national ozone standard.<sup>3</sup> Coal-burning, electricity-generating units contribute to ozone formation by emitting nitrogen dioxides, which, in the presence of sunlight, react with manmade and naturally occurring volatile organic compounds to form

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<sup>3</sup>The areas in Texas currently classified as ozone nonattainment areas are (1) Dallas/Fort Worth (nine counties); (2) Houston/Galveston/Brazoria (eight counties); and (3) Beaumont/Port Arthur (three counties).

ozone.<sup>4</sup> Moreover, ozone, as well as other pollutants, can be transported to downwind areas many miles away. Many clinical studies have shown that repeated exposure to ozone can lead to respiratory illnesses, decreased lung function, and premature death. To provide increased protection against these ozone-related adverse health effects, EPA revised the national ozone standard in 2008 based upon the evidence from over 1,700 scientific studies conducted since the 1997 national ozone standard was issued. In March 2009, the governor of Texas listed seven areas in the state that were not meeting the new 2008 national ozone standard and recommended to EPA that these areas be designated as ozone nonattainment areas by initially designating them as nonattainment.<sup>5</sup> EPA will consider the governor's recommended initial designation and promulgate ozone nonattainment area designations by March 2010. If EPA designates these areas as nonattainment for ozone, the number of nonattainment areas in the state will increase from three to seven, substantially expanding the number of Texas residents living in areas where ozone levels exceed the national standard.

### **The Number of Proposed Coal-Burning, Electricity-Generating Units in Central Texas Has Declined from 10 to 5 in Recent Years**

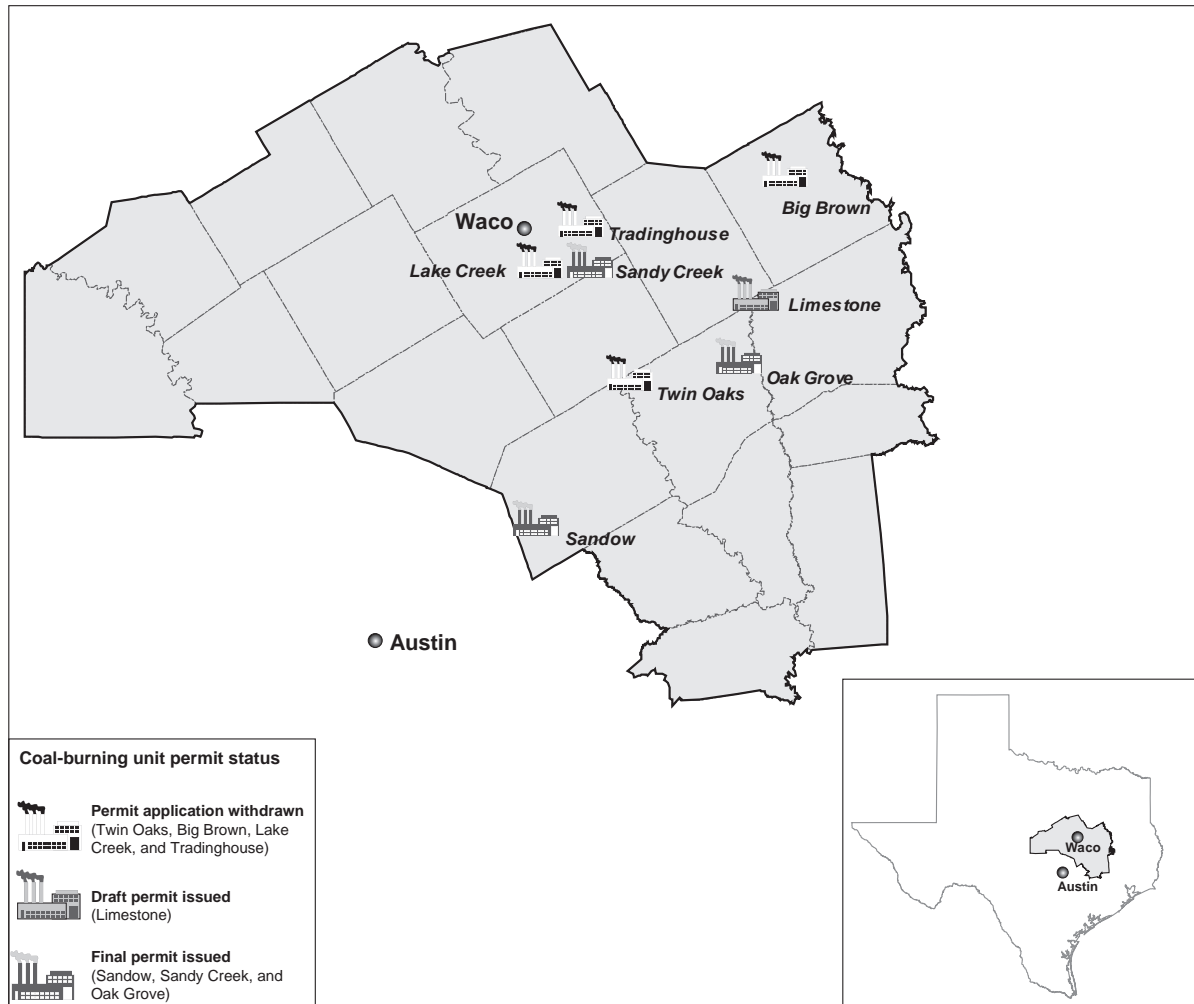
Since 2002, TCEQ has received proposals for 10 coal-burning, electricity-generating units to be built in Central Texas, but permit applicants for 5 of these units have withdrawn their applications (see fig. 1 for the location of each proposed unit).

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<sup>4</sup>Burning coal to produce energy also emits carbon dioxide—a greenhouse gas—into the atmosphere.

<sup>5</sup>The areas recommended to be designated as nonattainment for the new 2008 national ozone standard are the existing nonattainment areas identified in footnote 3 and (1) Austin (one county); (2) El Paso (one county); (3) San Antonio (one county); and (4) Tyler (three counties). Also, it was recommended that one county be added in the Dallas/Fort Worth area. None of the areas recommended as nonattainment for the 2008 national ozone standard is within the region we refer to in this report as Central Texas.

**Figure 1: Locations of Coal-Burning Units Proposed in Central Texas Since 2002**



Sources: GAO; EPA; TCEQ; MapInfo (map); and Art Explosion (clip art).

Notes: The Oak Grove and Tradinghouse power plants each had two coal-burning units included in their permit applications. Additionally, the Sandow, Twin Oaks, Big Brown, and Limestone power plants included existing coal-burning units prior to 2002.

Specifically, from 2002 through 2006, one energy company proposed seven new coal-burning units for Central Texas and submitted permit applications for four of these units simultaneously. Environmental advocates, local government officials, and some Central Texas residents opposed the addition of these coal-burning units to Central Texas, claiming that their emissions would cause the region to violate the national ozone standard. In February 2007, a group of private equity firms purchased the company that had proposed the seven new coal-burning units. As part of the purchase, the company agreed to withdraw the permit applications for the four coal-burning units that it had submitted simultaneously.<sup>6</sup> In exchange for the company withdrawing these applications, two environmental groups agreed to drop their opposition to the three Central Texas coal-burning units that the company had proposed separately. In addition, from 2004 through 2006, three other energy companies submitted permit applications to each build one coal-burning unit in

<sup>6</sup>The permit applications for these four units were withdrawn in September 2008.

Central Texas. However, one of these companies withdrew its application in 2008 after a change in ownership. TCEQ has issued a draft or final permit for each of the remaining five coal-burning units, although opposition to building these units persists. Table 1 provides additional information on the 10 proposed coal-burning units.

**Table 1: Ten Coal-Burning Units Proposed in Central Texas Since 2002**

Coal-burning unit	Permit application date	Location	Permit status	Generation capacity (in megawatts)
Sandow <sup>a</sup>	November 2002	Milam County	Final permit issued	564
Sandy Creek	January 2004	McLennan County	Final permit issued	800
Twin Oaks	July 2005	Robertson County	Application withdrawn	600
Oak Grove (first unit)	July 2005	Robertson County	Final permit issued	800
Oak Grove (second unit)	July 2005	Robertson County	Final permit issued	800
Big Brown	April 2006	Freestone County	Application withdrawn	860
Lake Creek	April 2006	McLennan County	Application withdrawn	860
Tradinghouse (first unit)	April 2006	McLennan County	Application withdrawn	860
Tradinghouse (second unit)	April 2006	McLennan County	Application withdrawn	860
Limestone	June 2006	Limestone County	Draft permit issued	800

Sources: GAO and TCEQ.

<sup>a</sup>The Sandow unit is comprised of two coal-burning boilers connected to one electricity generator. Although TCEQ regulates these two boilers as two separate emission points, for the purposes of our report, we refer to the Sandow coal-burning unit as one coal-burning, electricity-generating unit.

The five coal-burning units with draft or final permits to be built in Central Texas are in various stages of construction and litigation. Construction is nearing completion on the Sandow unit and one of the Oak Grove units, and these two units are anticipated to begin operating by the end of 2009. The remaining two units with final permits are currently under construction and will likely be operational within the next few years, and construction has not begun on the Limestone unit, which currently has a draft permit. The five coal-burning units have faced administrative and legal challenges from environmental advocates, local government officials, and some Central Texas residents. In general, the challenges have claimed that TCEQ's approval of the permits failed to comply with Clean Air Act requirements. These administrative and legal challenges include the following:

- *Sandow Unit 5.* In 2001, a coalition of environmental and community groups sued Sandow's operator for violating the Clean Air Act and Texas state implementation plan by failing to obtain the necessary permits and adopt the appropriate pollution control strategies. The lawsuit was settled in 2003 by consent decree, and Sandow's operator has chosen to comply with the consent decree, as modified in 2004 and 2007, by building a new unit.
- *Sandy Creek Unit 1.* In August 2008, an environmental and consumer group filed a complaint in federal district court against the owners of the Sandy Creek power plant for failing to install appropriate pollution control technology to limit mercury and other hazardous air pollutants. The court held a hearing in early April 2009, but as of June 2009, the court had not issued a ruling, and the case was still pending.

- *Oak Grove Units 1 and 2.* As of June 2009, five lawsuits were pending in state court alleging that TCEQ's approval of the permit application violated Clean Air Act requirements, among other allegations.
- *Limestone Unit 3.* In February 2009, the Texas State Office of Administrative Hearings held a contested case hearing over the draft permit's limits on mercury emissions.<sup>7</sup> TCEQ expects to decide by the end of 2009 whether to issue the final permit.

### **Texas Reviews Permit Applications and Issues Permits for New Major Sources of Air Pollution under EPA's Oversight**

When EPA approved Texas's state implementation plan—a plan for attaining and maintaining national air quality standards—TCEQ became responsible for reviewing permit applications and issuing permits for proposed new major sources of air pollution. EPA retains oversight to ensure TCEQ adheres to its state implementation plan permit procedures. For example, senior EPA air program officials said they have reviewed over 90 percent of Texas's new major source permit applications and draft permits in the last 2 years to ensure TCEQ was properly implementing Clean Air Act requirements and have provided written comments to TCEQ on the majority of these actions.

According to TCEQ, when a new major source such as a power plant submits a permit application to TCEQ, the agency reviews the application to ensure it contains the required documentation, determines the compliance history of the applicant, and then directs the applicant to conduct public notice about the proposal with a 30-day comment period. Once the agency completes this initial review, TCEQ evaluates the application's content, which includes the applicant's analysis of the proposed new major source's likely effect on air quality in the area. If TCEQ approves the permit application, it develops a draft permit for the source and issues a public notice about the draft permit with another 30-day comment period.<sup>8</sup> TCEQ also sends the draft permit to EPA and members of the public who previously commented on the permit application, as well as others.

According to both TCEQ and EPA, one of the most important components of the permit application process for new major sources is the air quality analysis that applicants prepare. TCEQ explained that the first step in this analysis is for applicants to use air dispersion models to determine if the new source's emissions

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<sup>7</sup>A contested case hearing is a proceeding in which the legal rights, duties, or privileges of a party are to be determined by a state agency after an opportunity for adjudicative hearing.

<sup>8</sup>During this public comment period and the public comment period following TCEQ's receipt of the permit application, certain members of the public and others may ask for a contested case hearing and/or a public meeting on the permit application or draft permit. Any member of the public may submit a comment to TCEQ on the permit application or draft permit during their respective comment periods.



are likely to exceed EPA-established threshold levels for certain criteria pollutants.<sup>9</sup> If these dispersion models demonstrate that emissions are not likely to exceed these threshold levels, no further analysis is required.<sup>10</sup> However, if emissions are likely to exceed threshold levels, the applicant is required to perform a more detailed analysis to assess the impact of emissions from the new source, as well as the impact of emissions from other sources located within approximately 50 kilometers (about 31 miles) from the new source.<sup>11</sup> Specifically, TCEQ requires applicants to consider emissions from the new source, as well as from those sources that (1) already exist; (2) are under construction; or (3) have a complete permit application but have not yet received a permit. TCEQ officials said that this modeling is in accordance with EPA guidance. According to both EPA and TCEQ officials, there is no federal or Texas requirement for an air quality analysis to consider new major sources whose permit applications are not complete.

Regarding EPA's oversight of TCEQ's permitting procedures for new major sources, EPA attempts to resolve any differences with TCEQ related to EPA's review of these permit applications or draft permits before a permit is issued. However, EPA said that there are occasions when TCEQ has issued permits with which EPA's comments on either the application, or draft permit, have disagreed. EPA explained that this situation can occur when EPA's determinations and interpretations of the Texas state implementation plan differ from TCEQ's. TCEQ may, however, issue a final permit even if the differences are not fully resolved. If EPA's review of a draft permit reveals that the permit does not comply with the Clean Air Act or the Texas state implementation plan, EPA officials said that, generally, EPA must utilize its authority under section 113 of the Clean Air Act to take an enforcement action. Under this authority, EPA may issue an order to stop construction of the new major source, impose administrative penalties, or bring a civil action against the owner or operator

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<sup>9</sup>Because ozone forms in the atmosphere and is not emitted directly, there is no EPA-established threshold of ozone emissions. Instead, emission levels of the precursors of ozone—nitrogen dioxide and volatile organic compounds—are considered.

<sup>10</sup>As previously noted, TCEQ evaluates the content of a permit application, including the applicant's analysis of the proposed new major source's likely effect on air quality in the area. Dispersion models project the impact of the proposed source's emissions on recent existing air quality levels and other proposed sources, based on air quality and weather monitoring data, emission inventory data of surrounding sources, the technical specifications of the new sources, and the topography of the surrounding landscape, among other factors. The results of modeling depend on such variables as data inputs and the design of the model.

<sup>11</sup>According to EPA, 50 kilometers is the useful distance to which most steady-state Gaussian plume models are considered accurate for setting emission limits. The traditional stationary source models recommended in EPA's *Guideline on Air Quality Models* (40 C.F.R. Part 51, Appx. W) are the models generally used in the air quality impact analysis of stationary sources for most criteria pollutants. TCEQ officials said that available air dispersion modeling techniques used for permitting purposes generally provide accurate modeling estimates up to 50 kilometers from the source being modeled. Although EPA recognized the need to estimate impacts at distances greater than 50 kilometers, its guidelines state that long range transport models are limited for regulatory use to a case-by-case basis.

of the facility.<sup>12</sup> For example, EPA may issue an administrative order against any person assessing a civil administrative penalty of up to \$25,000 per day for violation of the Clean Air Act, under certain circumstances, after a hearing on the record.<sup>13</sup>

EPA expressed concerns to TCEQ about draft permit review problems in November 2006 when a company simultaneously submitted applications for four coal-burning units to be built in Central Texas. Specifically, EPA expressed a concern about the cumulative impact of the emissions from these units, especially on ozone levels, and recommended that TCEQ perform a cumulative ozone impact analysis that would include all of the proposed coal-burning units. In TCEQ's February 2007 response to comments on draft permits, it stated that individual permit applicants were not required under TCEQ rules to perform this analysis. EPA officials told us that Prevention of Significant Deterioration regulations do not require TCEQ or the applicant to conduct a cumulative ozone impact analysis. However, EPA officials said that the applicant must determine if other existing sources or proposed sources are within the impact area to be modeled.<sup>14</sup> If so, these emissions must be included in the modeling required by the applicable regulations. This modeling must demonstrate that the proposed source, in conjunction with all other applicable emissions increases or reductions, would not cause or contribute to air pollution in violation of any national ambient air quality standard or maximum allowable increase for certain pollutants. Therefore, if a series of new sources within the same impact area submits a permit application, each successive source must include the emissions from the sources who have already filed a complete permit application in the air quality modeling for its source.

According to EPA, it may make a recommendation that cumulative modeling is easier and more convenient where (1) a significant number of proposed new sources are in an area that is close to not meeting national air quality standards (Central Texas) and (2) where proposed new sources that will emit significant amounts of the precursors of ozone are just outside of an ozone nonattainment area (Dallas/Fort Worth), but it is only a recommendation.<sup>15</sup> EPA officials stated that they would, however, review each draft permit to ensure that modeling included all existing and previously proposed sources in the impact area. EPA further noted that, generally, under section 165(a) of the Clean Air Act, no major emitting facility may be constructed unless the proposed permit has been subject to a review in accordance with the applicable regulations and

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<sup>12</sup>When EPA's review of a draft operating permit reveals that it is not in compliance with the Clean Air Act or the state implementation plan, EPA must object to the permit. TCEQ is then required to revise the draft permit in response to the objection. If TCEQ fails to do so, EPA must assume responsibility for determining whether to issue or deny the draft operating permit.

<sup>13</sup>However, EPA's authority to impose administrative assessments of civil penalties is limited to matters where the total penalty sought does not exceed \$200,000 and the first alleged date of the violation occurred no more than 12 months prior to the administrative action, except when the EPA Administrator and Attorney General agree that a larger penalty or longer period can be appropriately addressed by an administrative penalty.

<sup>14</sup>According to EPA guidance, the impact area is a circular area with a radius of approximately 50 kilometers (about 31 miles) extending from the proposed source.

<sup>15</sup>As previously noted, the precursors of ozone are nitrogen dioxide and volatile organic compounds.

that it is TCEQ's responsibility as the permitting authority to ensure, prior to granting the permit, that potential impacts caused by an individual proposed source will not cause or contribute to a violation of any applicable national air quality standard, including ozone.

Additionally, when EPA commented on the draft permits in November 2006, it said it had difficulty evaluating the air quality analyses of the individual permit applications because TCEQ had deemed the applications as complete at the same time and had not assigned a sequential order to them. EPA explained that applicants generally submit permit applications on separate days, and when that occurs, the sequence of the applications and, therefore, the scope of the air modeling required are clear. However, in this case, EPA stated that though the air modeling for each of these four coal-burning units should have accounted for the likely emissions from the others applying that day, EPA was unable to determine if the modeling had accounted for those emissions. As such, EPA said that the impact on air quality from these new sources could not be accurately determined. According to TCEQ officials, however, routine EPA modeling practices were followed for each of the applications. The permit applications for these four units were ultimately withdrawn by the company after it was purchased in February 2007 by a group of private equity firms.

### **Central Texas Meets National Air Quality Standards, but Available Data Show Slightly Higher Mortality Rates from Respiratory Illnesses in the Region than in the State or Nation**

Current data from TCEQ's air quality monitoring network show Central Texas meets national air quality standards for all six criteria pollutants.<sup>16</sup> However, monitoring data also show ozone concentrations in the region are close to exceeding the new EPA 2008 national ozone standard. TCEQ operates an air quality monitoring network of over 200 monitoring sites throughout the state. In Central Texas, two air quality monitors currently measure pollutant concentrations. One monitor, located near the city of Waco, measures levels of carbon monoxide, nitrogen dioxide, sulfur oxides, particulate matter, and ozone. This monitor began collecting data on pollution levels in April 2007, when TCEQ established it to satisfy a request from a member of the Texas legislature. The second monitor is located in the city of Killeen, and it measures ozone levels. TCEQ established this monitor in June 2009 to meet federal air quality monitoring requirements.<sup>17</sup> Because EPA's ozone nonattainment designations are based on 3 complete years of data, the Waco air quality monitor cannot be used in EPA's consideration of a nonattainment designation for the region

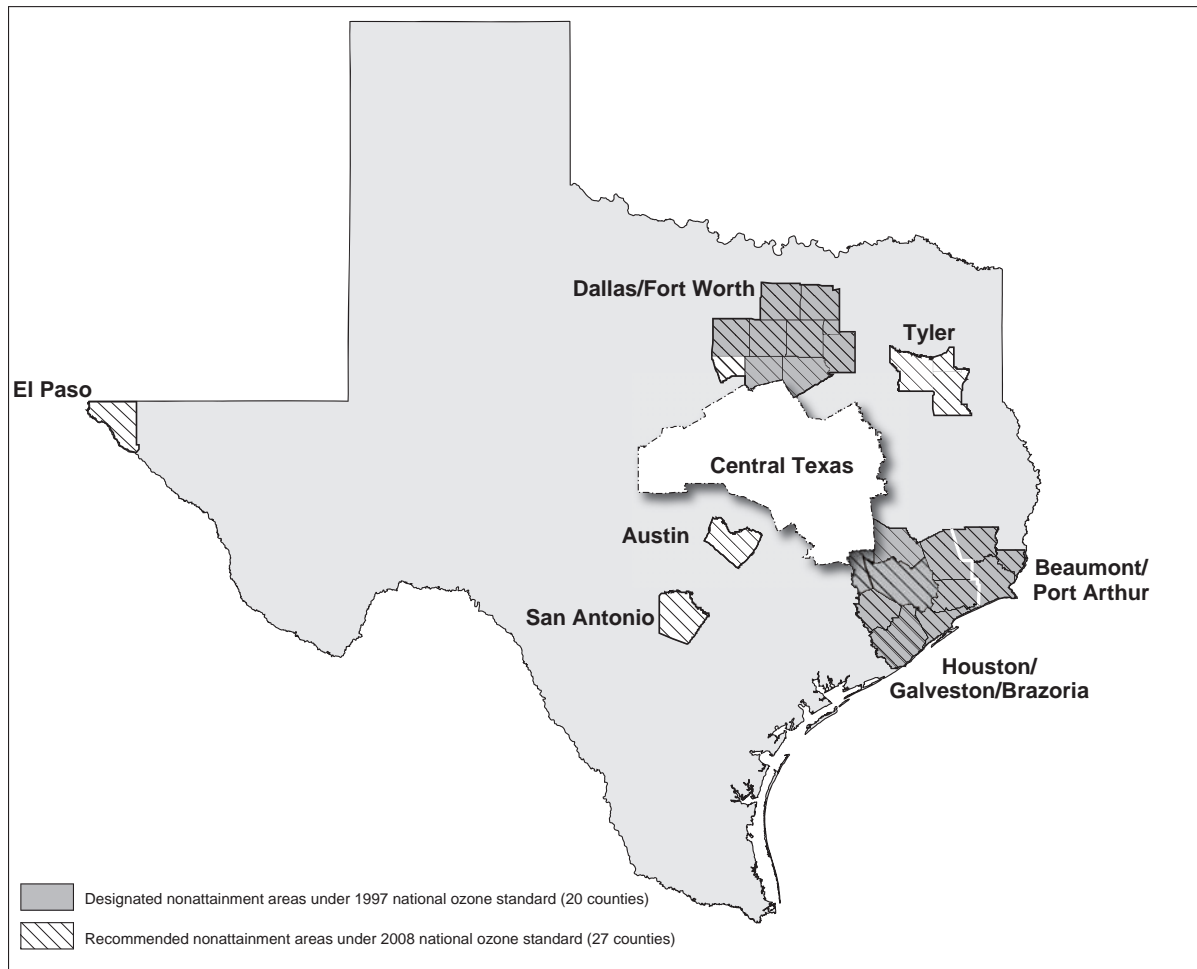
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<sup>16</sup>TCEQ uses emissions data to monitor lead concentrations throughout most of the state. According to TCEQ, ambient air quality in Central Texas meets the 1978 national air quality standard for lead.

<sup>17</sup>TCEQ establishes air quality monitors in accordance with design requirements contained in Appx. D to 40 C.F.R. Part 58. For ozone, the various monitor locations depend upon area size (in terms of population and geographic characteristics) and typical peak concentrations (expressed in percentages below, or near, the ozone national ambient air quality standard).

until April 2010, and the Killeen monitor cannot be used until June 2012.<sup>18</sup> However, when TCEQ calculates current data from the Waco monitor for comparison against the 2008 national ozone standard of 75 parts per billion, the region's preliminary calculated ozone value, as of July 30, 2009, is 72 parts per billion.<sup>19</sup> Furthermore, as figure 2 shows, Central Texas is bordered by areas that EPA designated as nonattainment under the 1997 national ozone standard and areas that the governor of Texas recommended EPA designate as nonattainment under the new 2008 national ozone standard.

**Figure 2: Designated and Recommended Ozone Nonattainment Areas in Texas**



Sources: GAO; EPA; TCEQ; and MapInfo (map).

<sup>18</sup>EPA makes attainment and nonattainment designations based on a statistic, known as a design value, which EPA compares to the national air quality standard. For the national ozone standard, the design value is the 3-year average of the annual fourth-highest daily maximum 8-hour average ozone concentration. The 2008 national ozone standard is 0.075 parts of ozone for 1 million parts of air, (or 75 parts of ozone for 1 billion parts of air). Areas with a design value above this amount have failed to meet the standard.

<sup>19</sup>The preliminary calculated ozone design value of 72 parts per billion includes data from April 20, 2007, through July 30, 2009. When 3 complete years of data from the Waco monitor are available in April 2010, the calculated ozone design value will likely be different because it will include monitored ozone levels from the entire summer of 2009. (Ozone levels are typically highest during the summer.)

When an area is classified as a nonattainment area for ozone, the state must revise its state implementation plan to describe the measures the state will implement so that the area will attain the national ozone standard. If EPA finds that the state has failed to submit this plan revision, submitted an inadequate plan, or failed to implement any requirement of the plan, EPA makes a finding of inadequacy and publishes a proposed rule calling for the imposition of sanctions on the nonattainment area.<sup>20</sup> After the proposed rule's notice and comment period, EPA must impose an emission offset sanction or federal highway funding sanction on the nonattainment area.<sup>21</sup> For example, the highway funding sanctions allow EPA to impose a prohibition on the Secretary of Transportation's approval of certain projects or awarding certain grants applicable to the nonattainment area. These sanctions could have adverse economic consequences for the nonattainment area. In addition, the state's revised implementation plan must list the pollution control measures the state will apply so that the area will attain the national ozone standard. Examples of these pollution control measures include requirements that the state and local governments impose strict nitrogen dioxide and volatile organic compound emission limits on new, modified, and existing sources of these pollutants because they contribute to ozone formation. According to TCEQ and EPA officials, the cost of meeting these emission limits may discourage businesses from locating factories and other industrial facilities in nonattainment areas. In fact, TCEQ said that when one international company recently considered building a new factory in Texas, the company avoided the Dallas/Fort Worth and Houston areas because of the strict emission limits in those two ozone nonattainment areas.

Research over the past 50 years has consistently found that exposure to ozone is associated with adverse respiratory effects.<sup>22</sup> Epidemiological and human exposure studies conducted in the last several years provide evidence of a robust association between ozone exposure and decreased lung function, respiratory hospitalizations,

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<sup>20</sup>Some of the inadequacy findings, such as a failure to implement, must be made through a separate rulemaking.

<sup>21</sup>The emission offset sanction requires a ratio of at least 2 to 1 for emissions reductions from existing sources of pollution within the nonattainment area to offset emissions from major new or modified facilities. In other words, a company that is constructing or modifying a facility over a certain size is required to reduce emissions in the nonattainment area by 2 tons for every new ton the new or modified facility will emit. The offset requirement refers to reductions in emissions that major new and modified sources must get from existing sources before they may begin construction.

<sup>22</sup>We refer to several epidemiological and human exposure studies under this section that are found in 72 Fed. Reg. 37818 (July 11, 2007) (the proposed rule for the national ambient air quality standards for ozone) or the criteria document that EPA's Office of Research and Development developed to critically evaluate the latest scientific information on the health and welfare effects of ozone. EPA used these studies, along with many others cited in these documents, to support its decision to revise the national ozone standard in 2008. We did not assess the methodological soundness of the studies or the analysis referred to in our report.

and premature mortality.<sup>23</sup> These studies also found that children, older adults, adults who are active outdoors, and those with pre-existing lung conditions such as asthma, are more vulnerable to these adverse health effects.<sup>24</sup> Furthermore, recent studies have provided strong evidence that respiratory health effects associated with ozone occur at ozone concentrations below the current standard. For instance, an EPA analysis of a 2006 study found statistically significant lung function decrements in healthy adults exposed to ozone levels of 60 parts per billion, and a 2006 multicity study found the relationship between ozone concentration and mortality could occur at concentrations far below the current standard.<sup>25</sup>

Regarding respiratory health in Central Texas, the most recent data available show mortality rates from most respiratory illnesses are slightly higher for the region than for the entire state or the nation as a whole. Specifically, the Texas Department of State Health Services and the National Center for Health Statistics report mortality rates from respiratory illnesses for 2001 through 2005 that are adjusted to control for differences in the age distribution of the different populations but not for other influences, such as rates of smoking and socioeconomic levels.<sup>26</sup> As figure 3 shows, Central Texas has higher mortality rates than the entire state and the nation as a whole from certain respiratory illnesses, but mortality rates from one type of respiratory illness—other chronic obstructive pulmonary diseases—were slightly lower for Central Texas than for the state and the nation. The Texas Department of State Health Services and National Center for Health Statistics data do not draw links between these mortality rates and any specific contributing causes of the respiratory illnesses.

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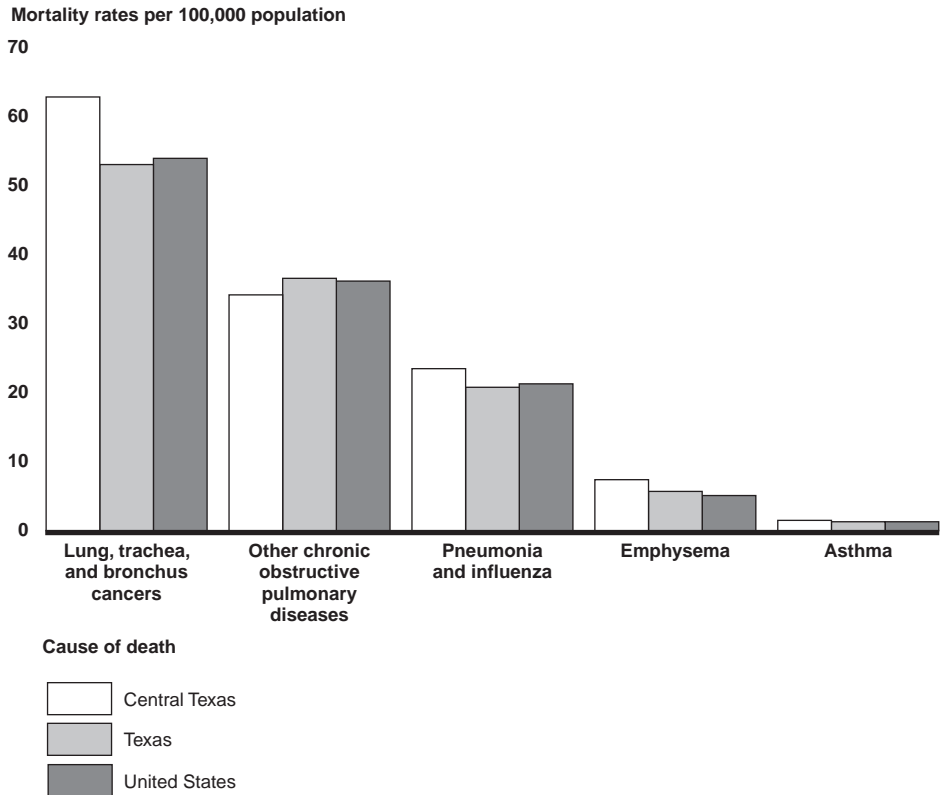
<sup>23</sup>These studies include: W. F. McDonnell et al., “Ozone-induced respiratory symptoms: exposure-response models and association with lung function,” *European Respiratory Journal*, vol. 14 (1999); R. T. Burnett et al., “Association between ozone and hospitalization for respiratory diseases in 16 Canadian cities,” *Environmental Research*, vol. 72 (1997); M. L. Bell et al., “Ozone and short-term mortality in 95 US urban communities, 1987-2000,” *Journal of the American Medical Association*, vol. 292 (2004).

<sup>24</sup>These studies include: P. Höppe et al., “Environmental ozone effects in different population subgroups,” *International Journal of Hygiene and Environmental Health*, vol. 206 (2003); N. Gouveia and T. Fletcher, “Time series analysis of air pollution and mortality: effects by cause, age and socioeconomic status,” *Journal of Epidemiology and Community Health*, vol. 54 (2000); S.A. Korrick et al., “Effects of ozone and other pollutants on the pulmonary function of adult hikers,” *Environmental Health Perspectives*, vol. 106 (1998).

<sup>25</sup>See J.S. Brown, “The effects of ozone on lung function at 0.06 [parts per million] in healthy adults,” Memo to the Ozone NAAQS, OAR-2005-0172 (2007); W.C. Adams, “Comparison of chamber 6.6 hour exposures to 0.04—0.08 ppm ozone via square-wave and triangular profiles on pulmonary responses,” *Inhalation Toxicology*, vol. 15 (2006); and M.L. Bell, et al., “The exposure-response curve for ozone and risk of mortality and the adequacy of current ozone regulations,” *Environmental Health Perspectives*, vol. 114 (2006).

<sup>26</sup>The mortality rates are per 100,000 population, and the standard used for age adjustment is the U.S. 2000 standard population.

**Figure 3: 2001-2005 Mortality Rates from Respiratory Illnesses in Central Texas, Texas, and the United States**



Source: GAO analysis of Texas Department of State Health Services and National Center for Health Statistics data.

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We provided relevant sections of this report to the Environmental Protection Agency and the Texas Commission on Environmental Quality to confirm the information they provided and incorporated their technical comments, as appropriate. We are sending copies of this report to appropriate congressional committees and other interested parties. In addition, this report will be available at no charge on the GAO Web site at <http://www.gao.gov>.

If you or your staffs have any questions about this report, please contact John Stephenson at (202) 512-3841 or [stephensonj@gao.gov](mailto:stephensonj@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Key contributors to this report include Michael Hix (Assistant Director), Heather Chartier, Nancy Crothers, Philip Farah, Cindy Gilbert, Kristin Hughes, Karen Keegan, Summer Lingard, Kirk Menard, and Jeanette Soares.

A handwritten signature in black ink, reading "John B. Stephenson". The signature is written in a cursive style with a long horizontal flourish at the end.

John Stephenson  
Director, Natural Resources  
and Environment



*Congressional Addressees*

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Subcommittee on Interior, Environment  
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Committee on Appropriations  
House of Representatives

The Honorable Chet Edwards  
House of Representatives

## **Enclosure I: Objectives, Scope, and Methodology**

We prepared this report in response to a congressional directive in the Joint Explanatory Statement accompanying the Consolidated Appropriations Act of 2008. The objectives of this review were to provide information on (1) the current status of permitting coal-burning, electricity-generating units in Central Texas; (2) the process the Environmental Protection Agency (EPA) and Texas use, under the Clean Air Act, to review permit applications for proposed new major sources of air pollution; and (3) what is known about air quality and respiratory health in Central Texas.

To provide information on the current status of permitting coal-burning, electricity-generating units in Central Texas, we interviewed officials with EPA's Region 6 Multimedia Planning and Permitting Division in Dallas, Texas, and the Texas Commission on Environmental Quality's (TCEQ) Air Permits Division in Austin, Texas. The information we obtained from these officials helped us identify coal-burning, electricity-generating units proposed to be built in Central Texas and describe the history and current status of those units. To gain a better understanding of how coal-burning, electricity-generating units work, we also visited a coal-fired power plant in Central Texas and discussed with company officials how their coal plant operates. For the purposes of our review, we defined "Central Texas" as the 20 Texas counties that fall within TCEQ Region 9—Bell, Bosque, Brazos, Burleson, Coryell, Falls, Freestone, Grimes, Hamilton, Hill, Lampasas, Leon, Limestone, Madison, McLennan, Milam, Mills, Robertson, San Saba, and Washington counties.

To provide information on the process EPA and TCEQ use to review permit applications for proposed new major sources of air pollution under the Clean Air Act, we reviewed relevant laws, regulations, and policies on federal and state permitting requirements for new major sources of air pollution. We also interviewed officials with EPA's Region 6 Multimedia Planning and Permitting Division in Dallas, Texas, and TCEQ's Air Permits Division, Monitoring Operations Division, and Chief Engineer's Office, in Austin, Texas, to determine how the state implements federal and state laws and regulations in its permit application review process. TCEQ is subject to ongoing litigation related to some of the recently permitted coal-burning, electricity-generating units that fell under our review. GAO's policy is to avoid taking a position on or addressing matters that are pending in litigation. Because of this ongoing litigation, we did not evaluate whether the permitting actions taken by EPA or TCEQ comply with the Clean Air Act or other relevant statutes, regulations, or guidance. Specifically, we did not assess any permit applications, the quality of any air modeling conducted by an applicant, or the quality of the data used to conduct an air modeling analysis due to ongoing litigation.

To provide information on air quality and respiratory health in Central Texas, we reviewed federal requirements related to air quality standards and monitoring and interviewed EPA and TCEQ officials about these issues. Additionally, we obtained and analyzed existing ambient air quality data reported by TCEQ's Monitoring Operations Division to determine current air quality conditions in Central Texas. To assess respiratory health conditions in the region, we obtained and analyzed mortality data reported by the Texas Department of State Health Services and the Centers for Disease Control and Prevention's National Center for Health Statistics'

National Vital Statistics System. To assess the reliability of the air monitoring data we obtained from TCEQ and the mortality data we obtained from the Texas Department of State Health Services and the National Center for Health Statistics, we interviewed agency officials about data quality control procedures and reviewed relevant documentation. We determined that the data were sufficiently reliable for the purposes of this report.

We conducted our work from October 2008 to August 2009 in accordance with all sections of GAO's Quality Assurance Framework that are relevant to our objectives. The framework requires that we plan and perform the engagement to obtain sufficient and appropriate evidence to meet our stated objectives and to discuss any limitations in our work. We believe that the information and data obtained, and the analysis conducted, provide a reasonable basis for any findings and conclusions in this product.

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