



# Project Summary

Texas Department of Transportation

## 0-6513: Impacts of Energy Developments on the Texas Transportation System

### Background

Texas's energy sector has a critical impact on both the state economy and the Texas transportation system. The state's various transportation modes, including rail, highways, pipelines, and ports, form a system that facilitates the energy sector. The objectives of this research study were thus to: (a) illustrate and quantify the current and anticipated future impacts imposed by the energy sector on Texas's transportation system, and (b) identify key energy indicators that TxDOT can track to anticipate future use of the transportation system.

### What the Researchers Did

This extensive research effort comprised:

- a detailed overview of Texas's energy sector and the contribution of the sector to Texas's economy,
- the development of supply chains for Texas's major energy sectors (i.e., natural gas, crude oil, coal-based thermal power, wind, and bio-fuels) to identify major activities within each energy supply chain that use Texas's transportation system, as well as the traffic characteristics of each of these major activities,
- estimating the pavement impacts and reduction in pavement service life associated with major activities in the wind energy, natural gas, and crude oil supply chains, and
- the development of four energy scenarios that reflect different assumptions and outcomes for Texas's future energy sector over a 20- to 30-year period. Analyses of several factors, referred to as *drivers*, were presented before using these drivers in developing the scenarios and discussing the potential impacts on Texas's transportation system. The drivers are:
  - Texas's energy portfolio and goals,
  - energy demand,
  - enabling infrastructure,
  - energy extraction technologies,
  - current and historic energy price trends,
  - socio-economic impacts,
  - environmental regulations, and
  - tax and other government incentives.
- the identification of key energy indicators that TxDOT can track to anticipate future use of the transportation system.

### Research Performed by:

Center for Transportation Research (CTR),  
The University of Texas at Austin

University of Texas at San Antonio (UTSA)

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## What They Found

Texas's thriving energy sector is the product of many decades of resource discoveries and innovative production practices, all supported by the state's transportation system. Whether importing out-of-state coal, using Farm-to-Market roads to access natural gas wells, or transporting wind turbine components along major Interstate Highway corridors, the transportation system plays a major role in supporting Texas's energy industry. The study team, however, also found that the energy sector has a substantial impact on Texas's road system, especially the lower functional classes. In this study, it was found that certain activities associated with natural gas mining have a serious impact on Texas's highway infrastructure. Depending on the highway functional class, the study team found a reduction in pavement service life associated with the development of one well site to range from:

- 1 to 16% for rig traffic,
- 4 to 53 % for construction traffic, and
- 1 to 34% for saltwater traffic.

In the case of crude oil, the impact of the production traffic associated with transporting the crude oil from the tank batteries to the pipeline breakout stations resulted in a reduction in pavement service life ranging from 2 to 16%, with the Farm-to-Market roads being the most impacted. Construction traffic, associated with well development, resulted in a reduction in pavement service life ranging from 1 to 3% depending on the highway functional class.

In the case of the wind energy sector, the study team focused on evaluating the impacts associated with the movement of the wind turbine components. The wind turbine components primarily traverse the higher classifications of highways. On average, the reduction in pavement service life due to the movement of wind turbine components on Interstate, US, and State Highways were 1.9%, 15.2%, and 20.2%, respectively. On the other hand, the average haul length for the wind energy industry is comparatively longer. This implies that the pavement impacts will be system-wide, while that for natural gas or crude oil is mostly confined within a specific region. Finally, a lack of reliable data prevented the calculation of the pavement impacts associated with the construction of the wind turbine pad sites.

## What This Means

Texas's energy sector is undeniably a major contributor to the economic prosperity of the state and it can be argued that the energy sector has tempered the economic contraction of the state's economy in the 2008 recession. This research study has showed that Texas's transportation system plays a very important role in serving and facilitating Texas's energy sector. The continued impact of the sector on Texas's road infrastructure and the transportation system's continued ability to serve the industry is, however, in question at current funding levels and given how funding is allocated to transportation. Adequate funding sources to maintain the current road infrastructure is required to ensure that Texas's transportation system will continue to facilitate and serve the energy sector in the future.

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