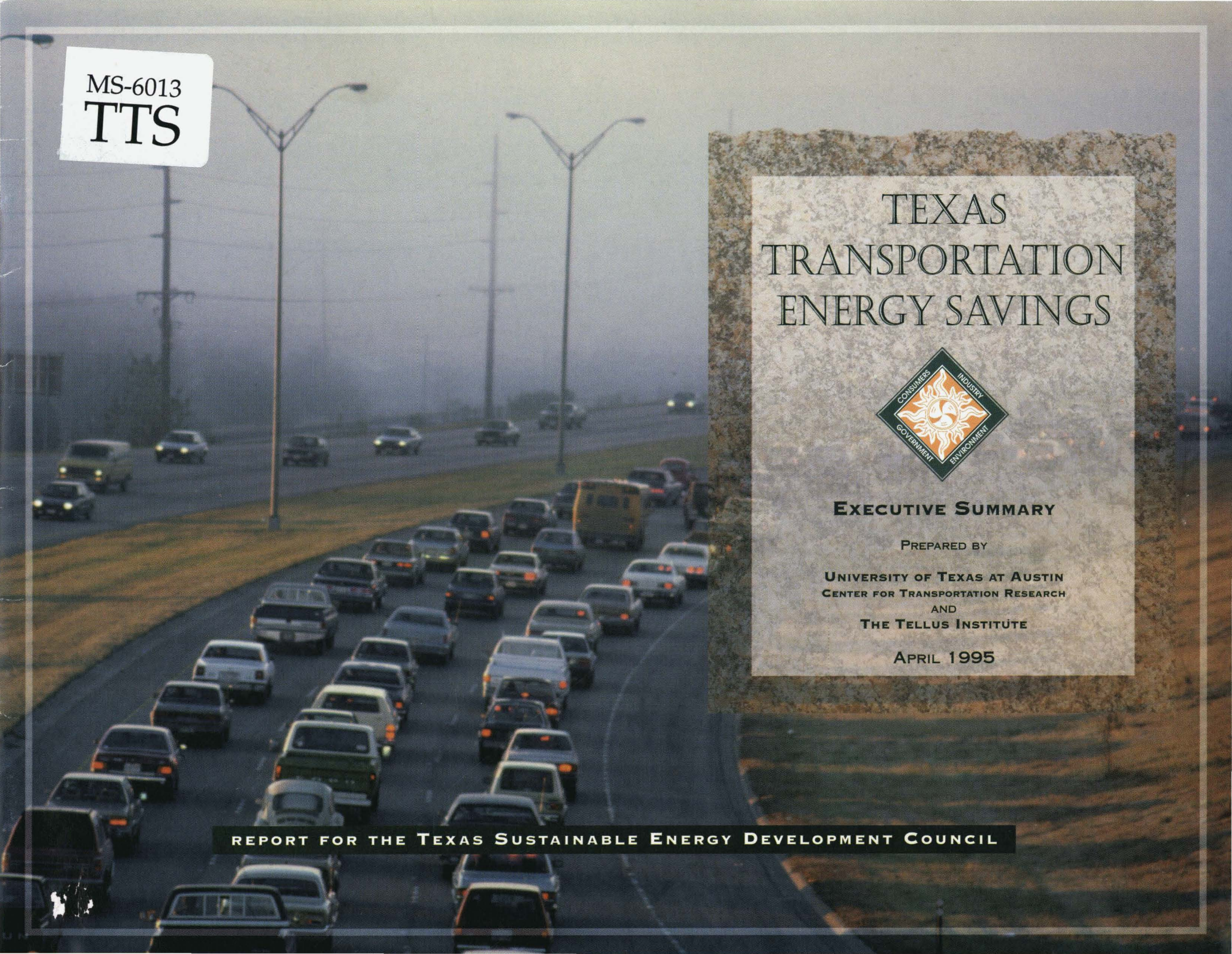


TEXAS TRANSPORTATION ENERGY SAVINGS

CONSUMERS INDUSTRY GOVERNMENT ENVIRONMENT

EXECUTIVE SUMMARY

PREPARED BY

UNIVERSITY OF TEXAS AT AUSTIN
CENTER FOR TRANSPORTATION RESEARCH
AND
THE TELLUS INSTITUTE

APRIL 1995

REPORT FOR THE TEXAS SUSTAINABLE ENERGY DEVELOPMENT COUNCIL

Project Directors

MARK A. EURITT
ANGELA WEISSMANN
STEPHEN BERNOW

Research Staff

ROBERT HARRISON
MIKE MARTELLO
JIEFING QIN
MARK FULMER
JEFFREY HALL
IRENE PETERS
JOHN M. DECICCO

Administrative Support

BONNIE J. MALEK
BRIDGET H. DICKERSON

Technical Advisor

HARVEY SACHS, PH.D.

Designed by the Texas General Land Office
Cover Photo
Loop 1, Austin, Texas
Texas Department of Transportation

The University of Texas at Austin
Center for Transportation Research
3208 Red River, Suite 200
Austin, Texas 78705-2650
512-472-8875

The Tellus Institute
11 Arlington Street
Boston, Massachusetts 02116
617-266-5400

♻ Printed on Recycled Paper with Soybased Inks

Texas Sustainable Energy Development Council

Co-Chair

GARRY MAURO
Texas General Land Office

VACANT

Members

BRENDA ARNETT
Texas Department of Commerce

E.R. "DICK" BROOKS
Central and South West Corporation

GEORGE W. BUSH
Governor of Texas

TIM CURTIS
Texas Citizen Action

TOM DUFFY
Comptroller of Public Accounts

ROGER DUNCAN
City of Austin

JOHN HALL
Texas Natural Resource
Conservation Commission

ROBERT J. KING
KENETECH Corporation

JOHN L. LAAKSO
Public Utility Commission of Texas

JIM MORRISS
Texas Electric Cooperatives, Inc.

MICHAEL OSBORNE
Texas Renewable Energy
Industries Association

MARK ROSE
Lower Colorado River Authority

TOM "SMITTY" SMITH
Public Citizen

LESLIE TUGMAN
Texas Water Development Board

BARRY WILLIAMSON
Texas Railroad Commission

SEDC Staff

KATHLEEN VALE-O'HARA
JUDITH CARROLL
JANE PULASKI
CHARLOTTE BANKS

Texas Sustainable Energy Development Council
1700 North Congress Avenue
Stephen F. Austin Building, Room 1141
Austin, Texas 78701-1495
(512) 463-1745 • FAX 305-8953

TEXAS TRANSPORTATION ENERGY SAVINGS

EXECUTIVE SUMMARY

PREPARED BY

UNIVERSITY OF TEXAS AT AUSTIN
CENTER FOR TRANSPORTATION RESEARCH
AND
THE TELLUS INSTITUTE

APRIL 1995

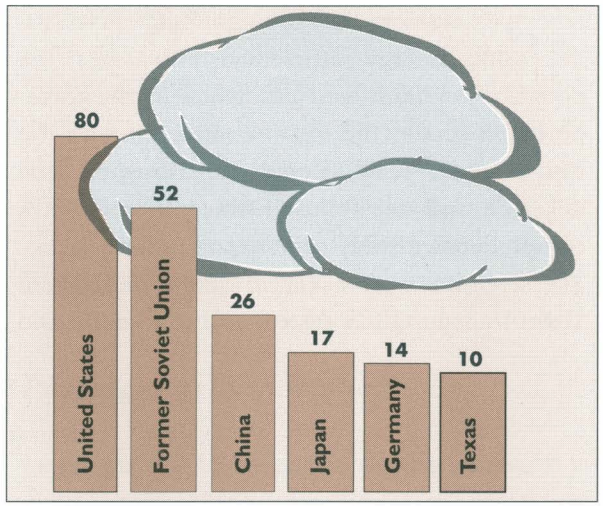
EXECUTIVE SUMMARY

INTRODUCTION

Texas is the world's sixth largest energy consumer. With an annual energy consumption of ten quadrillion British Thermal Units (BTU) of energy in 1992, Texas used more energy than any other state, surpassing California, the second largest consuming state, by 40 percent. Per capita, Texans used more natural gas, petroleum, and electricity than citizens of any other state.

Transportation accounts for almost one-fourth of Texas energy use. Although Texans use more natural gas for transportation than any other state, petroleum supplies more than 90 percent of the transportation energy needs in Texas.

Current energy habits, coupled with the finite nature of traditional fuel supplies, indicate that a transition to more sustainable practices is imperative. While the importance of energy in our lives cannot be denied, neither can we deny our complete reliance on limited fuel resources nor the effects of our fuel use on the earth's delicate environmental balance. During the past two decades, Texas' steadily increasing consumption has caught up with its waning energy production. Already a net energy importer, Texas is becoming more and more dependent on imported energy.



Major Energy Consumers Worldwide in 1991.
(measured in quadrillion BTUs)

In addition to addressing pressing consumption issues, Texans must also consider air quality issues. The Clean Air Act Amendments of 1990 (CAAA) and the Congestion Mitigation and Air Quality Improvement (CMAQ) Program of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) were strongly influenced by the understanding that mobile sources are important contributors to air quality problems, and that the continuing growth of vehicle-miles-traveled (VMT) supersedes the benefits derived from technical innovations related to pollution control.

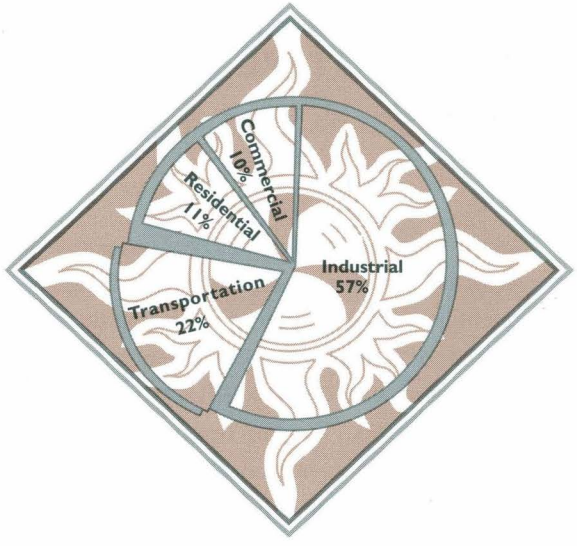
Recognizing that energy efficiency measures and renewable energy sources have significant potential for meeting Texas' long-term energy demand, Governor Ann W. Richards created the Sustainable Energy Development Council (SEDC) by Executive Order in March 1993. To offer Texans the chance to secure our energy independence, the Governor instructed the group to craft a strategic plan for developing the use of Texas' energy efficiency and renewable energy resources.

SEDC defines "sustainable" as a ***method of use*** that meets the developmental and environmental needs of present and future generations. Several key concepts are incorporated in this definition:

First. A sustainable energy future must be equitable for all Texans.

Second. A sustainable energy future works harmoniously with economic development and other development goals of our society.

Third. A sustainable energy future addresses the very real environmental problems we face today to preserve the environment for future generations.



Texas 1992 Energy Use by Sector.

Purpose of this Project

With almost one-fourth of the energy consumed by Texans each year used to transport passengers and freight, the transportation sector is an essential element of the strategic plan for increasing energy efficiency. To assess the potential for improved efficiency in the transportation sector, the SEDC contracted with the University of Texas' Center for Transportation Research and the Tellus Institute to conduct a comprehensive study of transportation in Texas. The scientists were asked to define the current Texas transportation system and to identify and evaluate measures to reduce energy consumption and associated pollutant emissions.

The study was accomplished by defining and analyzing five transportation scenarios:

- Reference
- Rollback
- Moderate
- Aggressive
- Visionary

Each scenario includes a set of specific policies and measures. The scenarios and the findings are detailed in this Executive Summary. For your convenience, a glossary of transportation terminology is included on pages 14 and 15.

TEXAS TRANSPORTATION SYSTEM

Transportation is vital to the social and economic well-being of every Texan. Our quality of life is linked to the mobility and accessibility afforded us by our transportation network of walkways, highways, railways, waterways, and air-space. The products we consume are transported by truck, train, ship, airplane, or pipeline. Most of our daily activities require some form of transportation, whether commuting to work, shopping for goods and services, visiting friends and families, or going on vacation. Without question, we are heavily dependent on transportation.

To meet Texas' mobility and accessibility needs, a vast transportation network has developed. It consists of corridors and facilities that link the state's cities and towns to each other and to the rest of the nation and world. This transportation system is dominated by 294,152 miles of public roads, 74 percent more than any other state in the country. The system also includes the largest rail network in the U.S., with 11,370 miles of rail line. In the aviation sector, 90 percent of the Texas population is within one hour of the state's 26 primary commercial airports. In addition to these primary facilities, there are 369 reliever and utility airport facilities serving general aviation traffic. In 1975, the Texas Legislature passed the Texas Coastal Waterway Act, authorizing the state to serve as the nonfederal sponsor of the Texas Intracoastal Waterway. This man-made canal parallels the gulf coastline from Brownsville, Texas, to St. Marks, Florida. The state transportation system also includes 196,000 miles of natural gas pipeline and 172,000 miles of pipeline carrying crude oil and refined petroleum products.

Passenger Transportation

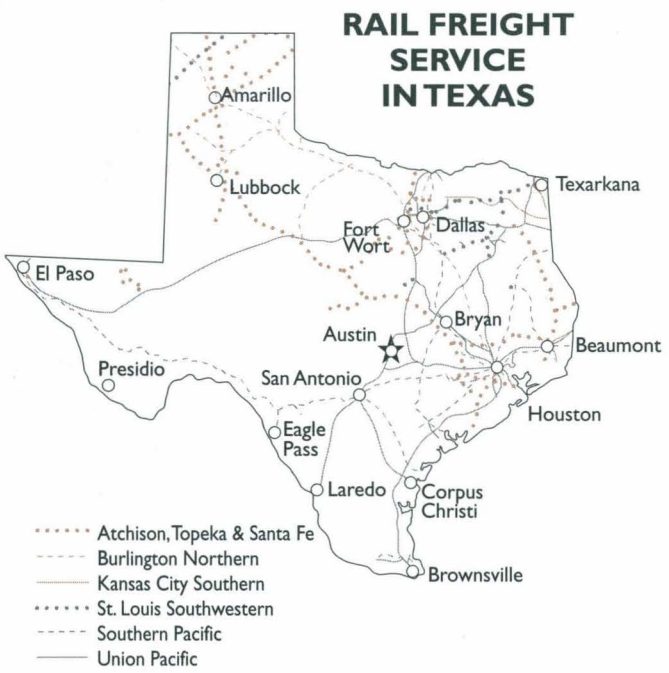
Simply put, the transportation system's purpose is to move either people (passengers) or commercial goods and services (freight) from one place to another. In Texas, and throughout the U.S., most passengers travel over public roads. It is estimated that 82 percent of the 301.8 billion passenger miles of travel occurred on the state's network of roads and highways in 1994. The remaining passenger travel was by air, except for a very small percentage by passenger rail.

A majority (55 percent) of the passenger miles are local travel. Nearly 71 percent of the local travel occurs in the Texas cities with populations over 200,000. Most local travel is by private vehicle. It is estimated that about one percent of all local travel is by public transportation. Of some interest is the finding that only 23 percent of all local trips are work-related. This has important implications for transportation policies aimed at reducing employee trips.

Intercity trips account for 45 percent of the state's 301.8 billion passenger miles of travel. Nearly 60 percent of this traffic is by private vehicle, 39 percent by airline, and the remaining one percent by commercial bus and rail.

Freight Transportation

For freight transportation, the unit of measure changes from *passenger* miles of travel to *ton*-miles of travel. Tonnage is not indicative of dollar value; however, tonnage is the easiest unit of measure for comparison of the different modes of transportation. There is more balance among the freight transportation modes than among those used for passenger transportation. The largest percentage (43 percent) of freight ton-miles are moved across Texas highways by truck. Next are railroads (26 percent) and pipelines (25 percent). Petroleum and coal products account for over 50 percent of the commodities moved along the Texas Intracoastal Waterway, which accounts for five percent of total ton-miles. The importance of the waterway is illustrated in a recent impact study reporting that its closure would require an increase of 574,185 railroad cars or 2.3 million truckloads. Air transportation accounts for less than one percent of the freight ton-miles. However, the packages shipped by airline are typically of higher value. Airlines generally move most of the freight that is time- or value-sensitive.

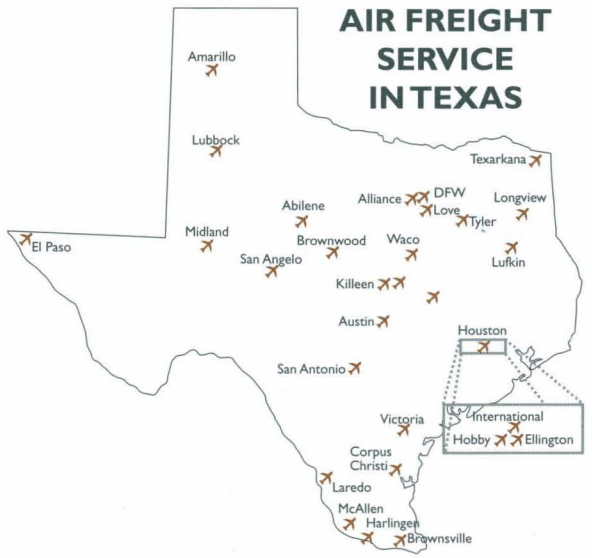


In contrast to passenger transportation, most freight transportation is intercity. It was estimated that 83 percent of the state's ton-miles in 1994 would be intercity in nature, 13 percent of the ton-miles would be in cities of more than 200,000 persons, and the remaining 4 percent in cities under 200,000 persons. Within the intercity transportation network, truck, rail, and pipeline share nearly an equal percentage of freight ton-miles.

Transportation Challenges

Without question, Texas depends on its network of public roads to move most people and goods. This dependence, however, is not without significant costs. The Federal Highway Administration reports that 25 percent of the Texas urban interstates

exceed 95 percent of their capacity, and 43 percent are operating at over 80 percent of their carrying capacity. The resulting congestion is estimated to cost Texas motorists an additional $3.9 billion in delay and fuel costs each year. At the same time the capacity of the system is being stretched to its limit, the quality of the road pavements is rapidly deteriorating. The Federal Highway Administration reports that nearly 75 percent of the state highway system is in fair or worse condition. Poorly maintained roads mean higher operating costs for the Texas consumer. The Congressional Budget Office estimates that consumer vehicle operating costs



increase from 11 to 29 percent on roads in poor condition. In addition to higher costs to the motoring public, dependence on highways has also led to worsening air quality, greater dependence on imported petroleum, and more rapid depletion of non-renewable resources. Almost half of the oil consumed in the Unted States is imported, and of that, half of it is used for transportation.

Renewable energy and energy-efficiency must play a larger role if Texas and the nation are to reach their goals of cleaner air, an improved domestic economy, and reduced reliance on foreign oil.

These major social concerns are the impetus behind this study's effort to explore future scenarios aimed at promoting greater efficiency in the transportation sector.

TRANSPORTATION SCENARIOS

The underlying objective of this project is to identify and evaluate measures to reduce energy consumption and associated pollutant emissions in the Texas transportation sector. A comprehensive energy model developed by the Tellus Institute was calibrated to examine modal energy consumption from 1994 to 2020.

The initial model calibration represents the "Reference Scenario," or base case.

A second scenario, the "Rollback Scenario," represents what might occur if current policies promoting the use of alternative fuels are terminated.

A third scenario, the "Moderate Scenario," represents changes in energy consumption based on policies that have a modest impact on transportation travel behavior and incentives that promote the purchase of newer, more energy-efficient technologies.

The fourth scenario, the "Aggressive Scenario," is guided by transportation pricing measures, aggressive feebates, and alternative-fuel mandates for urban freight transportation.

The final scenario, the "Visionary Scenario," represents what could be accomplished in Texas with fundamental changes in the transportation environment and widespread utilization of anticipated technologies.

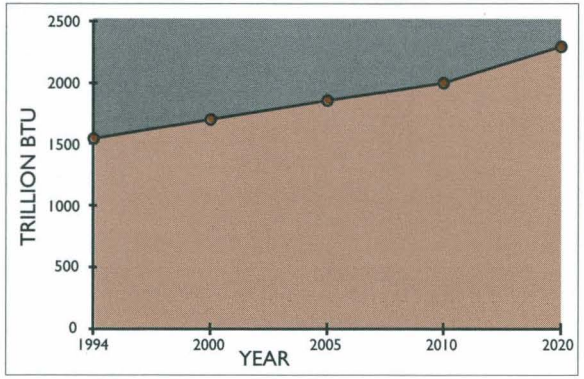
Scenario	Objective
Reference	Provide a transportation sector baseline to analyze potential impacts of alternative scenarios.
Rollback	Estimate the consequences of eliminating the current national alternative fuels program.
Moderate	Examine measures that require moderate changes in current travel behavior, modal distribution, and vehicle choice.
Aggressive	Examine pricing measures that produce drastic changes in current travel behavior, modal distribution, and technologies.
Visionary	Investigate significant modal shifts, behavioral changes, land use changes, and visionary technological innovations for the future.

Summary of Analysis Scenarios

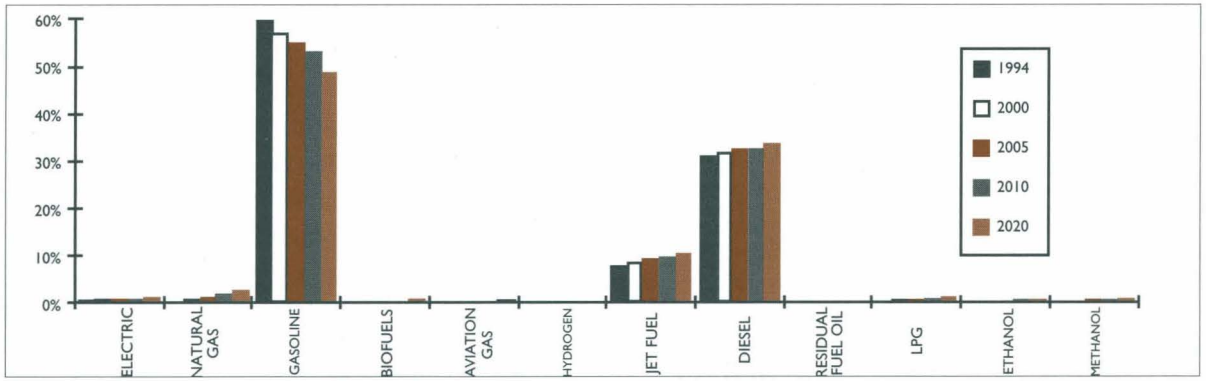
Reference Scenario

The Reference Scenario represents the existing transportation system and technologies based on adopted policies. It provides the baseline for comparing alternative scenarios. The transportation system was categorized and analyzed in sufficient detail for evaluation of alternative strategies to promote greater efficiency. Initially, the transportation sector is separated by mode—highway, rail, water, air, or pipeline. (The highway mode is subcategorized by vehicle type; i.e., automobile, pickup truck, commercial truck, bus.)

The modes are categorized as passenger or freight, intercity or urban, and small urban or large urban. Demand forecasts from 1994–2020 for each of the modes were constructed on the basis of reported trends and changes that can be expected to arise from adopted policies. The reference case includes vehicle technologies, various fuels, and energy intensity (represented as energy use per vehicle-mile of travel).



Reference Scenario Total Energy Use by Year.



Reference Scenario Percent Total Energy Use by Fuel Passenger & Freight Combined.

Actual energy consumption increases for all modes. The highway surface transportation system remains the major mode of operation for passenger and freight transportation in terms of energy use. As a percentage of total consumption, however, the highway sector's share of energy use declines from 1994 to 2020. This change occurs primarily because of improvement in vehicle fuel economy and greater utilization of alternative fuels. The direct impact of alternative fuels is discussed in the Rollback Scenario.

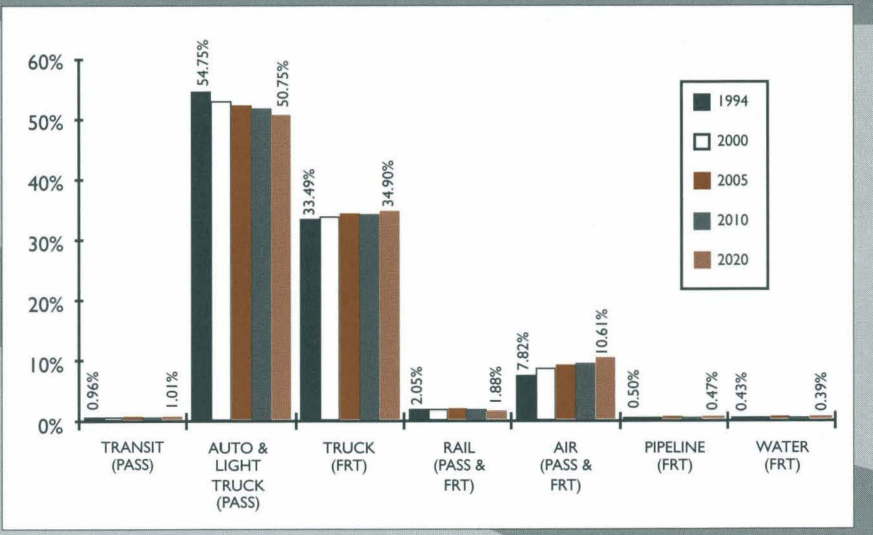
Rollback Scenario

This scenario modifies the Reference Scenario by eliminating the policies promoting greater utilization of alternative fuels. The Reference Scenario assumes a successful expansion of alternative-fuel vehicles. Specifically, the Reference Scenario projects the gasoline share for automobiles to decrease from 99.5 percent in 1994 to 77.2 percent in 2020. The Rollback Scenario identifies the energy implications of reversing the current alternative fuels incentives and mandates. Eliminating current alternative fuels policies results in a 2% increase relative to the Reference Scenario in overall transportation energy use by the year 2020. As expected, elimination of alternative fuels results in a slightly higher urban share of energy use. The urban automotive passenger trip is the most affected class. Its energy use increases relative to the Reference Scenario by nearly 4% in 2020. Losses would be even greater if it were not for the predicted steady improvement in vehicle fuel efficiency.

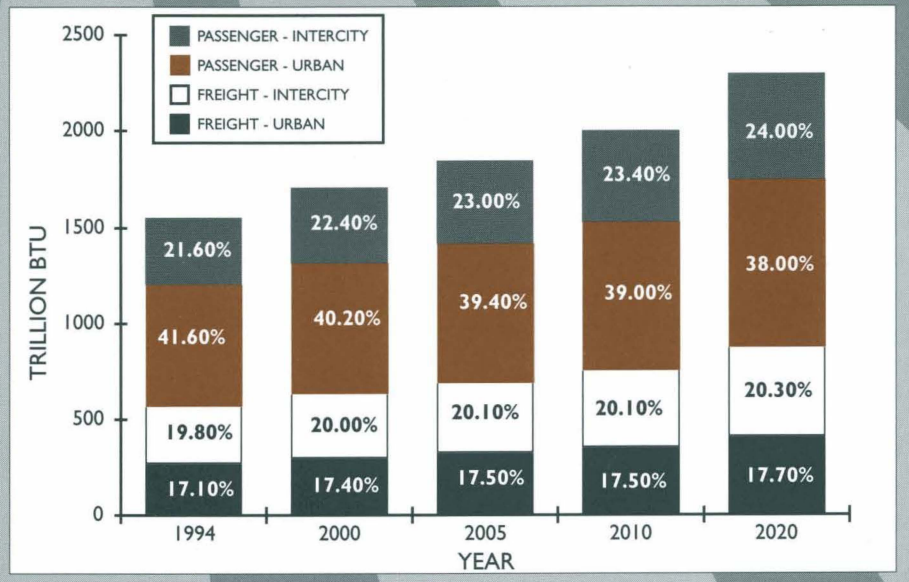
There are no significant effects in the freight transportation sector energy use as evidenced by total state transportation energy use by mode. Alternative fuels are primarily utilized in the passenger transportation market and thus do not significantly affect freight activity.

Reference Scenario Results

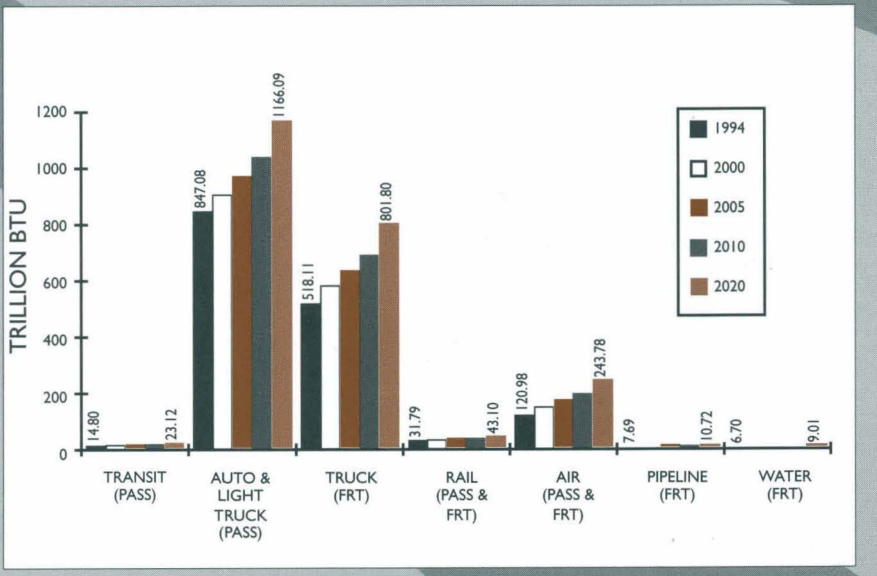
Under current practices and policies, the Texas transportation sector was estimated to consume 1,547 trillion BTU in 1994. The base case projects a steady increase in energy use through the year 2020. By 2020, energy use in transportation will have increased by 49 percent. Energy consumption is dominated by petroleum-based fuels, although alternative fuel use increases steadily during this period. Energy use begins to increase at a higher rate for intercity transportation than within the state's urban areas. The intercity share of energy increases from 41 percent in 1994 to 44 percent in 2020. Most of this growth is driven by the passenger sector. Intercity passenger transportation's share of energy consumption increases from just under 22 percent in 1994 to 24 percent in 2020.



Percentage of Total Energy Use by Mode.



Total Energy Use, Passenger vs. Freight.



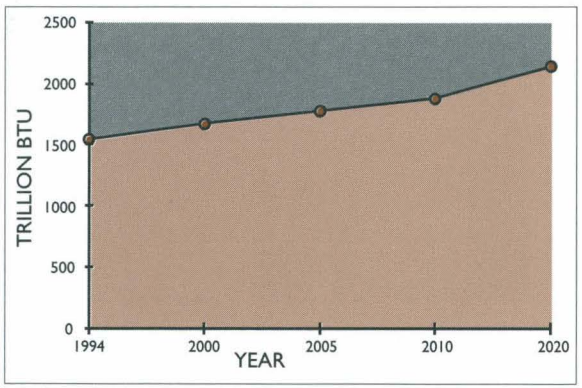
Total Energy Use by Mode.

Moderate Scenario

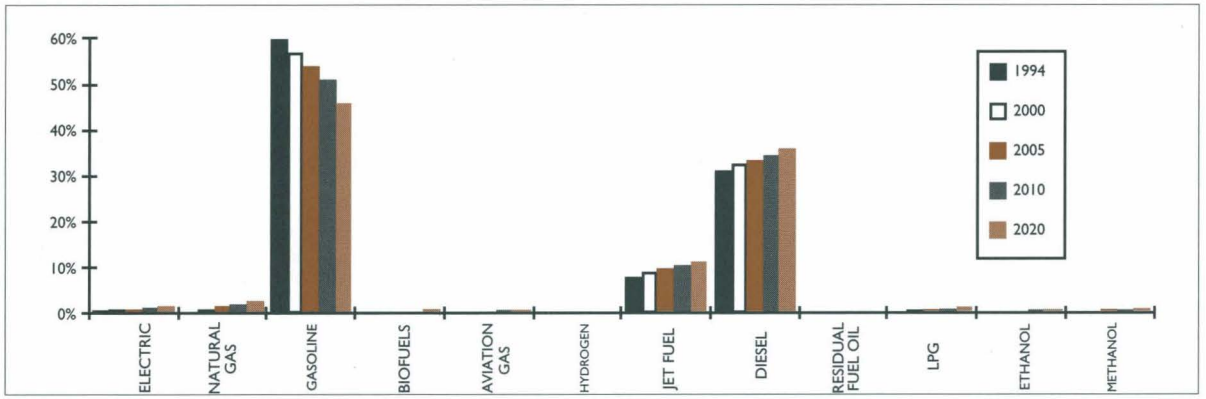
The objective of the Moderate Scenario is to investigate the potential impact of policies consisting primarily of transportation control measures, financial incentives, and technological innovations. This scenario assumes a moderate but steady increase in fuel efficiency for passenger vehicles and light trucks, but not for heavy trucks and other modes. This fuel efficiency improvement is a product of revenue-neutral financial incentives.

Feebates are a system of sales taxes and rebates on new vehicle purchases. For this scenario, a program of feebates is developed for automobiles and light trucks used only for passenger transportation. A steady improvement in vehicle fuel efficiency will lead to energy savings in the passenger transportation sector.

Accelerated Vehicle Retirement programs are similar to the feebate system. They offer a payment to owners of older, low-fuel-economy vehicles in order to induce them to scrap their vehicles in favor of newer, more fuel-efficient vehicles. In conjunction with feebates, accelerated vehicle retirement programs should yield a steady improvement in overall fuel efficiency for passenger transportation and a larger fleet of low- emission vehicles.



Moderate Scenario Total Energy Use by Year.



Moderate Scenario Percent Total Energy Use by Fuel Passenger & Freight Combined.

Employee Trip Reduction programs are required under this scenario for Texas cities with populations exceeding 200,000. The transportation control measures include work schedule changes, car- and van-pooling or other ridesharing, greater utilization of public transportation, and non-motorized transport.

Improved Public Transit is applied as a separate policy impacting large urban areas in Texas. Installing a transit system equivalent to that used in Portland, Oregon, in all of Texas' large urban areas yields a 39 percent increase in transit person-trips.

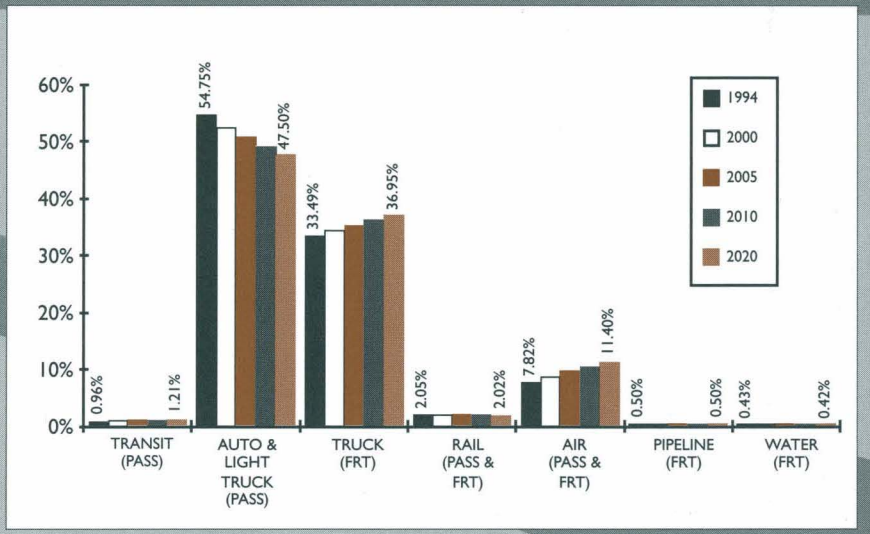
Telecommuting is applied to work trips in all Texas cities, large and small. Telecommuting reduces the number of vehicle-miles driven during a typical work week by shortening the commuting distance via a telecommuting regional center or by eliminating vehicle trips altogether. Telecommuting is only applicable to some work trips, which represent about 23 percent of local passenger-miles of travel.

Roadway System Optimization produces improved traffic flows, yielding higher speeds that are more fuel-efficient and less polluting. Specific optimization includes traffic management systems and improvements in traffic signalization and traffic operations.

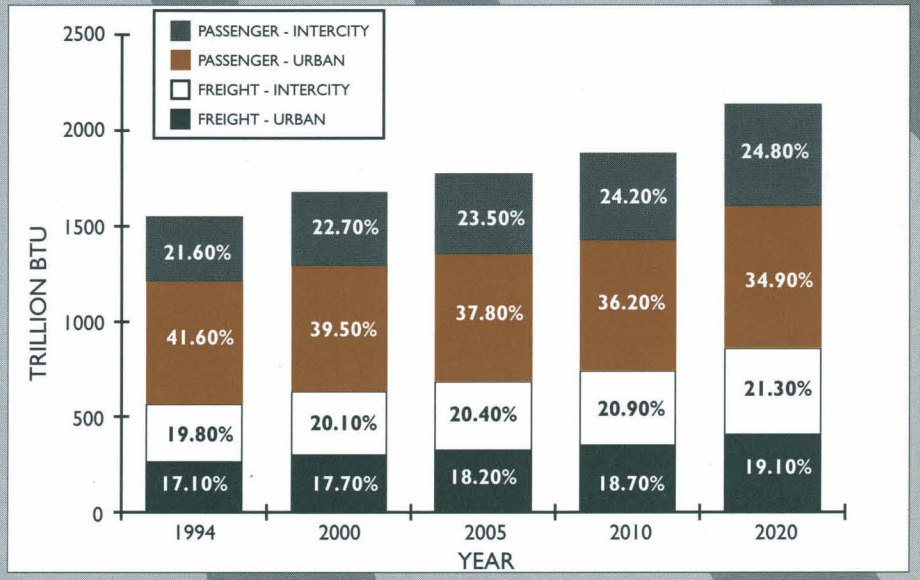
Increased Truck Size and Weight Limits for intercity commercial trucks should improve economies of scale for the trucking industry and result in fewer truck trips. This is partially off-set by reduced fuel economy, since truck weight is a major determinant of truck fuel consumption. However, these fuel economy losses should be more than off-set by productivity improvements in the industry.

Moderate Scenario Results

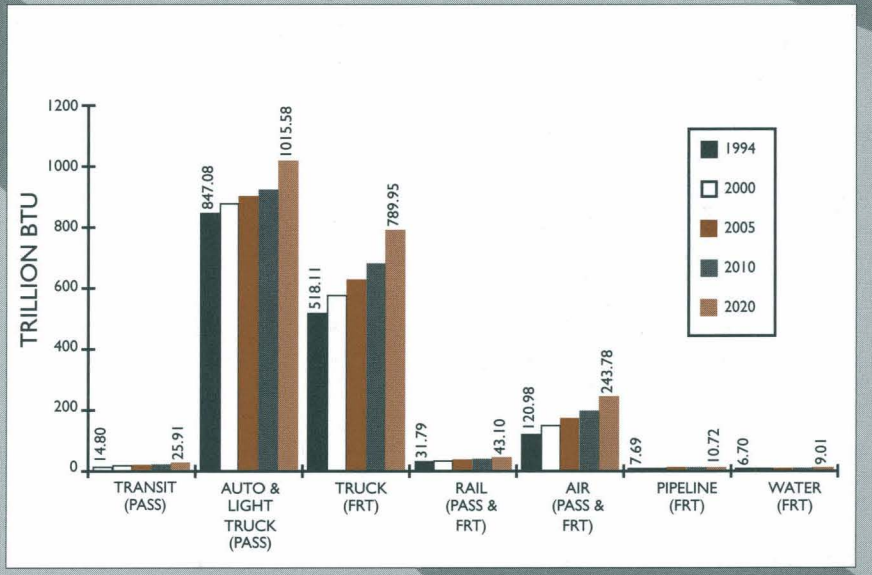
The total state energy consumption increases by 38% by 2020 (1,547 trillion BTU to 2,138 trillion BTU). Gasoline, diesel and jet fuels account for at least 90% of the total energy consumed by 2020. Within a given year, gasoline's share of the energy consumed by all fuel types steadily decreases from 60% to 46% due to increases in auto and light truck fuel efficiency and decreases in auto and light truck vehicle miles traveled relative to the Reference Scenario. Looking at the percent of total transportation energy use by area (large urban, small urban and intercity), intercity's portion gradually increases from 41% in 1994 to 46% in 2020, while the percent of total transportation energy use in large and small urban areas decreases. The percent of total transportation energy use by freight increases by 2020 from 37% to 40%, while the percent of total transportation energy use by passenger travel decreases from 63% to 60%.



Percentage of Total Energy Use by Mode.



Total Energy Use, Passenger vs. Freight.

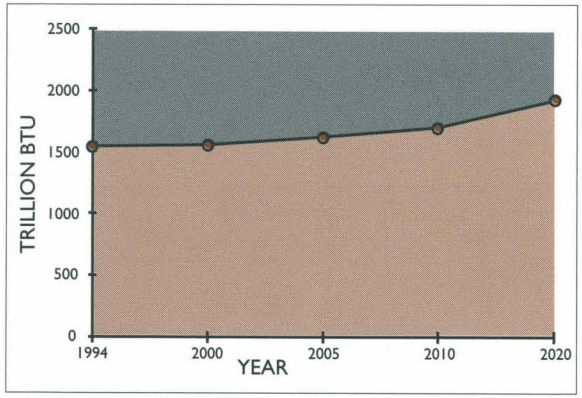


Total Energy Use by Mode.

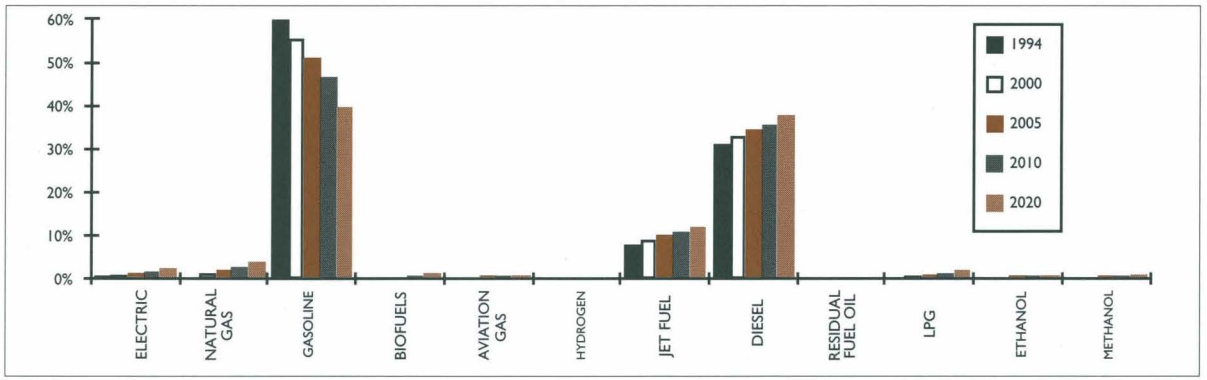
Aggressive Scenario

The primary thrust of the Aggressive Scenario is a comprehensive set of transportation pricing policies. It assumes that effective transportation pricing policies and related measures will lead consumers and freight haulers to make more efficient transportation decisions. This leads to significantly higher vehicle occupancy, shifts to telecommunication technology for all types of trips (not just work trips), shifts to more efficient freight modes, and the purchase of more efficient vehicles. The Aggressive Scenario also includes additional feebates and alternative-fuel mandates for urban truck freight transportation.

Pricing strategies impact all forms of surface transportation and may include travel taxes based on vehicle-miles traveled, congestion charges, Pay-As-You-Drive Insurance, and axle-weight distance taxes. These pricing measures shift a larger percentage of urban passenger transportation to higher-occupancy vehicles through such means as carpooling, vanpooling, and public transportation; teletravel for a larger share of urban trips, principally for work and shopping; and the purchase of more fuel-efficient or alternative-fueled vehicles. With more rational pricing of transportation, consumers will make more efficient choices.



Aggressive Scenario Total Energy Use by Year.



Aggressive Scenario Percent Total Energy Use by Fuel Passenger & Freight Combined.

The intercity freight component in this scenario is affected most significantly by axle-weight distance taxes. The axle-weight distance tax is a more rational economic basis for charging motor carriers. As a result of the current highway taxation system, trucks receive a large subsidy that results in less efficient freight movements and higher social costs.

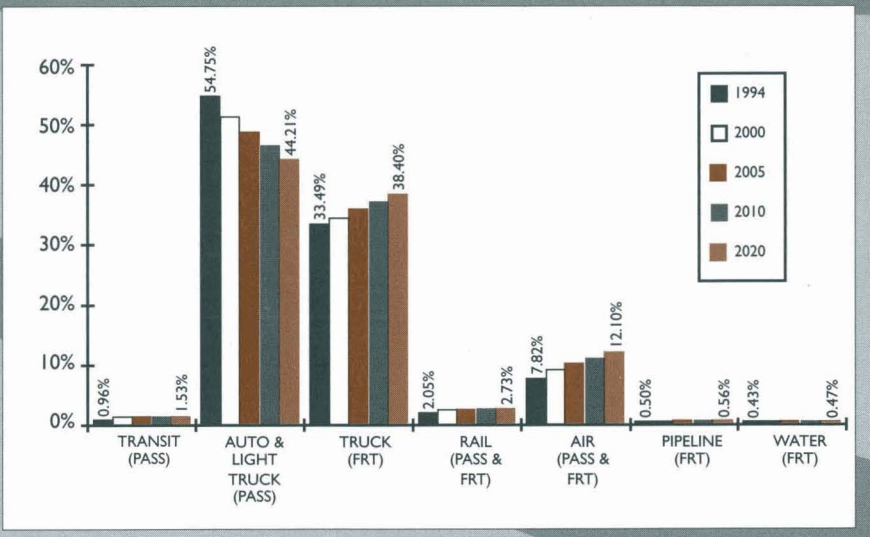
Charging motor carriers on the basis of their road consumption via an axle-weight distance tax makes the rail industry more competitive in the long-haul sector and takes advantage of the rail industry's more energy-efficient operations, on a ton-mile basis.

Expanded use of feebates is closely linked to pricing policies. In the Aggressive Scenario, feebates are constructed to provide additional revenues for funding other high-occupancy vehicle transportation improvements. The aggressive feebates include all motor vehicles, not just passenger cars. This yields additional efficiency improvements in urban freight transport through changes in freight fleet and logistics management.

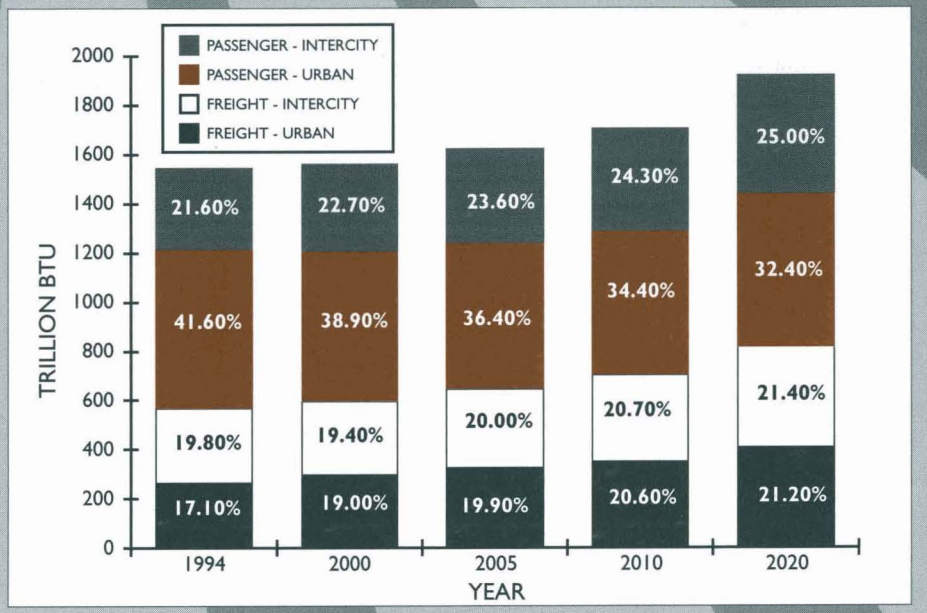
Alternative fuels for all urban freight transportation in cities with populations greater than 200,000 are required in the Aggressive Scenario. The direct effect of this measure is more energy-efficient freight vehicles. Because of higher transport costs, the freight sector will also implement measures to optimize fleet movements in order to remain competitive.

Aggressive Scenario Results

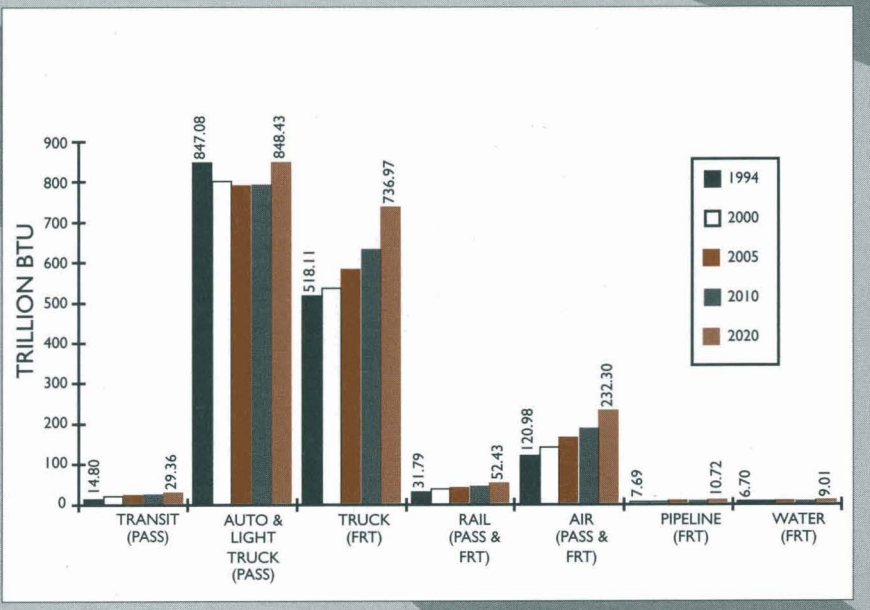
Implementation of the strategies in the Aggressive Scenario will lead to a 24% increase in overall energy use by 2020. Petroleum-based fuels will remain the fuel of choice, but at a much lower percentage. Intercity transportation's share of energy use increases significantly from 41% in 1994 to 46% in 2020. Auto and light truck passenger travel energy use actually decreases between 1994 and 2010 from 847 trillion BTU to 793 trillion BTU due to a combination of the policies implemented under this scenario. By 2020, the growth rate in passenger travel overtakes the improvements and the auto and light truck passenger travel energy use increases to 848 trillion BTU.



Percentage of Total Energy Use by Mode.



Total Energy Use, Passenger vs. Freight.

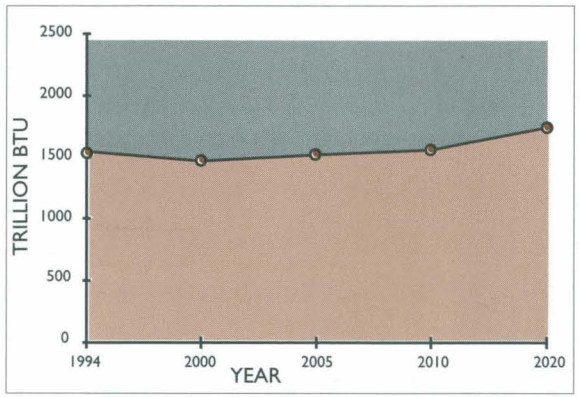


Total Energy Use by Mode.

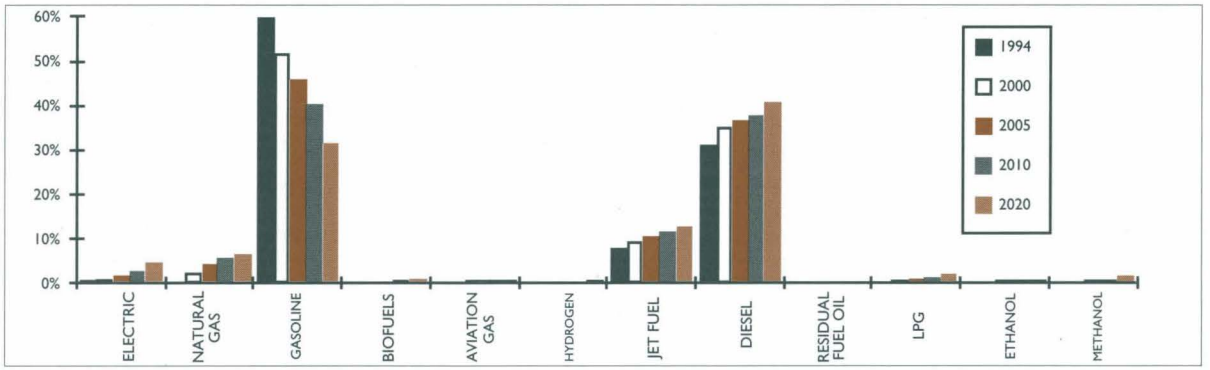
Visionary Scenario

The Visionary Scenario represents what can be accomplished in Texas with fundamental changes in the urban transportation environment and utilization of anticipated technological changes. The policies that would foster such a change include:

- Large-scale utilization of fuel-cell powered vehicles and electric vehicles
- Ambitious fuel economy standards
- Land use changes
- Teletravel
- High-speed rail and improved intercity bus service
- Full-cost pricing



Visionary Scenario Total Energy Use by Year.



Visionary Scenario Percent Total Energy Use by Fuel Passenger & Freight Combined.

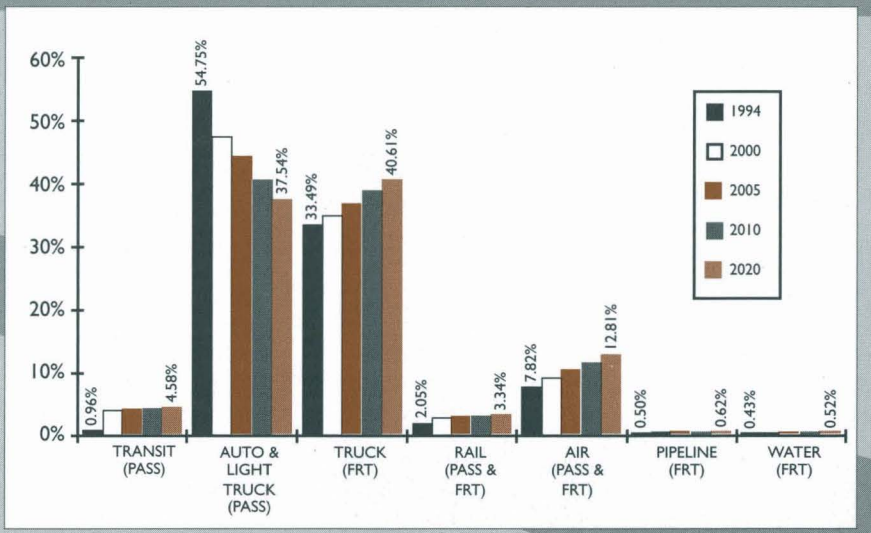
Central to this scenario is a fundamental change in the urban perspective. This is a long-term scenario which assumes that urban sprawl can be reduced and replaced by more dense communities wherein individuals will work, shop, and recreate.

Nearly all transportation in the urban environment can be provided by public transportation utilizing zero-emission vehicles and/or high-efficiency vehicles including non-motorized transport. Teletravel (i.e., telecommuting, teleshopping, etc.) would be widely used. Intercity travelers would rely less on the automobile and airlines and more on high speed rail and intercity buses. Business passenger travel via air would be less frequent through expanded use of teleconferencing. Freight operations would become much more efficient through full-cost pricing mechanisms, an extension of the aggressive pricing policies. Full-cost pricing is a method of charging that includes the cost of externalities like pollution.

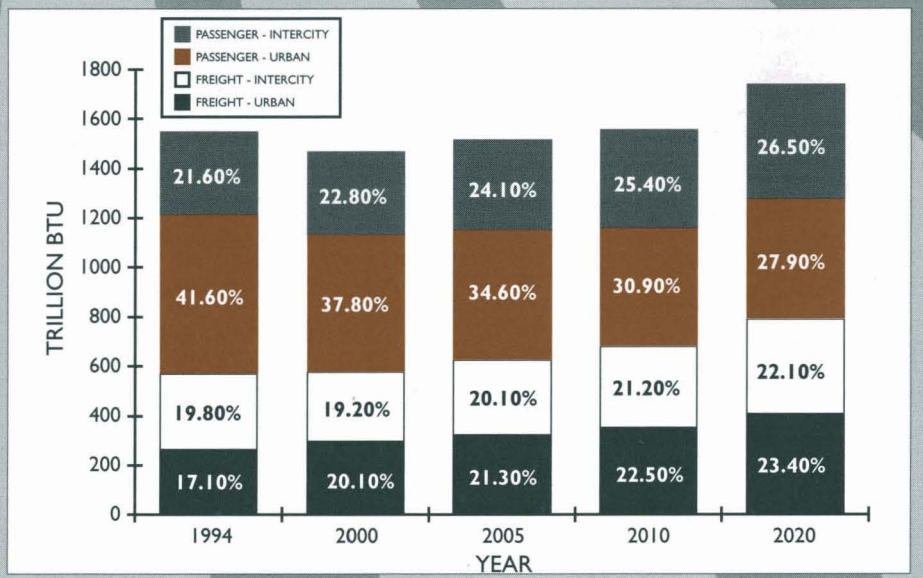
The Visionary Scenario represents a fundamental change in the way we see our communities. The operative element of the transportation system is a shift from mobility to accessibility. A community planned around the principal of access is more conducive to an energy-efficient and environmentally sensitive transportation system.

Visionary Senario Results

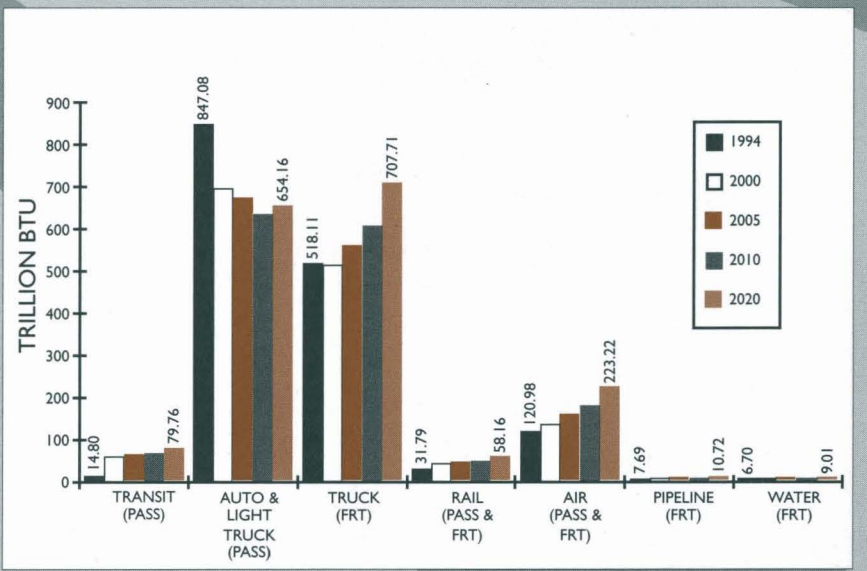
Total state transportation sector energy use decreases slightly between 1994–2010, but increases in the year 2020 by 11% as growth in passenger and freight travel eventually overtake the energy saving policies implemented. Petroleum-based fuels continue to dominate total transportation energy use in the state, but there are significant increases in alternative fuel use. Intercity energy use increases from 41% in 1994 to 49% in 2020, while urban energy use decreases from 59% to 51%. Passenger energy use decreases from 63% in 1994 to 54% in 2020, while freight energy use increases from 37% in 1994 to 46% in 2020. Modal comparison of state transportation energy use shows auto and light truck passenger energy use decreasing by 23% between 1994–2020, while truck freight energy use increases by 27% during the same period.



Percentage of Total Energy Use by Mode.



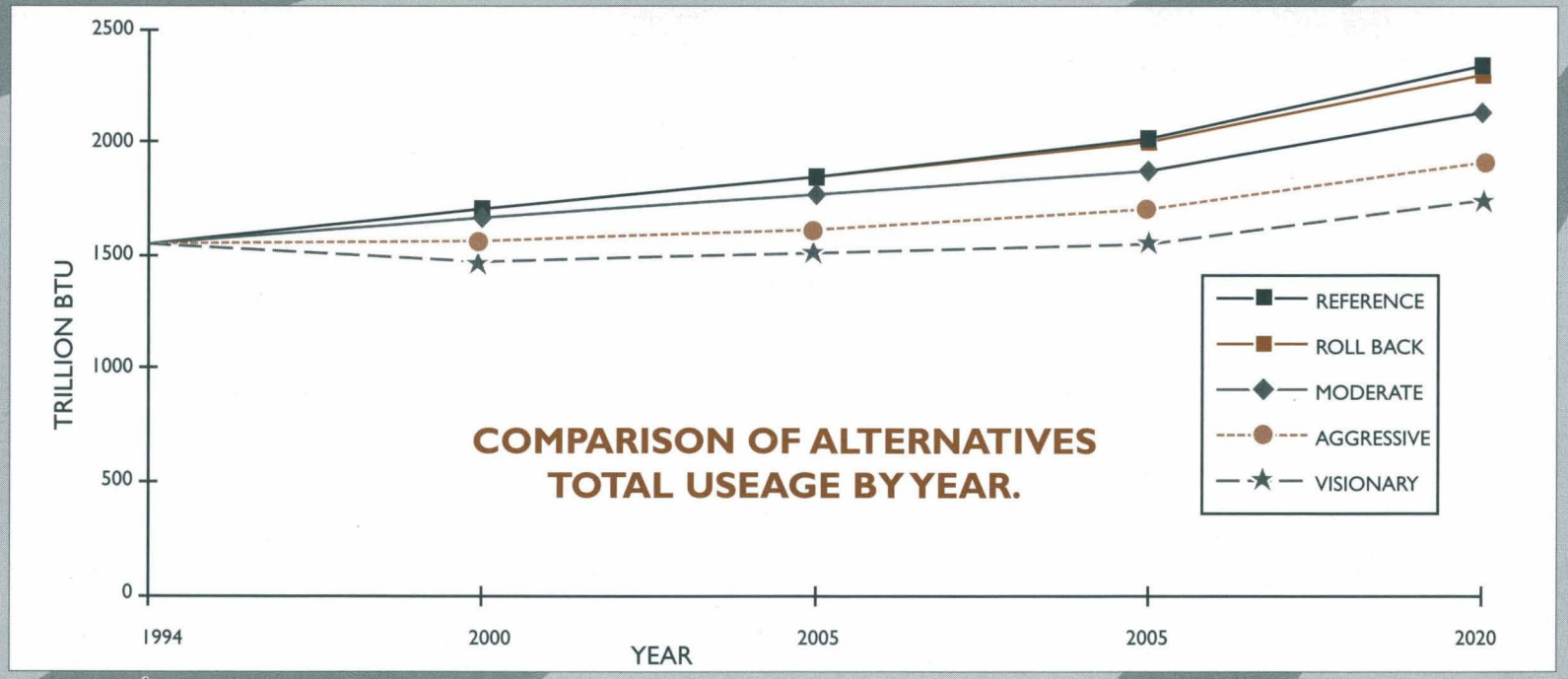
Total Energy Use, Passenger vs. Freight.

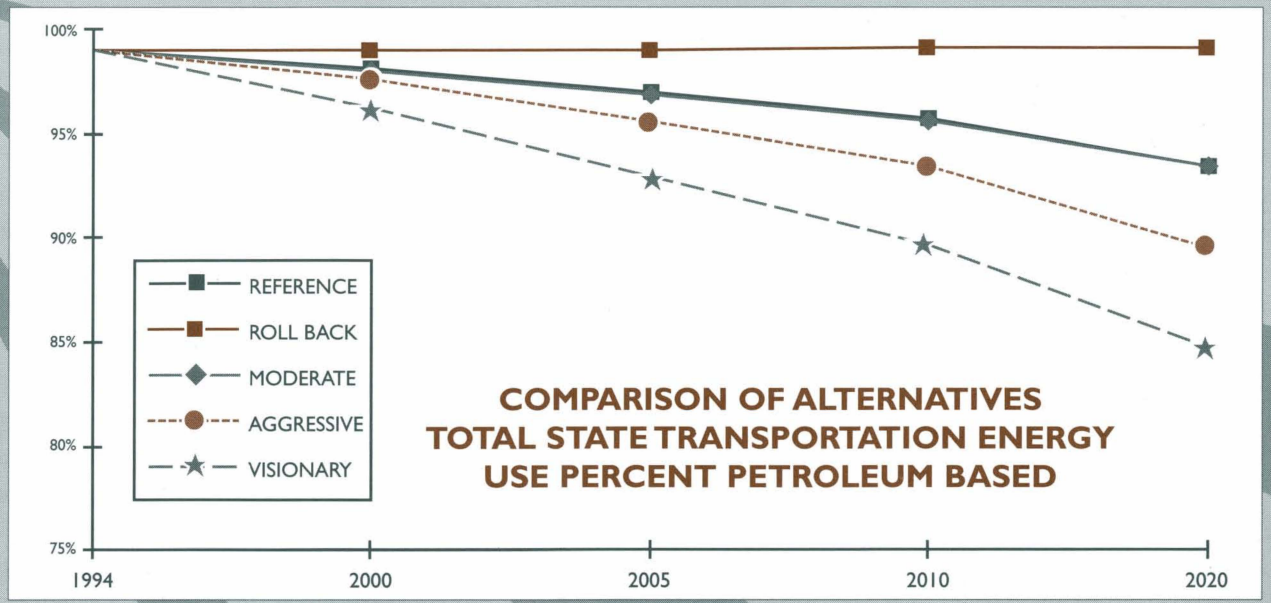


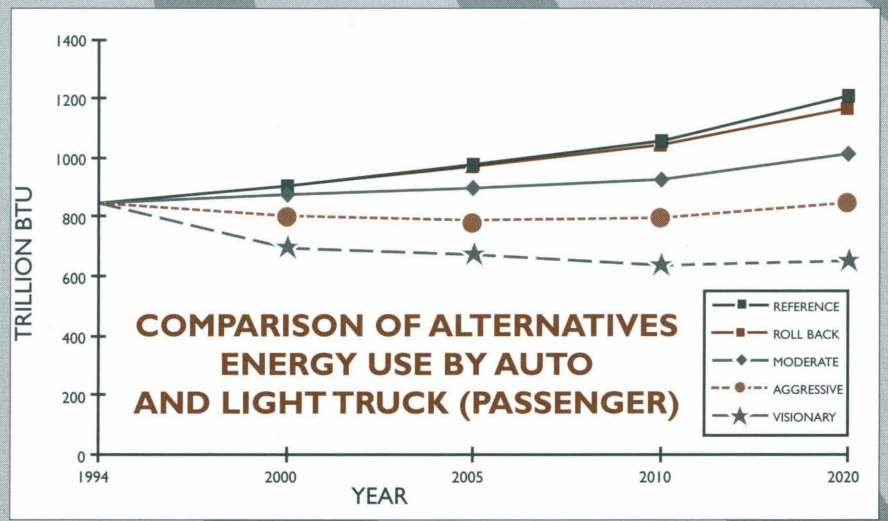
Total Energy Use by Mode.

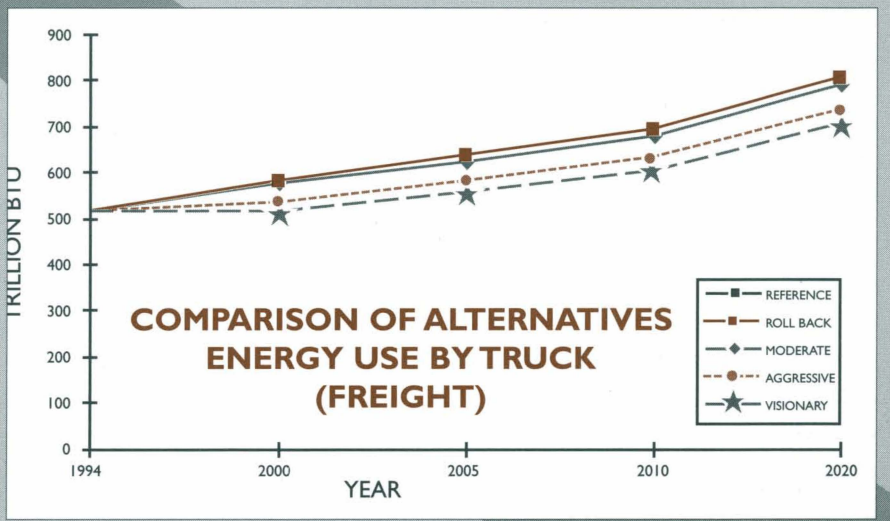
Comparison of Scenarios

Comparison of the results of the various scenarios evaluated shows their relative impacts on state transportation energy consumption. Total transportation energy consumption under the Rollback Scenario is slightly higher than the Reference Scenario, as expected, due to the rolling back of alternative fuel policies. The Moderate, Aggressive, and Visionary Scenarios progressively reduce energy consumption in the state's transportation sector. The percentage of energy consumption in the state's transportation sector with petroleum-based fuels (gasoline, diesel, jet fuel, aviation gas, and residual fuel oil) decreases for each scenario evaluated except the Rollback Scenario. By the year 2020, alternative fuels are providing about 16% of the energy needs for the state's transportation sector in the Visionary Scenario; 11% in the Aggressive Scenario; and about 7% in the Moderate and Reference Scenarios. Energy consumption by auto and light truck passenger travel is reduced progressively with the Moderate, Aggressive, and Visionary Scenario policies relative to the Reference Scenario. Energy consumption by truck freight shows similar trends, but the policies enacted by the various scenarios have less of an impact on truck freight energy use than on auto and light truck passenger travel.




100%
95%
90%
85%
80%
75%
1994
2000
2005
2010
2020
REFERENCE
ROLL BACK
MODERATE
AGGRESSIVE
VISIONARY
COMPARISON OF ALTERNATIVES
TOTAL STATE TRANSPORTATION ENERGY
USE PERCENT PETROLEUM BASED


TRILLION BTU
1400
1200
1000
800
600
400
200
0
1994
2000
2005
2010
2020
YEAR
REFERENCE
ROLL BACK
MODERATE
AGGRESSIVE
VISIONARY
COMPARISON OF ALTERNATIVES
ENERGY USE BY AUTO
AND LIGHT TRUCK (PASSENGER)


TRILLION BTU
900
800
700
600
500
400
300
200
100
0
1994
2000
2005
2010
2020
YEAR
REFERENCE
ROLL BACK
MODERATE
AGGRESSIVE
VISIONARY
COMPARISON OF ALTERNATIVES
ENERGY USE BY TRUCK
(FREIGHT)

GLOSSARY

BTU (British Thermal Unit). A standard unit of energy, defined as the amount of heat required to raise one pound of water one degree Fahrenheit. One BTU corresponds roughly to the heat produced by one kitchen match.

Clean Air Act Amendments of 1990. Landmark federal legislation which represents the most substantial modification of the original Clean Air Act since 1970. The Clean Air Act Amendments of 1990 take an aggressive and comprehensive approach to urban air pollution by implementing extensive new provisions. They identify mobile sources (vehicles) as primary sources of pollution and call for stringent new requirements in metropolitan areas and states where attainment of National Ambient Air Quality Standards is or could be a problem.

Congestion Mitigation and Air Quality Improvement (CMAQ) Program. A program created by ISTEA to combat transportation-related air pollution in nonattainment areas. The program contemplates funding of approximately $6 billion over six years for projects such as transportation control measures or transit projects that contribute to attainment of air quality standards.

High-Occupancy Vehicle (HOV). A carpool, vanpool, or bus carrying enough people to travel in the HOV or Diamond Lane.

Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). Signed into law on December 18, 1990, the Intermodal Surface Transportation Efficiency Act implemented broad changes in the way transportation decisions are made by emphasizing diversity and balance of modes and preservation of existing systems over construction of new facilities, especially roads, and by proposing a series of social, environmental, and energy factors that must be considered in transportation planning, programming, and project selection. Included within ISTEA is the CMAQ program which targets projects in air quality nonattainment areas.

Intelligent Transportation Systems (ITS). Generally refers to the advanced technology applications that automate highway and vehicle systems to enable the more efficient and safer use of existing highways.

Intermodal. Refers to transfer facilities where freight or passengers change modes of transport. For example, an airport is an intermodal facility where freight and passengers make intermodal transfers between motorized vehicles and airplanes.

Mode. A form of transport. For example, airplanes and trains are both transportation modes.

Multimodal. Refers to a plan or program that accounts for the needs and/or trends of multiple modes. The Texas Transportation Plan is an example of a multimodal plan.

National Ambient Air Quality Standards (NAAQS). Air quality standards set up by the Environmental Protection Agency to help mitigate the health impacts of air pollution. National Ambient Air Quality Standards exist for six pollutants: carbon monoxide, ozone, particulate matter, lead, sulfur dioxide, and nitrous oxide.

Nonattainment Area. A nonattainment area does not meet National Ambient Air Quality Standards.

Passenger Miles Traveled (PMT). A measure of transportation system use reflecting the number of miles traveled multiplied by the total number of passengers.

Telecommuting. The substitution of electronic or telephone systems for traditional forms of transportation. A person using a personal computer at home or at a neighborhood work station, that is linked by a modem or facsimile machine to his or her work place or co-workers, is telecommuting: electronically substituting a journey to work. This can also apply to other travel substitutions, for example teleshopping, teleconferencing, telemedicine, etc.

Teletravel. The substitution of electronic or telephone systems for traditional forms of transportation. Any substitution of electronic communication for a journey. This can apply to any travel substitution, for example teleshopping, teleconferencing, telemedicine, telecommuting, etc.

Texas Coastal Waterway Act of 1975. Texas law passed in 1975 which authorized the state to serve as the nonfederal sponsor of the Gulf Coast Intracoastal Waterway from the Sabine River to the Brownsville Ship Channel. The nonfederal sponsorship of the waterway furthers the state policy to support the marine commerce and economy of the state by providing for the shallow draft navigation of the state's coastal waters in an environmentally sound fashion.

Transportation Control Measures (TCM). Transportation control measures are implemented to enable nonattainment areas to meet emissions goals.

Transportation Demand Management (TDM). Transportation Demand Management measures reduce the proportion of person-trips by single-occupancy vehicle. They can include promotion of alternative modes of transportation, car and van-pool formation assistance, transit subsidies, and other measures.

Transportation Management Area (TMA). Under the Intermodal Surface Transportation Efficiency Act, any urban area over 200,000 population is automatically a Transportation Management Area, which subjects it to additional planning requirements but also entitles it to funds earmarked for large urbanized areas under ISTEA.

Transportation System Management (TSM). TSM improves the flow of traffic through traffic signal synchronization, freeway on-ramp signals, the construction of high-occupancy vehicle (HOV) lanes, left turn restrictions, and other measures.

Vehicle Miles Traveled (VMT). A measure of transportation system use reflecting the number of miles traveled by a vehicle.

Zero Emission Vehicle (ZEV). A vehicle with no tailpipe emissions. For example, an electric vehicle is a zero emission vehicle.

Information available from the Texas Sustainable Energy Council

The Texas Sustainable Energy Development Council has commissioned numerous projects and studies relating to renewable energy and energy efficiency in Texas. Instant public access to these information sources, news releases, and planned activities of the SEDC are available to anyone with a computer, modem, and Internet capability, as detailed below:

MOSAIC for WINDOWS

- Enter MOSAIC through Windows
- Select OPEN URL form the file menu
- Enter the URL: http://sedc.twdb.texas.gov FTP
- Type ftp sedc.twdb.texas.gov
- Enter the word anonymous for the user ID
- Enter your E-mail address for the password
- Data is located in: /pub/sedc directory

The full report, *Texas Transportation Energy Savings*, contains detailed information on all aspects of energy efficiency in the Texas transportation sector. Also, the *Proceedings for the Transportation Efficiency Roundtable* conducted in April 1995 by the SEDC is available upon request. For more information, contact the SEDC at (512) 463-1745.

To request a copy of this document in an alternative format, contact the Sustainable Energy Development Council at 512-463-1745, or through RELAY Texas at 1-800-735-2989. Mail your requests to 1700 North Congress Avenue, Room 620, Austin, Texas 78701-1495.

FINANCIAL ACKNOWLEDGMENT

This publication was developed as part of the Texas sustainable Energy Development Council's Alternative Energy Program which is funded 100% by oil overcharge funds from the Stripper Well Settlement, as administered by the State and approved by the U.S. Department of Energy.

SEDC Vision Statement

The Texas Sustainable Energy Council envisions a Texas responsibly powered by its sustainable energy resource base and serving as a model to others in equitable prosperity, environmental health, advanced technology, innovative government and respect for future generations.