

# The Texas Story

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DOE National Workshop on State Energy  
Codes

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# Themes

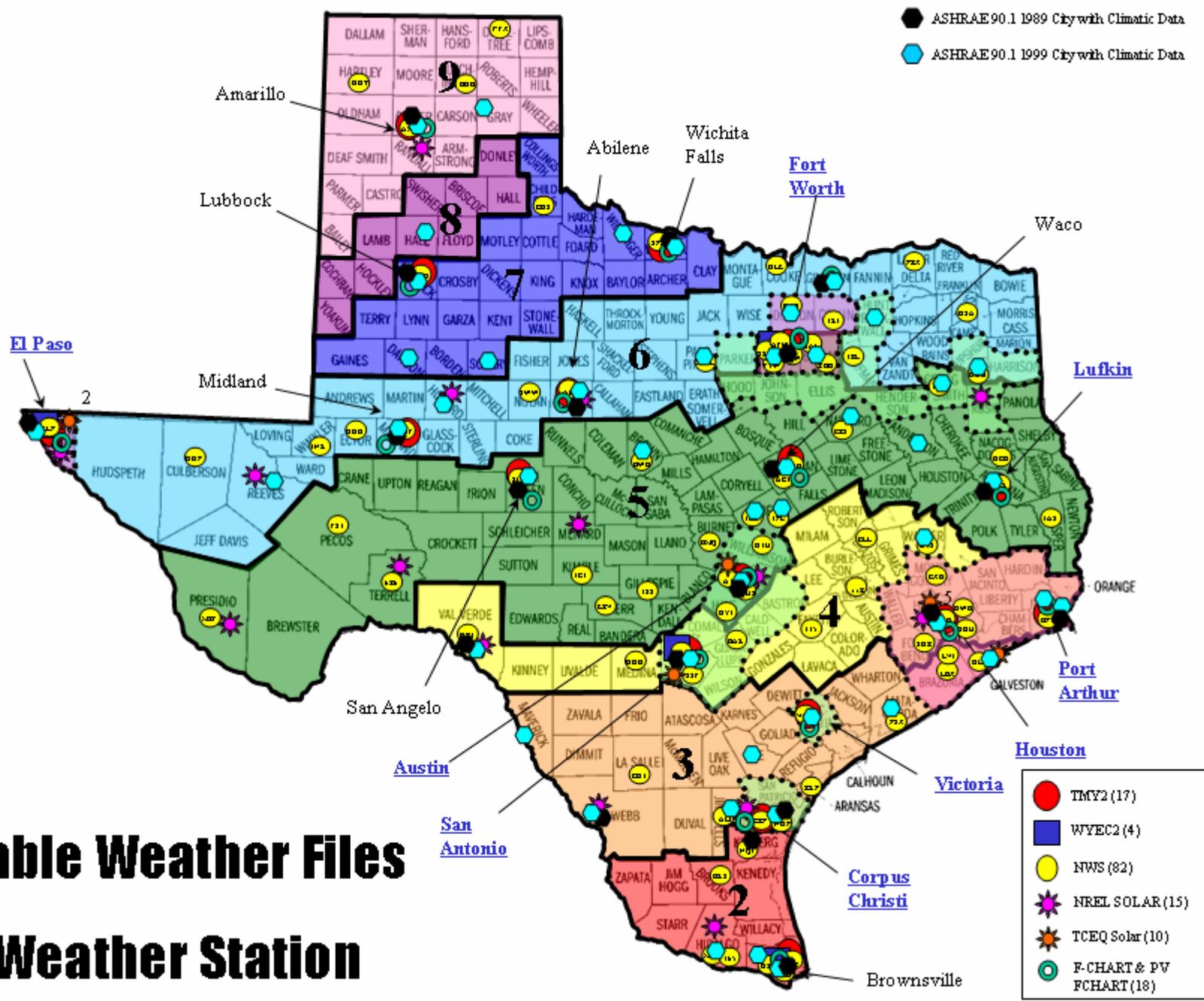
- Passion
- Partnerships
- Potential for Economic Development

# A Story in 3 Parts

- Identity
- Pursuit of Energy Code Adoption
- And then?

# Identity

The background of the slide is a smooth blue gradient. On the left side, there is a bright, glowing area that resembles a sun or moon reflecting on a body of water, creating a shimmering effect that fades into the rest of the blue background.



# Available Weather Files & Weather Station





TIME ZONES

764 MILE LINE

## CONTINENTAL LOCATION OF TEXAS

A time zone is an area in all parts of which the same time is kept, to prevent the confusion of many local local times. Because the 360° round earth rotates once every 24 hours, or 15° every hour, standard time zones are based on meridians divisible by 15, i.e., 15° W., 30° W., 45° W., etc. Within a time zone extending 7½° east and west of each time meridian the time is the same, and times in adjacent zones differ by exactly one hour. Deviations from this system have been made for physiographic, economic and political reasons. Hence, the United States time zones depart widely from the mathematical system. The United States uses seven time zones: Eastern (75° W.), Central (90° W.), Mountain (105° W.), Pacific (120° W.), Yukon (135° W.), Alaska-Hawaii (150° W.), and Spring (165° W.).

Scale 1:18,000,000  
One inch equals 293 miles  
0 100 200 300 400 miles  
0 100 200 300 400 kilometers

Any point on this line is approximately 382 miles (613 kilometers) from the nearest point in Texas. The great circle distance from El Paso, Texas, to Orange, Texas, is 764 miles.

# A Large Landscape

- Area
  - 268,581 square miles. The state's area consists of 261,797 square miles of land and 6,784 square miles of water.

Facts from “Texas Almanac 2004-2005”, The Dallas Morning News Co.

# A Large Landscape

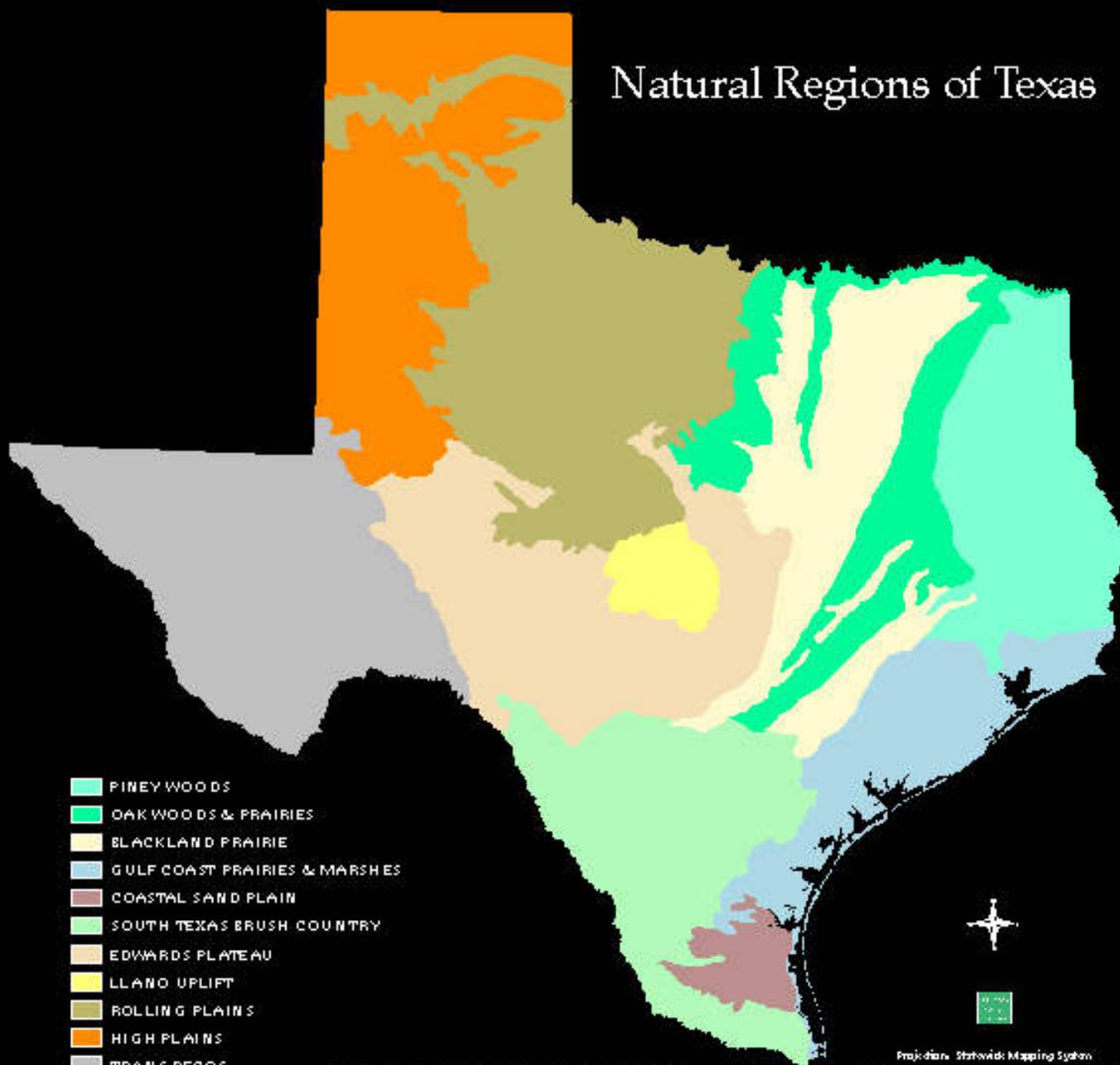
- **Boundary Lines.** The boundary of Texas by segments, including only larger river bends and only the great arc of the coastline, is as follows:
  - Rio Grande -- 889.0 Miles
  - Coastline -- 367.0 Miles
  - Sabine River, Lake and Pass -- 180.0 Miles
  - Sabine River to Red River -- 106.5 Miles
  - Red River -- 480.0 Miles
  - East Panhandle line -- 133.6 Miles
  - North Panhandle line -- 167.0 Miles
  - West Panhandle line -- 310.2 Miles
  - Along 32nd parallel -- 209.0 Miles
  - **Total -- 2,842.3 Miles**

(Note: Following the smaller meanderings adds about another 1,000 miles of boundary line!)

# A Large Landscape

- Length and Breadth:
  - Longest straight-line distance in a general north-south direction is 801 miles.
  - Greatest east-west distance is 773 miles.

# Natural Regions of Texas



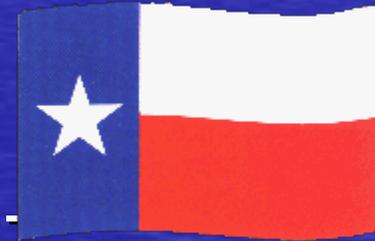
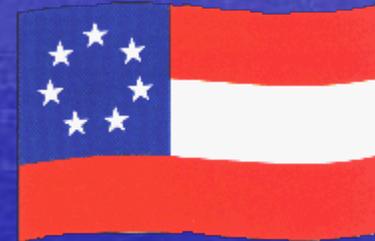
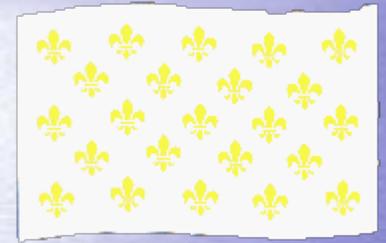
# Natural Regions of Texas

- THE PINEY WOODS 35-50" annual rainfall. 23,500 sq. mi.
- THE OAK WOODS AND PRAIRIES 35-45" annual rainfall. 19,500 sq. mi.
- THE BLACKLAND PRAIRIES 30-40" annual rainfall. 25,500 sq. mi.
- THE GULF PRAIRIES AND MARSHES 20-50" annual rainfall. 21,000 sq. mi.
- COASTAL SAND PLAINS 35-45" annual rainfall. 4,000 sq. mi.
- SOUTH TEXAS BRUSH COUNTRY 16-35" annual rainfall. 28,000 sq. mi.
- THE EDWARDS PLATEAU 15-33" annual rainfall. 31,000 sq. mi.
- THE LLANO UPLIFT 30" annual rainfall. 5,000 sq. mi.
- THE ROLLING PLAINS 22-30" annual rainfall. 43,500 sq. mi. square miles
- THE HIGH PLAINS 15-21" annual rainfall. 34,500 sq. mi.
- THE TRANS PECOS Less than 12" annual rainfall. 38,000 sq. mi.

# A Rich History

The flags of six nations have flown over Texas.

- Spain (1519-1685; 1690-1821)
- France (1685-1690)
- Mexico (1821-1836)
- Republic of Texas (1836-1845)
- Confederate States of America (1861-1865)
- United States of America (1845-1861; 1865- )



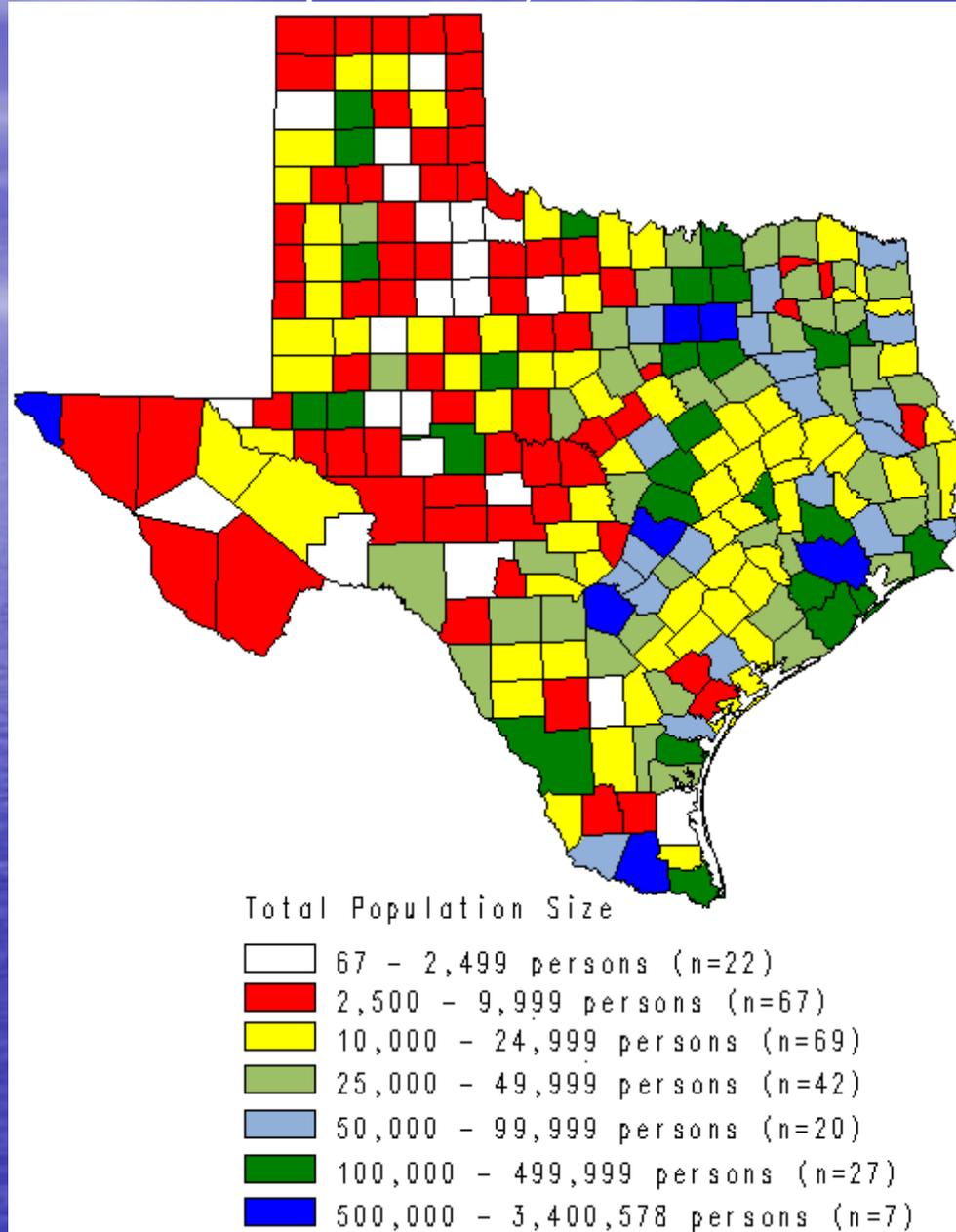
# Total Population and Percent Population Change in Texas and the United States, 1850-2004

Year*	Total Population		Percent Change	
	Texas	U.S.	Texas	U.S.
1850	212,592	23,191,876	---	---
1860	604,215	31,443,321	184.2	35.6
1870	818,579	39,818,449	35.5	26.6
1880	1,591,749	50,155,783	94.5	26.0
1890	2,235,527	62,947,714	40.4	25.5
1900	3,048,710	75,994,575	36.4	20.7
1910	3,896,542	91,972,266	27.8	21.0
1920	4,663,228	105,710,620	19.7	14.9
1930	5,824,715	122,775,046	24.9	16.1
1940	6,414,824	131,669,275	10.1	7.2
1950	7,711,194	150,697,361	20.2	14.5
1960	9,579,677	179,323,175	24.2	19.0
1970	11,196,730	203,302,031	16.9	13.4
1980	14,229,191	226,545,805	27.1	11.4
1990	16,986,510	248,709,873	19.4	9.8
2000	20,851,820	281,421,906	22.8	13.2
2004	22,490,022	293,655,404	7.9	4.3

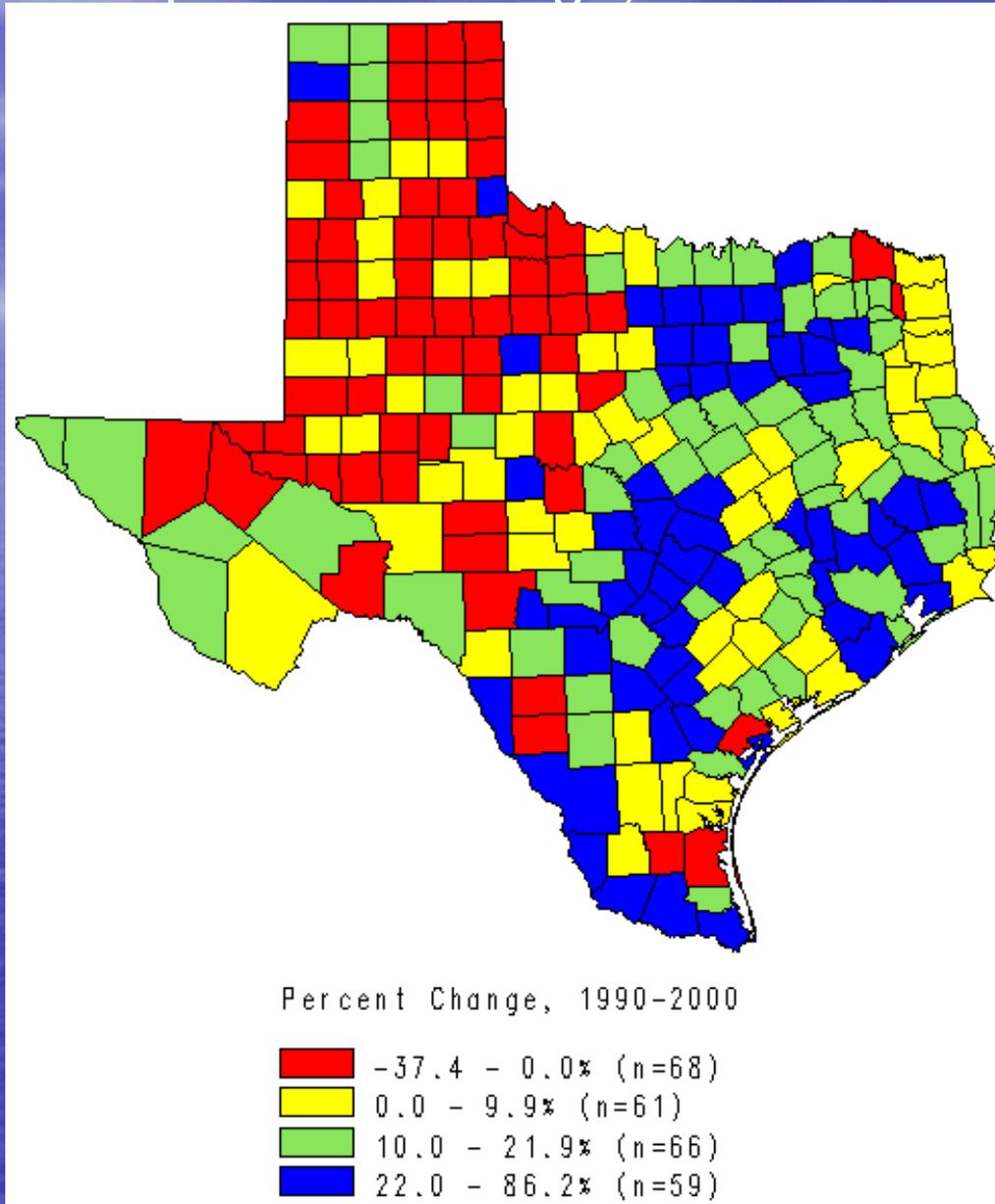
\* All values for the decennial dates are for the indicated census year. Values for 2004 are as estimated by the U.S. Bureau of the Census.

Source: Derived from U.S. Bureau of the Census Estimates for dates indicated by the Texas State Data Center, University of Texas at San Antonio

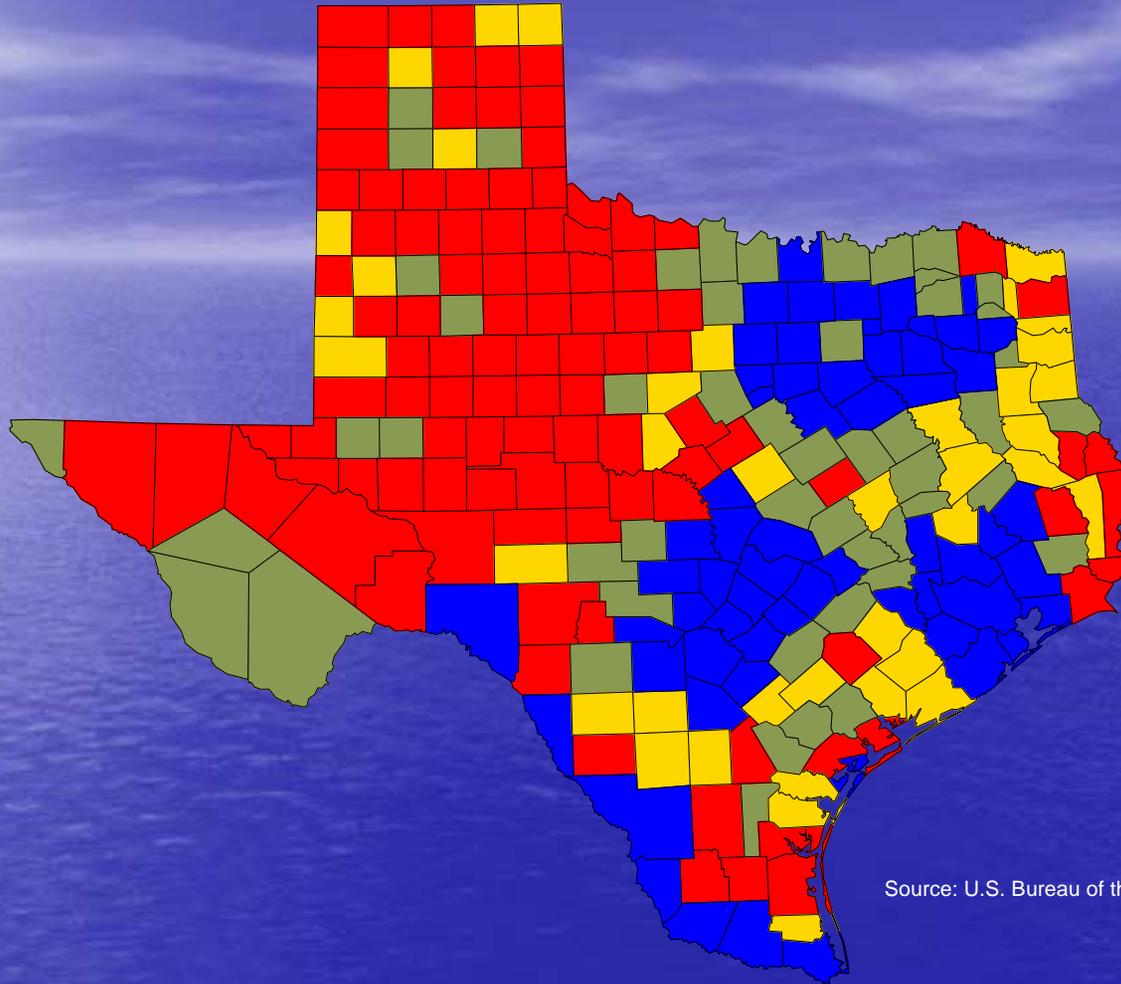
# Total Population, 2000 Census



# Population Change, 1990-2000

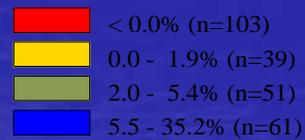


# Population Change in Texas Counties, 2000-2004



Source: U.S. Bureau of the Census, 2004 County Estimates

Percent Change 2000-2004



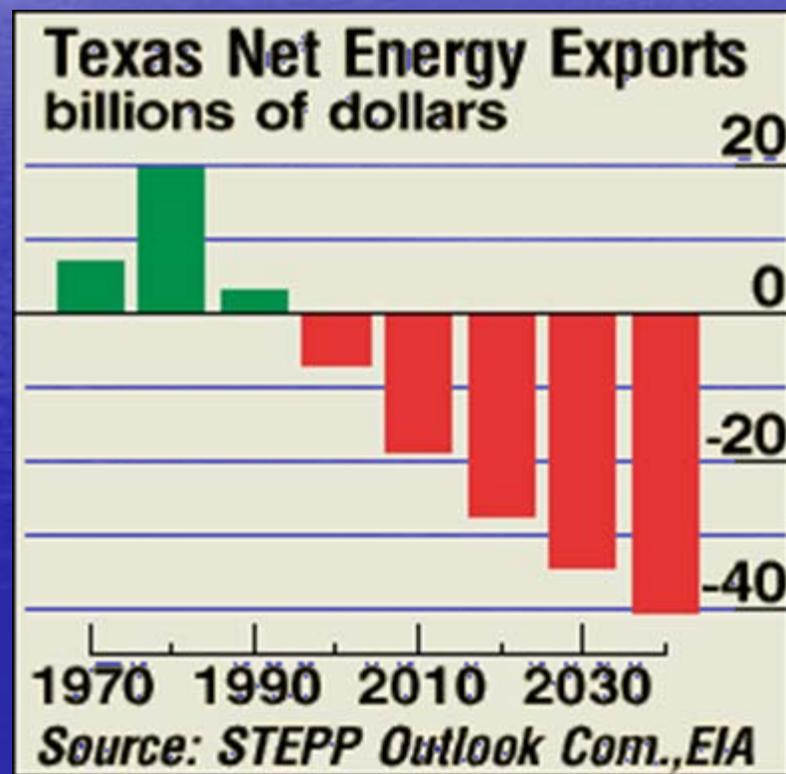
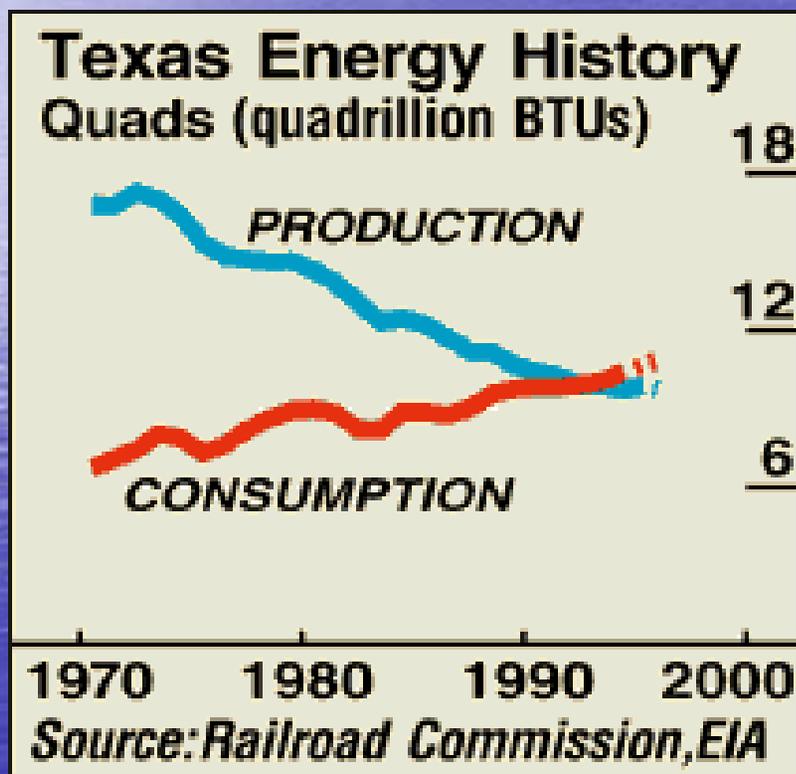
# Texas Rank Among States on Selected Characteristics of Race/Ethnicity Groups

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<b>Group</b>	<b>Texas Value</b>	<b>Texas Rank</b>	<b>Comparison Areas</b>
<b><u>By Size in 2000</u></b>			
<b>Anglo</b>	<b>11,074,716</b>	<b>3</b>	<b>California; 17.0 million New York; 12.5 million</b>
<b>Black</b>	<b>2,421,653</b>	<b>2</b>	<b>New York; 2.9 million</b>
<b>Hispanic</b>	<b>6,669,666</b>	<b>2</b>	<b>California; 11.0 million</b>
<b>Other</b>	<b>685,785</b>	<b>4</b>	<b>California; 4.2 million New York; 1.2 million Hawaii; 733,000</b>

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# Changing Energy Balance



Source: Virtus Energy Report on [www.infinitepower.org](http://www.infinitepower.org)

# The Texas Identity

- BIG!
- Independent
- Diverse
- Intent on diversifying future options
- Attracted to new frontiers

# Pursuit of Energy Code Adoption



©TxDOT

# Pursuit of Energy Code Adoption

- Pre-2001
  - Standards for state buildings only (SECO)
  - 1999 electric deregulation (SB 7, 76th TX Leg.)
  - DFW regional code coordination
  - DFW SIP
- 2001
  - SB 5 (77th) adopts IRC/IECC
  - Inside/Outside municipalities

# Standards for State Buildings

- Following Chapter 447 of the Texas Government Code, SECO adopted, by rule, a Texas Design Standard for *state-funded non-residential* buildings of state agencies and institutions of higher education, based on an adaptation of ASHRAE 90.1-1989, in 1993.
  - SECO adopted, by rule, current version (2001) of ASHRAE 90.1 as the Texas Design Standard in 2002.
- SECO adopted the 1993 CABO MEC for *state-funded residential* buildings in 1995.
  - SECO adopted 2000 IECC for *state-funded* residential buildings in 2002.

# DOE Support for Texas Energy Code Proposals Through SECO

- DOE Special Projects-1996 -- \$64,000
- DOE Special Projects-1997 -- \$74,000
- DOE Special Projects-1999 -- \$150,000
- DOE Special Projects-2001 -- \$190,000
- DOE Special Projects-2002 -- \$100,000
- DOE Special Projects -2003 -- \$200,000
- DOE Special Projects-2004 -- \$57,440
- SECO PVE Funds -2005 -- \$58,300 (supplement residential & commercial training)

# Texas Building Energy Institute

- A partnership model
- Program of the Texas Energy Coordination Council (state agency)
- Collaboration between public universities, utilities, trade associations, state agencies, non-governmental organizations
- 1997 Special Project Proposal/Award-  
"widespread promotion of MEC" – Dr. Jerry Matthews

# 1998 IECC - Oh, the South! (SHGC)

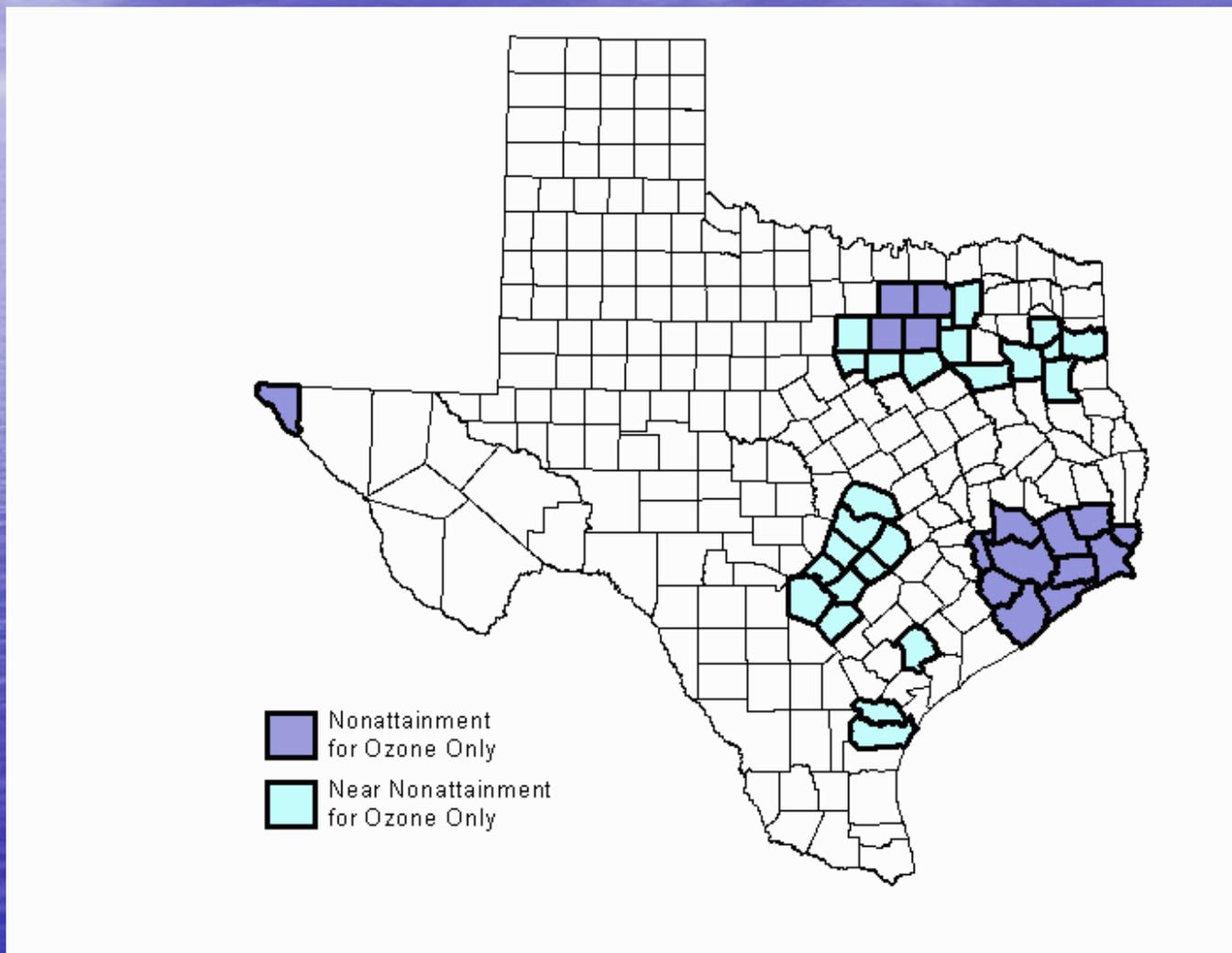


Rose Palmisano / The Albuquerque Journal

# Critical Context

- Air Quality
  - Major cities in non-attainment of standards
  - SIP commitments to improving efficiency
    - Houston-Galveston
    - Dallas/Fort Worth
- Electric deregulation (SB 7, 76<sup>th</sup> TX Leg., 1999)
  - Regulated transmission and distribution utilities: 10% of planned growth must come from efficiency
    - Standard offer programs
    - Limited, targeted market transformation programs

# Non- and Near-non-Attainment



# What Happens in These Counties?

- 70% of state's population
- 76.4% of aggregate employment
- 83.4% of personal income
- 83% of Gross State Product
- 85% of Texas manufacturing activity

Data Source: The Perryman Group. *The Importance of Maintaining A Proper State Implementation Plan (SIP) to Address Air Quality Issues in Texas: An Economic and Fiscal Impact Assessment*. November 2002.

# Expansion Restrictions (10 yr.)

- Direct only
  - \$438.4 billion in Total Expenditures
  - \$150.2 billion in Gross Product
  - \$84.2 billion in Personal Income
  - 1,758,847 Permanent Jobs
  - \$7.2 billion in State Revenue
- Including other sectors
  - \$586.6 billion in Total Expenditures
  - \$219 billion in Gross Product
  - \$126.8 billion in Personal Income
  - 2,7514,02 Permanent Jobs
  - \$10.6 billion in State Revenue

Data Source: The Perryman Group. *The Importance of Maintaining A Proper State Implementation Plan (SIP) to Address Air Quality Issues in Texas: An Economic and Fiscal Impact Assessment*. November 2002.

# Lost Highway funds (1 yr.)

- During Construction
  - \$3.6 billion in Total Expenditures
  - \$1.7 billion in Gross Product
  - \$1.1 billion in Personal Income
  - 27,122 Person-years of Employment
  - \$88.6 million in State Revenue
- After Construction
  - \$464.3 million in Total Expenditures
  - \$238.3 million in Gross Product
  - \$145 million in Personal Income
  - 4,830 Permanent Jobs
  - \$13.1 million in State Revenue

Data Source: The Perryman Group. *The Importance of Maintaining A Proper State Implementation Plan (SIP) to Address Air Quality Issues in Texas: An Economic and Fiscal Impact Assessment*. November 2002.

# Costs: 10 Year Simulation

- “Low” Scenario
  - NPV of State Revenues  
\$23.993 billion
- “High” Scenario
  - NPV of State Revenues  
\$35.667 billion

Data Source: The Perryman Group. *The Importance of Maintaining A Proper State Implementation Plan (SIP) to Address Air Quality Issues in Texas: An Economic and Fiscal Impact Assessment*. November 2002.

# 2000-DFW



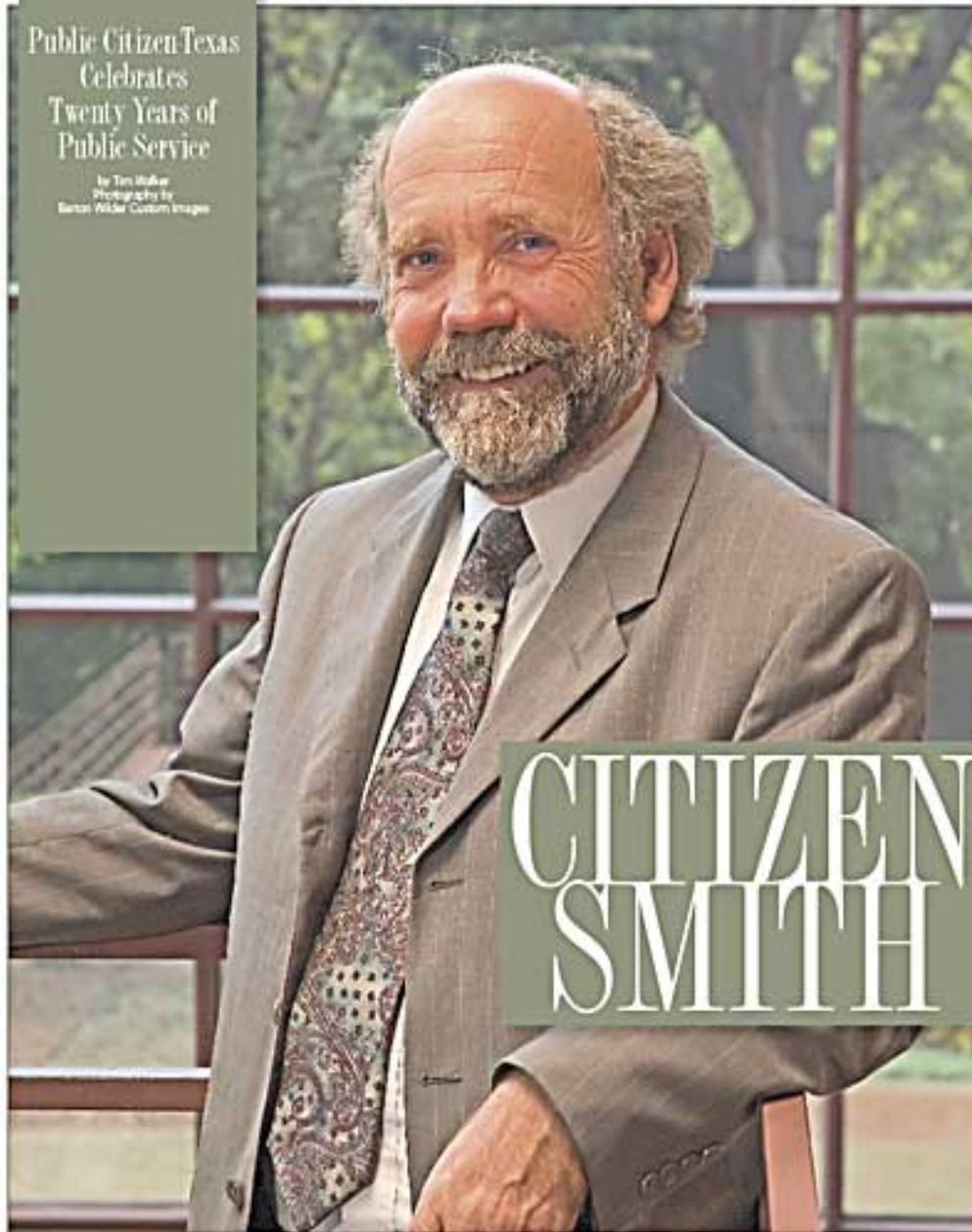
- Interest from city leaders
- Forums on issues of plausibility, esp. windows
- Strong political leadership to open door to all options to attainment demonstration – efficiency included
- Active citizen participation (Pub. Cit., ED, Blue Skies Alliance, Sierra Club, etc.)
- Builder association commitment to be part of solution
- A believable voice: “This works.” – Jim Sargent
- NCTCOG recommended 2000 IECC to cities
- Ft. Worth, Plano lead the way.

# 2000-DFW

- North Central Texas Council of Governments Regional Codes Coordinating Committee
  - Recommended regional amendment to IECC:
  - **101.3.3. Alternative compliance.** A building certified through a **voluntary energy performance testing program approved as meeting or exceeding** the provisions of this code may be deemed to comply with the requirements of this code.
  - (Reason: This amendment would encourage participation in above-code programs ...)

Public Citizen Texas  
Celebrates  
Twenty Years of  
Public Service

by Tim Walker  
Photography by  
Bertoni Walker Custom Images



CITIZEN  
SMITH



Public Citizen Texas staff Jennifer Carraway, Smitty Smith,  
Travis Brown and Anne Johnson

# SB 5, 77<sup>th</sup> TX Leg., 2001

- Establishes **Texas Emissions Reduction Plan**, including
  - a diesel emissions reduction incentive program,
  - a motor vehicle purchase or lease incentive program,
  - a new technology research and development program,
  - an energy efficiency grant program, and
  - building energy performance standards.

# Energy Efficiency in SB 5

- Innovations of SB 5 re: the State Implementation Plan (SIP)
  - Emphasis on voluntary programs
  - Dependence on broad participation
  - Inclusion of building sector in solution set
- Building sector sources of EE
  - utility grant programs
  - political subdivision – owned facilities
  - construction standards and HERS
- Legislative leadership: Sen. J.E. “Buster” Brown, Rep. Steve Wolens, Rep. Warren Chisum

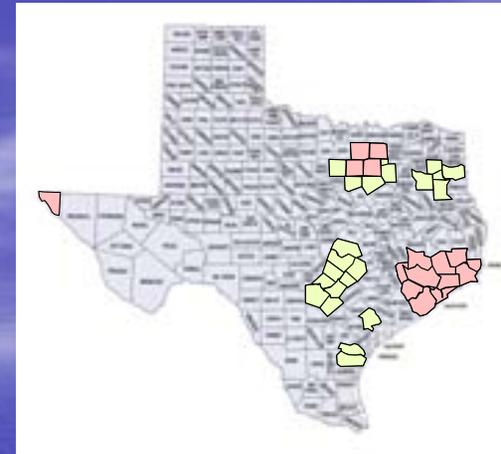
# Building Energy Performance Standards Adopted



- energy efficiency chapter of the **International Residential Code**, as appropriate, for single family residential construction, and
- **International Energy Conservation Code** for all other residential, commercial and industrial construction in the state.
- Required municipal procedures:
  - administration and enforcement
  - ensure that code-certified inspectors perform inspections.

# Local Amendments

- Local amendments allowed.
- In non-attainment areas and affected counties, may not result in less stringent energy efficiency requirements.
  - Energy Systems Laboratory (ESL) to review local amendments and submit annual report of savings impacts to TCEQ.



# Outside of Municipal Jurisdictions



- A building certified through an energy efficiency (above-code) program is considered in compliance;
- A building inspected by a code-certified inspector (e.g., warranty inspection) is considered in compliance; otherwise,
- A builder may self-certify a building with a form to be provided by ESL.
- (next legislative session in 2003 "grandfathered" residential construction before 9/1/2002)

And then?



# Energy Star



- EPA/DOE new home program adopted as a template for utility market transformation programs
- Several hundred in 2000
- 2003, 2004: more than 25% of newly constructed homes were Energy Star-rated; almost all for code compliance
- Achieving 30% of SB 7 energy efficiency
- Again, utilities underwrote implementation.

# Energy Star



- 2004 Energy Star certified Homes reported to PUCT (investor-owned utilities):
  - TXU Electric Delivery: 13,013
  - CenterPoint Energy: 12,995
  - Entergy: 860
  - Texas-New Mexico Power: 799
  - **Total 27,667**
  - Statewide total, including muni's and coops: >30,000

# 78<sup>th</sup> TX Legislature, 2003

- HB 1365...
  - Added the above code certification program as compliance option for municipalities ...
- HB 3235...
  - Added ESL training program for inspector certification

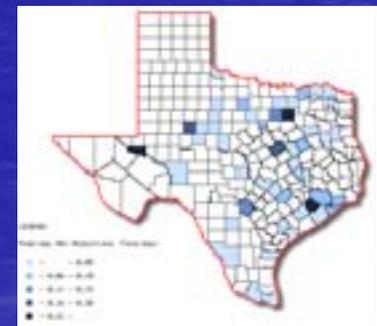
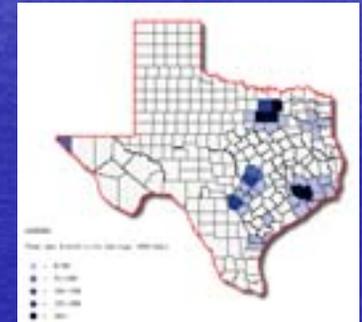
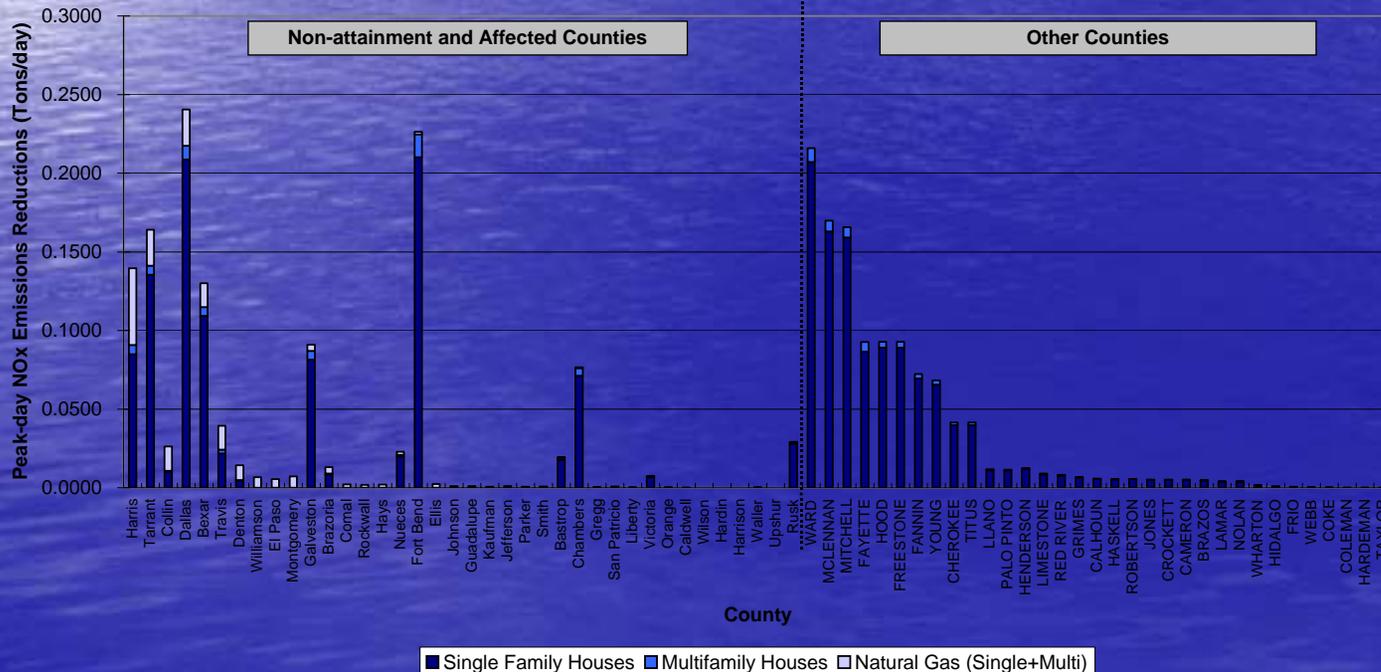
# Developments in 2004

- TCEQ published guidance on allowing energy efficiency and renewable energy as emission reduction measures in the State Implementation Plan for improving air quality (Feb '04)
- EPA published guidance on allowing EE/RE in State Implementation Plans (Aug. '04)
- Emission reduction measures in SIP must be quantifiable, surplus, permanent and enforceable

# Emissions Calculation

- To analyze NOx emissions reductions, ESL developed for TCEQ a code-compliant DOE-2 simulation capable of peak day modeling linked to EPA's eGRID database.
- TCEQ has submitted for SIP credit.
- Analysis applies to code implementation, enhanced local codes, and above code building performance achieved through ratings

**Peak-day NOx Emissions Reductions  
(Single and Multifamily Houses)**



# Emissions Reductions Calculator

- Emissions calculator developed for 3 classes of EE/RE projects:
  - New Buildings
  - Community Projects
  - Renewables
- Currently used to calculate annual emissions reductions from impact of 2001 IRC/ IECC.
- Web version online to estimate impact of different measures in non-attainment and affected counties.  
[www.ecalc.tamu.edu](http://www.ecalc.tamu.edu)

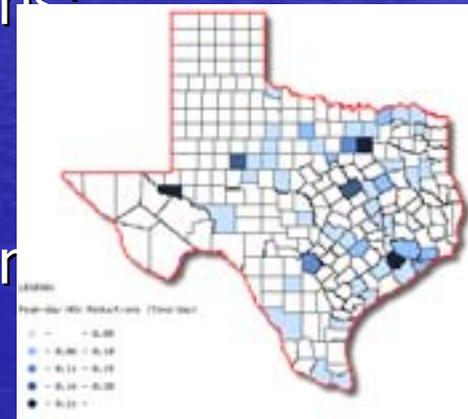
The screenshot displays the TEES (Texas Engineering Experiment Station) Energy & Emissions Calculator - eCalc interface. The header includes the TEES logo and the text "The Energy Systems Laboratory Energy & Emissions Calculator - eCalc". Logos for TAMU and TCEQ are also present. The interface is organized into three main sections:

- New Building Models:** This section features four categories of buildings, each with an icon and a label: SINGLE FAMILY (house icon), MULTI-FAMILY (apartment building icon), OFFICE (skyscraper icon), and RETAIL (storefront icon).
- Community Projects:** This section features five categories of community infrastructure, each with an icon and a label: MUNICIPAL (city hall icon), STREET LIGHTS (street lamp icon), TRAFFIC LIGHTS (traffic light icon), WATER SUPPLY (faucet icon), and WASTE WATER (sewer pipe icon).
- Renewables:** This section features three categories of renewable energy, each with an icon and a label: SOLAR PV (solar panel icon), SOLAR THERMAL (solar tower icon), and WIND (wind turbine icon).

At the bottom of the interface, there is a footer with the following text: "DEVELOPMENT VERSION WG1.06+CE04.10.05.0+DB1.57=B48 Date: 10/12/2004", a navigation menu with links for "TAMU | ESL | TEES | EPA | TCEQ | Credits | Contact Us | Logout", and a copyright notice: "Copyright © 2004 Energy Systems Laboratory, Texas Engineering Experiment Station. All rights reserved."

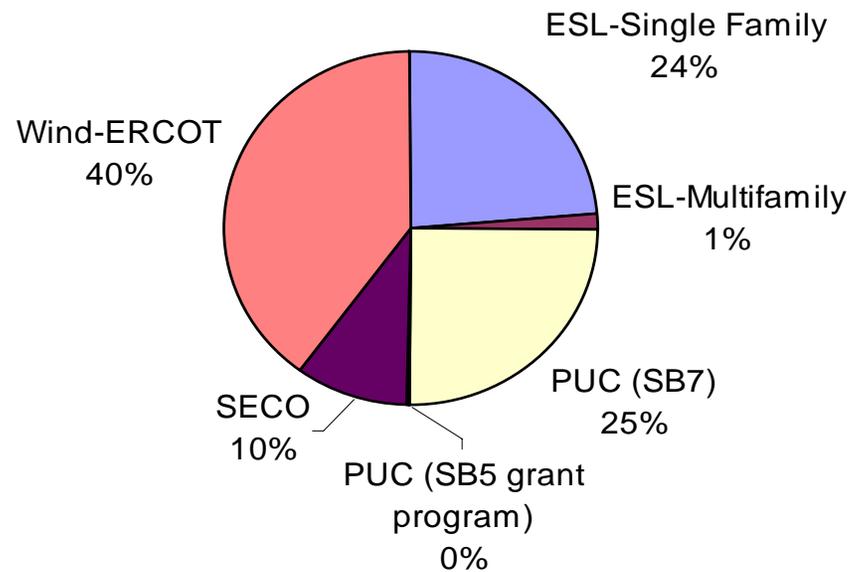
# Emissions Calculation – Code Impact

- Cumulative NO<sub>x</sub> emissions reductions required for SIP
- Values for 2003 projected to 2007 and 2012
  - Only residential included so far.
  - **2007 cumulative** NO<sub>x</sub> emission reductions:
    - Annual: **824 Tons**
    - Peak-day: **3.83 Tons**
  - **2012 cumulative** NO<sub>x</sub> emission reduction:
    - Annual: **1,416 Tons**
    - Peak-day: **6.58 Tons**



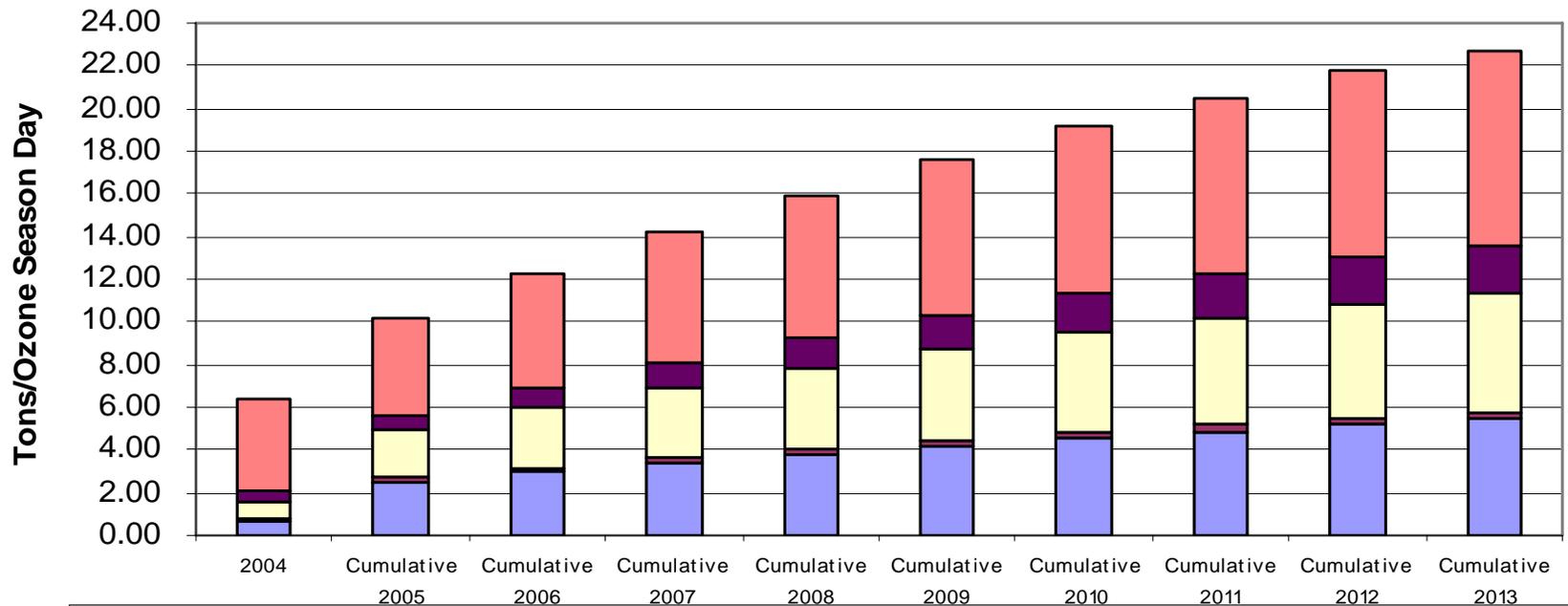
# Integrated Reporting of EE/RE

Ozone Season Day NOx reduction level for 2013 (program wise)



# Integrated Reporting of EE/RE

## OSD NOx reduction levels



ESL-Single Family

ESL-Multifamily

PUC (SB7)

PUC (SB5 grant program)

SECO

Wind-ERCOT

# Conclusions

- Think Big!
- Look for partners as passionate as you are.
- Take as partners everyone who has a stake in the changes you seek.
- Recognize that a clean energy future is the only one people are really willing to share.
- Consider that efficiency of homes and workplaces can impact the competitiveness of a community in a global market.

*Do it now!*

- <http://energysystems.tamu.edu>
- Tom Fitzpatrick, (512) 475-6982