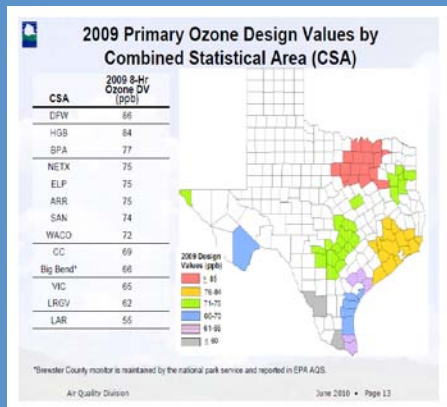


How New Air Quality Rules Will Affect Texas Power Generation



Tom "Smitty"
Smith
Public Citizen
Texas

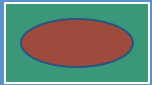


NO_x and SO₂ Emissions Affect the Health of Millions of Americans and Our Environment

- NO_x contributes to the formation of PM_{2.5} and ground-level ozone.
- SO₂ contributes to the formation of PM_{2.5}.
- PM_{2.5} has been linked to premature death, serious illnesses such as chronic bronchitis and heart attacks, and respiratory problems.
- Ozone has been linked to premature mortality, lung damage, respiratory symptoms, aggravation of asthma and other respiratory conditions.
- Sulfur deposition acidifies surface waters, and damages forest ecosystems and soils.
- Nitrogen deposition acidifies surface waters, damages forest ecosystems and soils, and contributes to coastal eutrophication.
- SO₂ and NO_x impair visibility, including at national parks and wilderness areas.

Recent Texas Coal Plants

And Counties In or Near to Non-Attainment Status



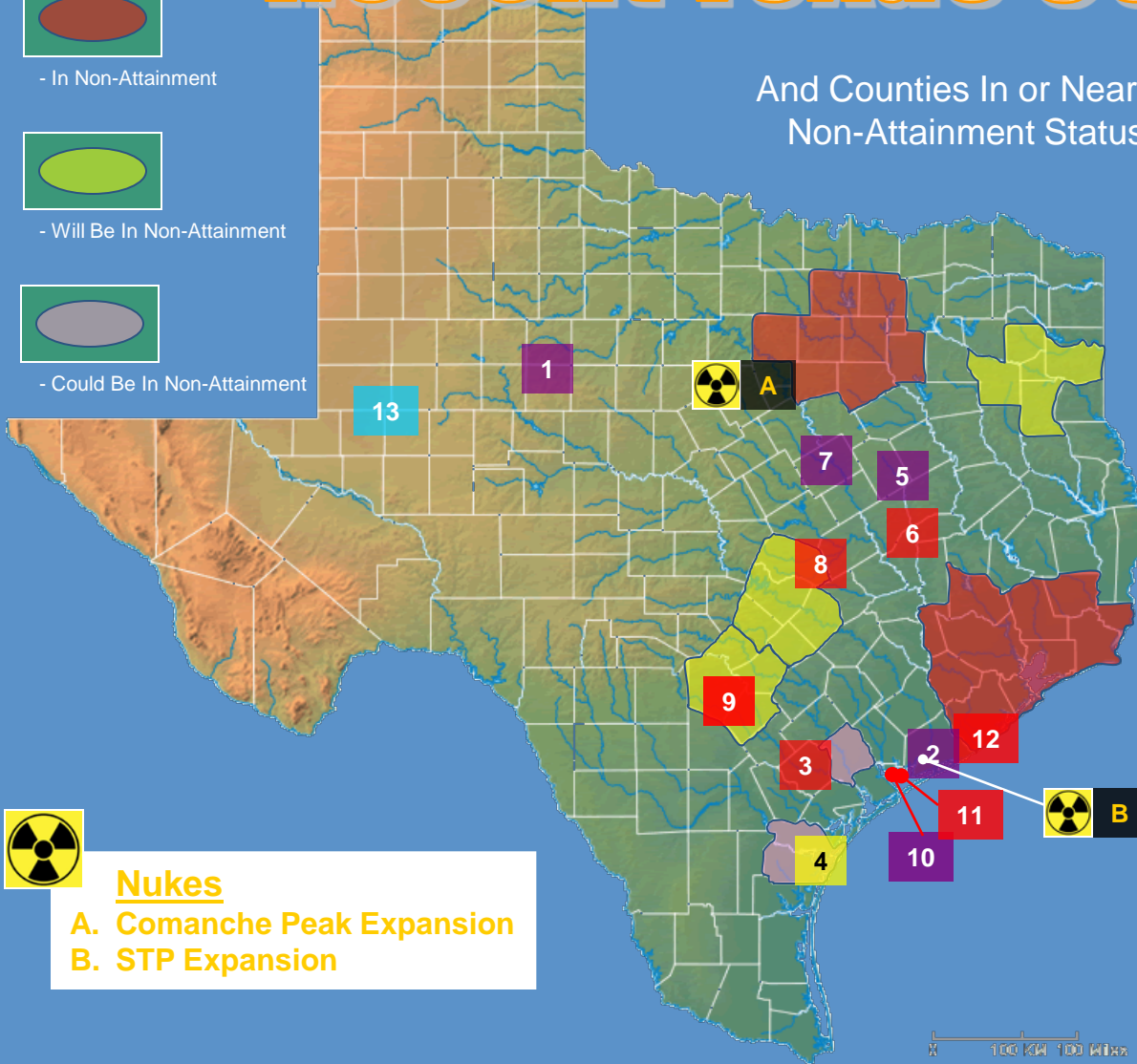
- In Non-Attainment



- Will Be In Non-Attainment



- Could Be In Non-Attainment



Nukes

- A. Comanche Peak Expansion
- B. STP Expansion

Coal

- 4. Las Brisas
- 1. Tenaska *
- 2. White Stallion
- 5. Limestone**
- 7. Sandy Creek
- 10. Calhoun Co.**

- 3. Coletto Creek
- 6. Oak Grove
- 8. Sandow
- 9. Spruce
- 11. Formosa
- 12. Lockwood Gasification*

- 13. Summit IGCC *

* Carbon Separation

** Carbon Offsets

In Permitting

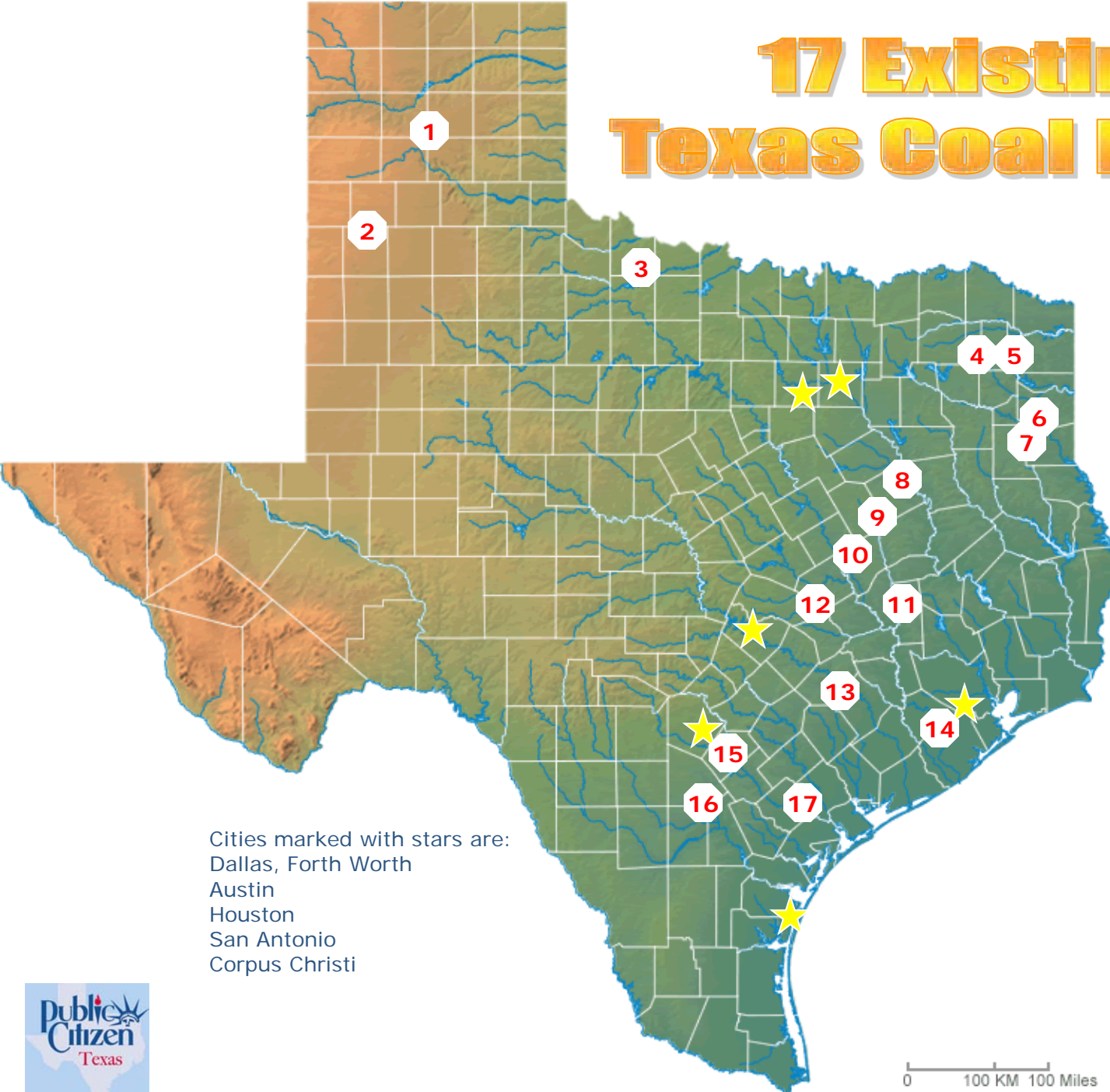
Permitted, Under Appeal

Permitted

Proposed

Recently Permitted Plants (values are taken from permits or permit applications)												
Plant	City, County	Permit #	Status	Mega-watts	CO2 Mil Tons/yr	SO2		NOx (forms Ozone)		Particulate Matter		Mercury lb/yr
						Tons/yr	lb/MMBtu	Tons/yr	lb/MMBtu	Tons/yr	lb/MMBtu	
TXU's Oak Grove 1 & 2 (2 units)		76474	Permitted – on Appeal	1,720	16.6	15,079	0.192	7,500	0.08	3,170	0.04	1,440
Bremond, Robertson												
CPS Spruce		70492	Permitted - under construction	750	7.4	2,102	0.06	1,752	0.05	771	0.022	140
San Antonio, Bexar												
Sandy Creek Energy		70861	Permitted – under construction	800	7.5	3,585	0.1	1,793	0.05	1,490	0.04	150
Riesel, McLennan												
Formosa Plastics (2 Units)		76044	Permitted	300	3.0	1,091 to 6,518	0.083 to 0.496	920	0.07	446	0.034	78
Point Comfort, Calhoun												
TXU's Sandow 5 at Alcoa		48437	Permitted	581	5.4	5,186	0.2	2,593	0.1	1,037	0.04	192
Rockdale, Milam												
Calhoun Co. Nav. Dist.		45586	Permitted and emissions settlement reached	300	2.6 (offset)	2,071	0.179	813	0.07	597	0.051	14
Point Comfort, Calhoun												
NRG's Limestone 3		79188	Permitted – on Appeal	745	7.4	2,102	0.06	1,752	0.07	1,226	0.04	140
Jewett, Limestone												
Totals for Recently Permitted Plants				5,196	49.9	36,643		17,123		8,737		2,154
Plants Still Being Pursued												
Tenaska		84167	Draft Permit Issued	900	0.75 (w/ CCS)	2,183	0.06	1,819	0.05	1,092	0.03	124
Sweetwater, Nolan												
White Stallion		86088	Draft Permit Issued	1,200	~10 (est.)	4,956	0.086	4,048	0.07	1,560	N/A	96
Bay City, Matagorda												
Las Brisas		85013	Draft Permit Issued	1,200	10.4 (est.)	8,096	0.15	3,776	0.07	1,620	0.033	216
Corpus Christi, Nueces												
Coleta Creek		83778	Draft Permit Issued	650	6.0	1,753	0.06	1,461	0.05	935	0.0325	100
Goliad, Goliad												
Totals for Other Plants Being Pursued				3,950	27.15	16,988		11,104		5,207		536

17 Existing Texas Coal Plants



1. Harrington
2. Tolk
3. Oklaunion
4. Monticello
5. Welsh
6. Pirkey
7. Martin Lake
8. Big Brown
9. Limestone
10. Twin Oaks
11. Gibbons Creek
12. Sandow
13. Fayetteville
14. Parish
15. Deely Spruce
16. San Miguel
17. Coletto Creek

Cities marked with stars are:
Dallas, Forth Worth
Austin
Houston
San Antonio
Corpus Christi



Threats from Coal

Toxins and Pollution:

NOx (Smog)

SOx (Acid Rain)

PM (infiltrates body)

Mercury & other heavy metals

Air pollution from existing power plants in Texas is estimated to cause:

1,160 premature deaths

1,791 heart attacks

144 lung cancer deaths

33,987 asthma attacks

1,798 ER visits

1,105 hospitalizations



13 Lakes and Reservoirs
& 3 Rivers in Texas
and the Entire Gulf Coast
have a consumption advisories due to Mercury
contamination.



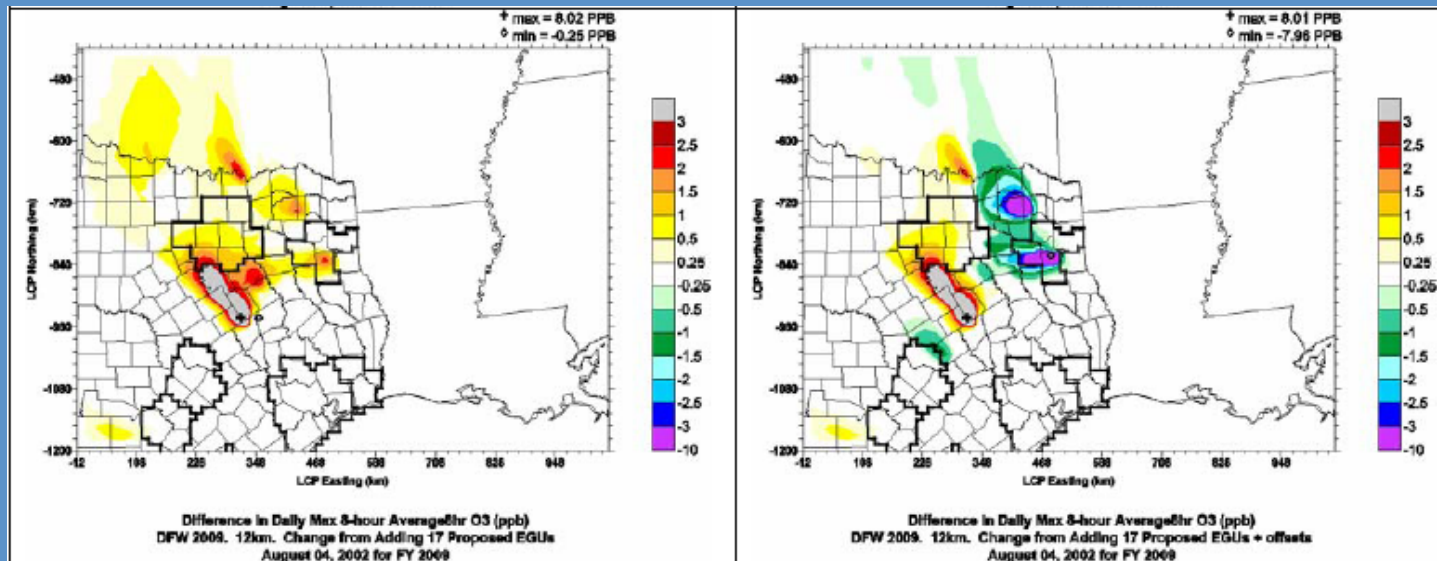
Upcoming Regulations



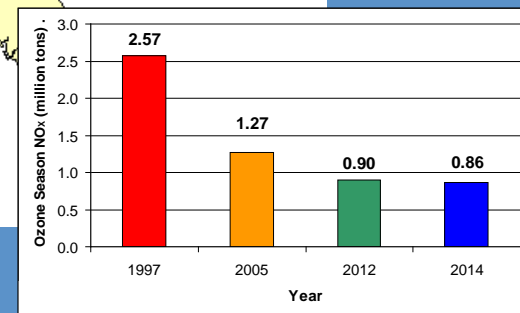
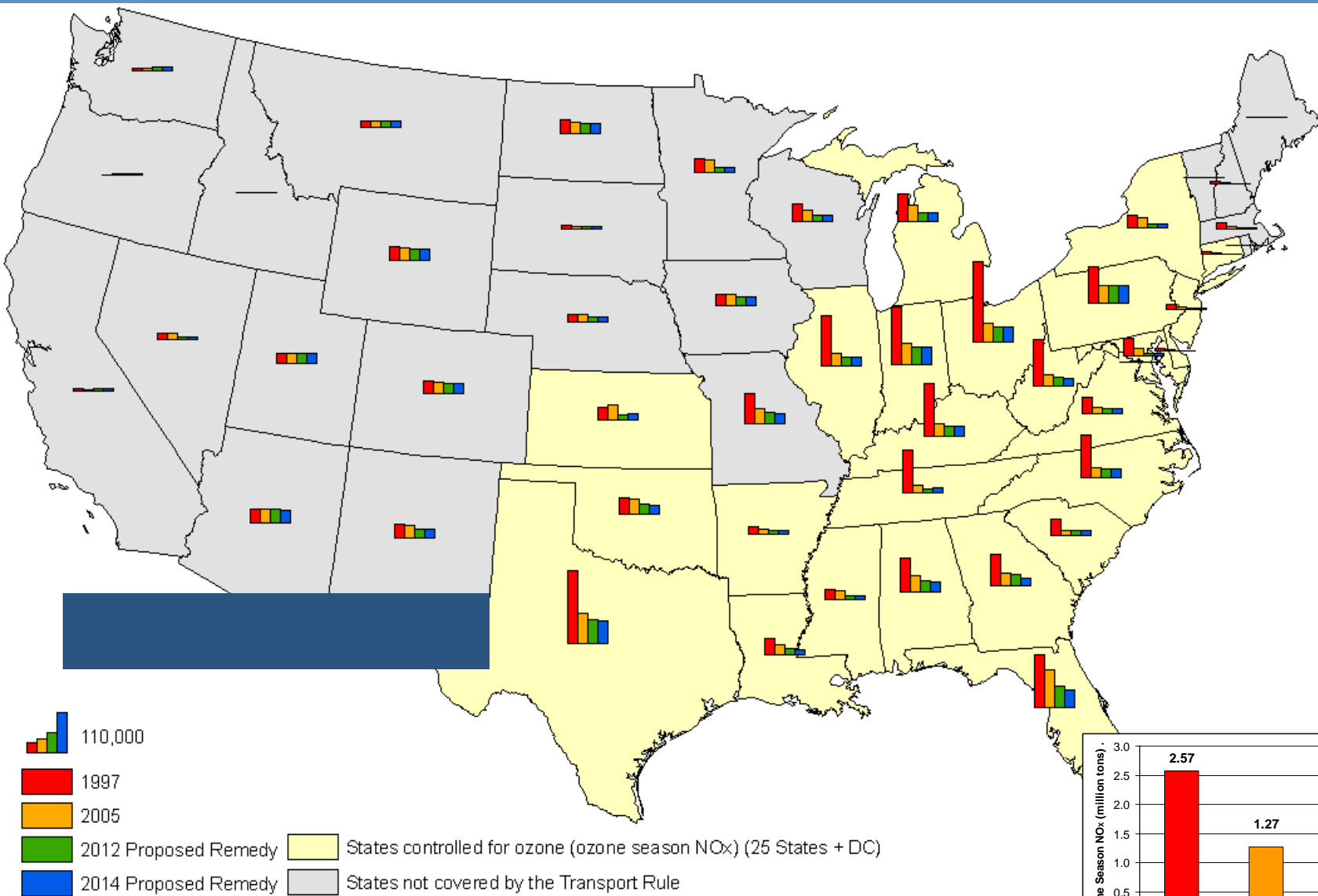
<i>Action</i>	<i>Schedule</i>
SO₂ NAAQS	Final June 2010
Transport Rule	Proposed June 2010/Final June 2011 - 14-20% reduction?
Ozone NAAQS Reconsideration	Final DEC 2010 Reduction from 85 to 70? ppb
Utility Boiler NSPS and MACT	Propose March 2011/Final Nov 2011
Transport Rule II (NO_x)	Propose Summer 2011/Final Summer 2012
PM NAAQS	Propose Feb 2011/Final Oct 2011

New EPA Smog rules may force Texas to reduce ozone by 7-20%

East Texas Power plants are a still the largest background sources of NOX



Ozone Season NO_x Power Plant Emissions reductions 1997-2014 * due to Clean Air Transport Rule



* Emissions shown include only Acid Rain Program sources – for 96% of ozone season Transport Rule NO_x emissions and 88% of Transport Rule units in 2014.

Benefits Outweigh Costs

- **EPA estimates the annual benefits from the proposed rule range between \$120-\$290 billion (2006 \$) in 2014.**
 - Most of these benefits are public health-related.
 - \$3.4 billion are attributable to visibility improvements in areas such as national parks and wilderness areas.
 - Other nonmonetized benefits include reductions in mercury contamination, acid rain, eutrophication of estuaries and coastal waters, and acidification of forest soils.
- **EPA estimates annual compliance costs at \$2.8 billion in 2014.**
- **Modest costs mean small effects on electricity generation. EPA estimates that in 2014:**
 - Electricity prices increase less than 2 percent.
 - Natural gas prices increase less than 1 percent.
 - Coal use is reduced by less than 1 percent.

Health Benefits for Millions of Americans

Estimated Number of Adverse Health Effects Avoided Due to Implementing the Proposed Transport Rule*

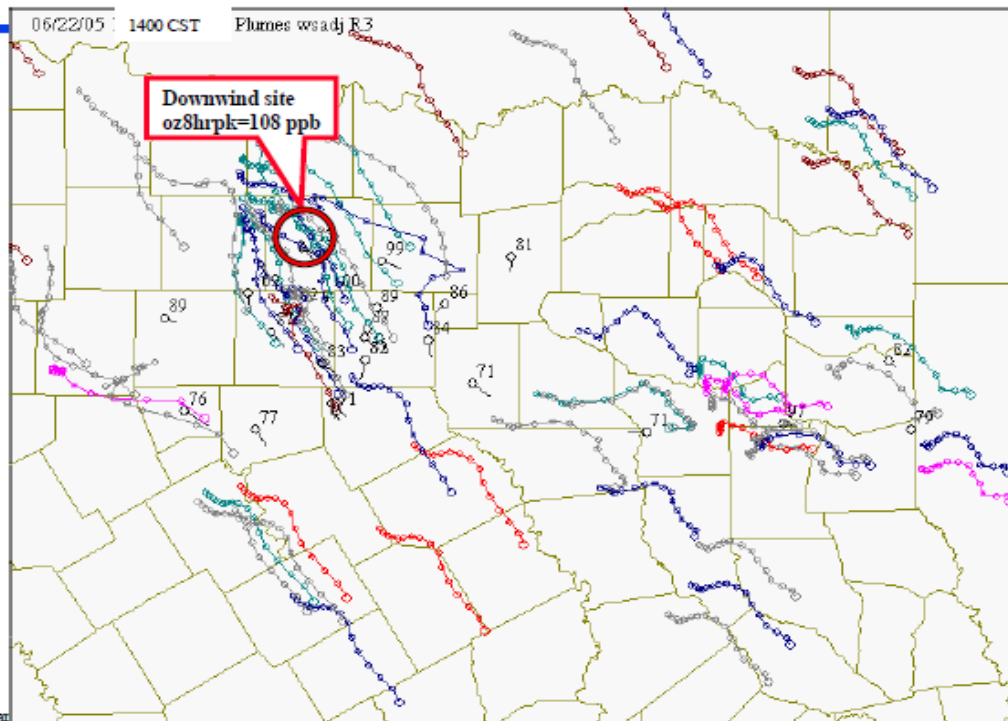
Health Effect	Number of Cases Avoided
Premature mortality	14,000 to 36,000
Non-fatal heart attacks	23,000
Hospital and emergency department visits	26,000
Acute bronchitis	21,000
Upper and lower respiratory symptoms	440,000
Aggravated asthma	240,000
Days when people miss work or school	1.9 million
Days when people must restrict their activities	11 million

* Impacts avoided due to improvements in PM_{2.5} and ozone air quality in 2014

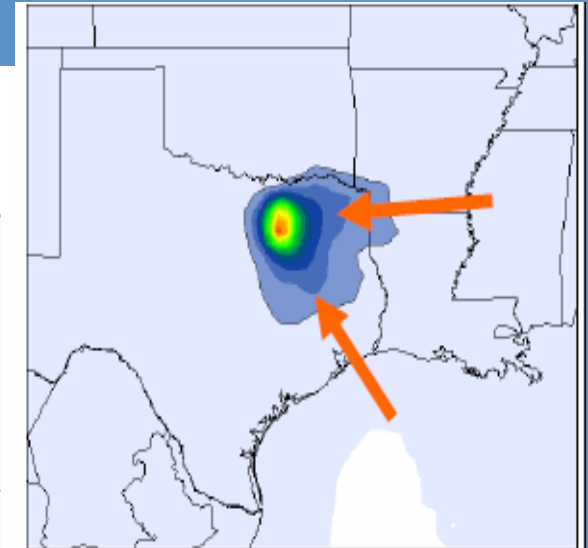
How power plants affect air pollution in the DFW area



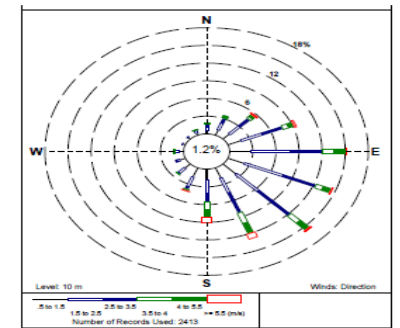
June 22, 2005 Plume

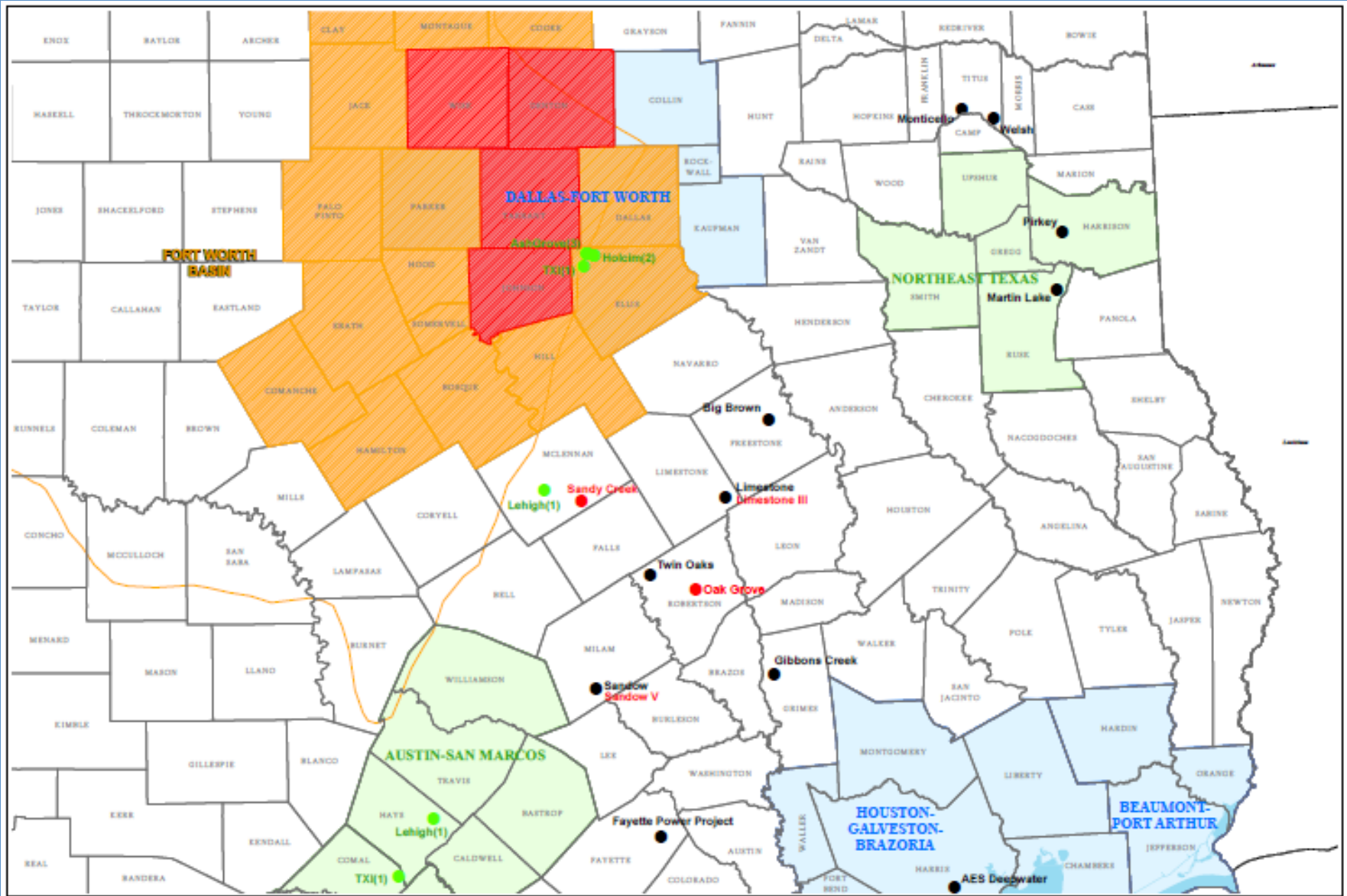


TCEQ Fall



Days with Ozone \geq 85 ppb





- Cement Kilns (8 of Kilns)
- Existing Coal-Powered Plant
- Recently Permitted Coal-Powered Plant
- Eight Hour Ozone Nonattainment Area
- Ozone Early Action Coagrat Area
- Core Counties in Barnett State Region
- Non-Core Counties in Barnett State Region
- Post World War II Gas Drifts

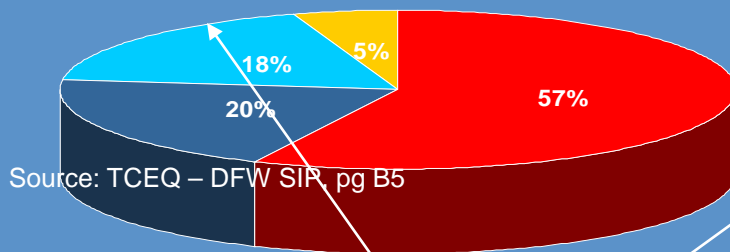
Major Industrial Contributors to DFW Smog

Where does DFW's smog pollution come from?

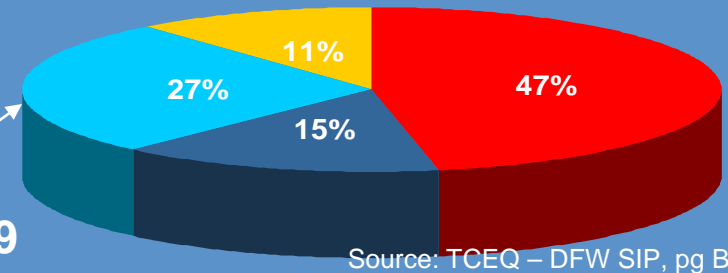
AIR QUALITY: OZONE

DFW Past, Present, Future NOx Projections

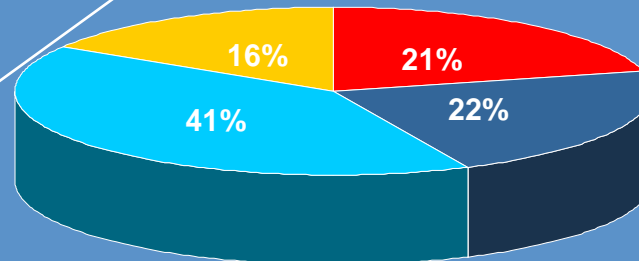
1999



2009



2019

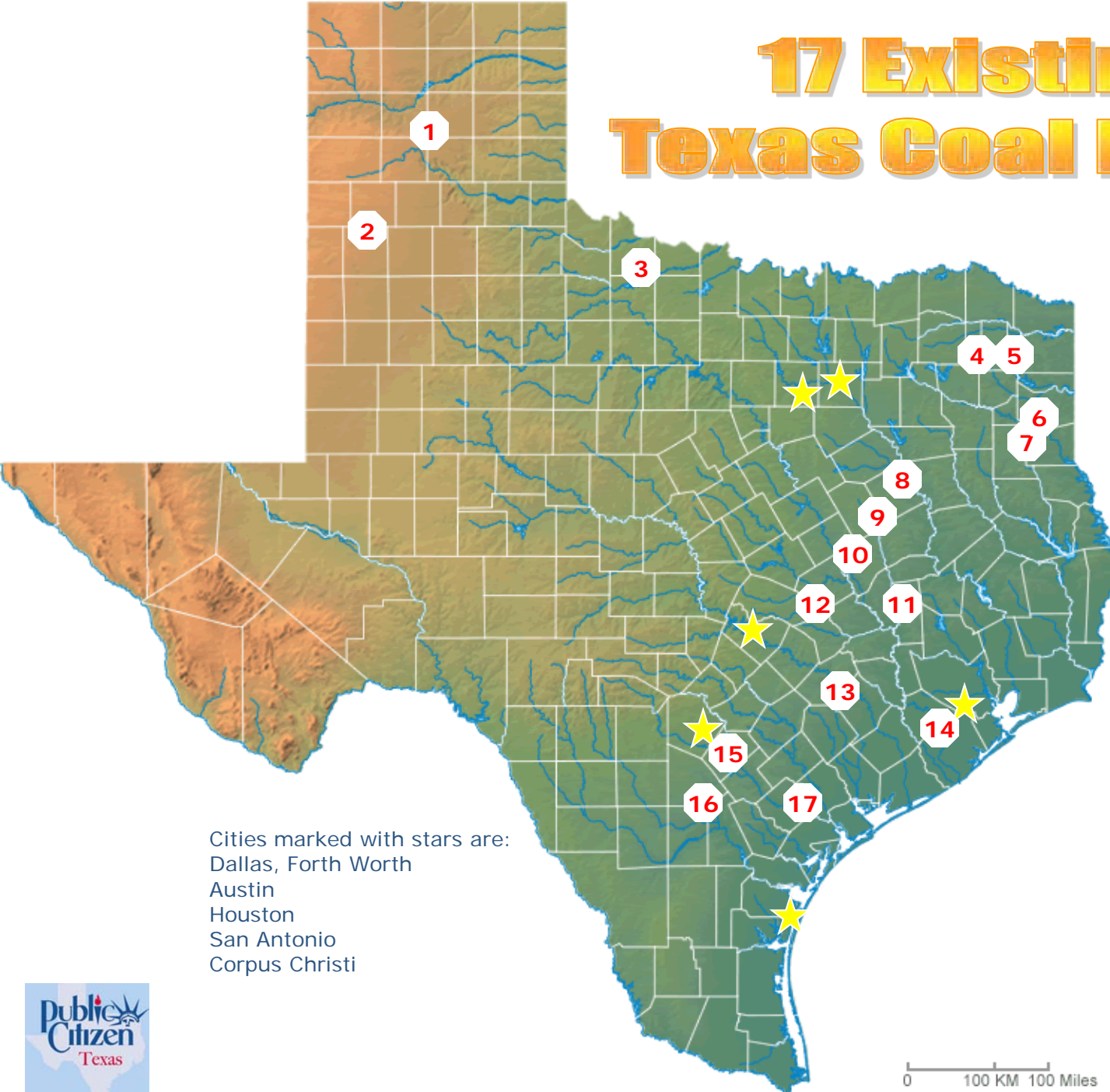


■ On-Road Mobile ■ Point ■ Off-Road Mobile ■ Area

Source: NCTCOG Forecast

Power Plant Emissions outside the non-attainment area are within the area source category

17 Existing Texas Coal Plants



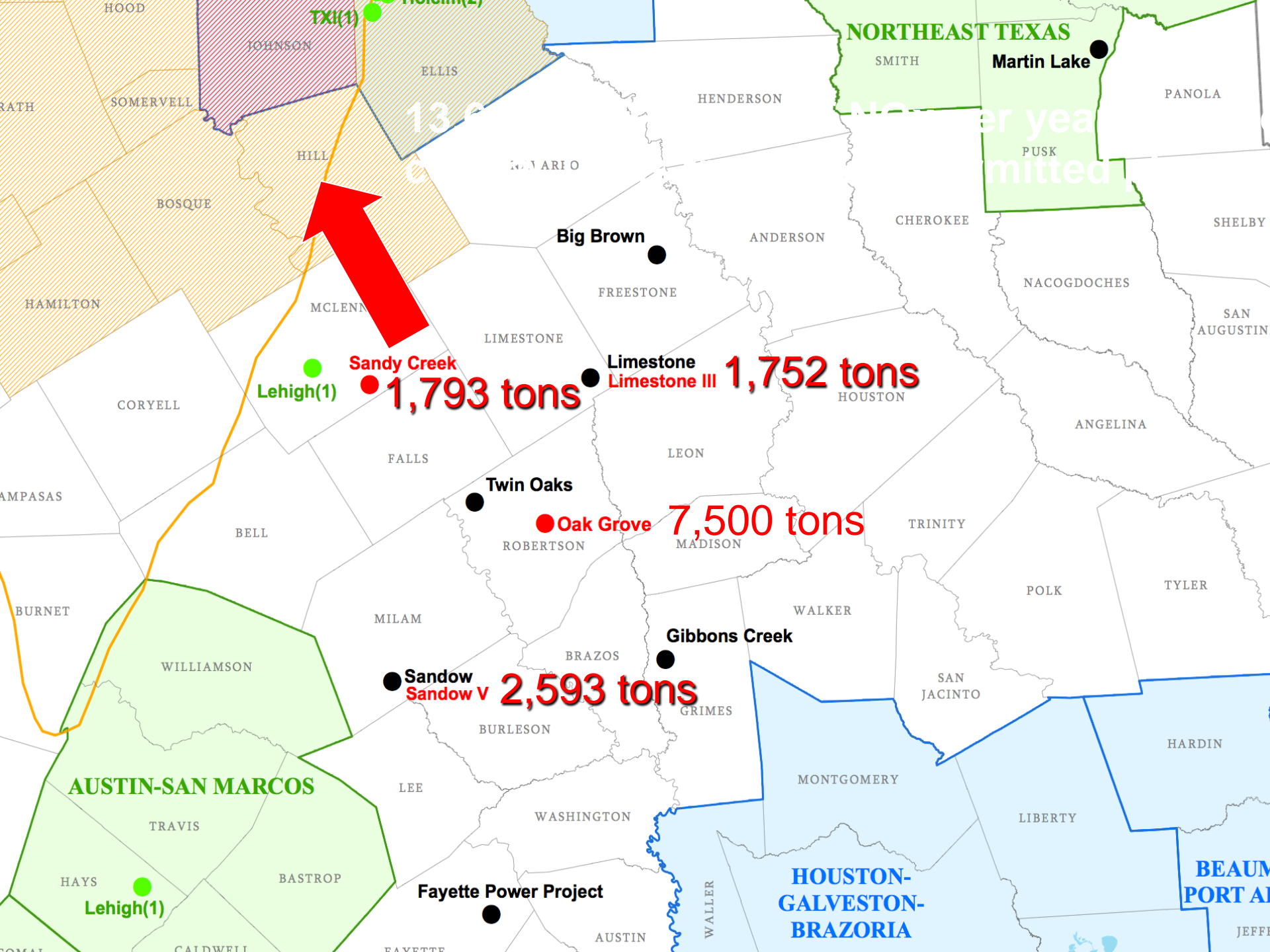
1. Harrington
2. Tolk
3. Oklaunion
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8. Big Brown
9. Limestone
10. Twin Oaks
11. Gibbons Creek
12. Sandow
13. Fayetteville
14. Parish
15. Deely Spruce
16. San Miguel
17. Coletto Creek

Cities marked with stars are:
Dallas, Forth Worth
Austin
Houston
San Antonio
Corpus Christi



Plant Name	CO₂ (million tpy)	NO_x (tpy)	SO₂ (tpy)	Pb (lbs/year)	Hg (lbs/year)
Martin Lake	19.57	15,703	71,842	69,314	1,836
W A Parish	19.21	5,060	42,502	25,143	1,248
Monticello	17.31	11,938	58,265	32,064	1,564
Limestone	13.36	12,019	20,849	44,145	2,074
Sam Seymour (Fayette)	12.51	6,222	27,551	2,291	307
Welsh	11.74	10,145	27,372	534	432
Spruce/Deely	9.33	6,177	17,934	1,837	456
Big Brown	8.88	5,777	55,547	17,224	1,725
Harrington	8.13	7,525	22,150	417	346
Tolk	7.6	7,164	22,641	239	303
Coletto Creek	5.38	4,198	21,453	5,187	275
Sadow	5.07	4,912	25,594	18,110	602
Pirkey	3.92	3,328	4,363	45,898	1,510
San Miguel	3.76	3,169	11,064	57,798	1,273
Gibbons Creek	3.52	2,114	11,931	1,341	275
Oklaunion	3.23	5,057	2,684	461	163
Twin Oaks	2.52	1,479	4,706	7,420	568
Totals	155.04	111,987	448,448	329,423	14,957

CO₂, NO_x, SO₂ from EPA Clean Air Markets Data Base; CO₂, Hg (Mercury & Methyl Chloroform) and Pb (Lead) from EPA Toxic Release Inventory for 2008



NORTHEAST TEXAS

Martin Lake

13.9
No. per year
mitted

Lehigh(1) ● **1,793 tons**

Sandy Creek ● **1,793 tons**

Limestone Limestone III ● **1,752 tons**

Oak Grove ● **7,500 tons**

Sandow Sandow V ● **2,593 tons**

AUSTIN-SAN MARCOS

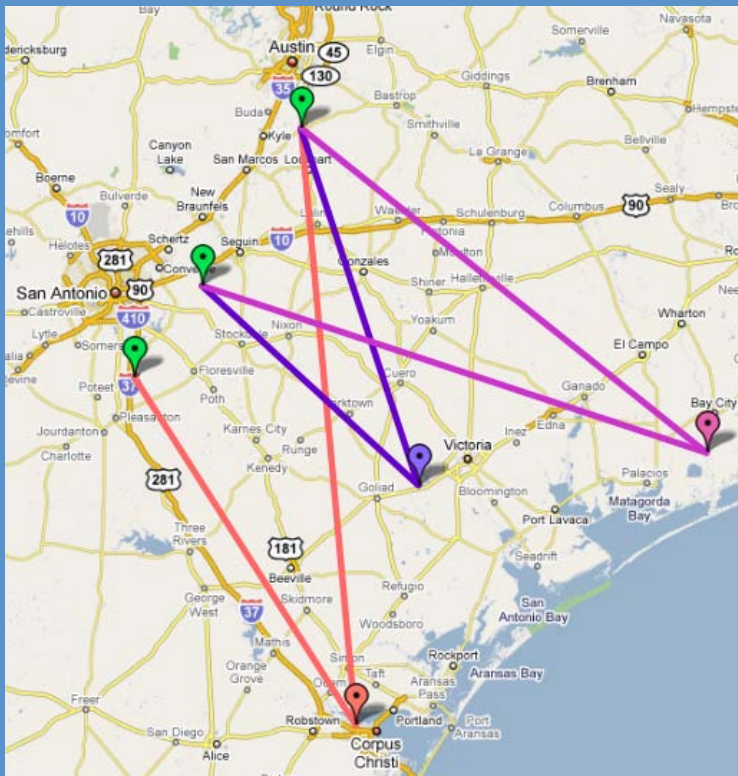
Lehigh(1)













HOUSTON-GALVESTON-BRAZORIA

Fayette Power Project

New power plants will have an impact on air quality in Austin, San Antonio, Corpus and Victoria

Distances From Newly Proposed Gulf Coast Power Plants to Travis and Bexar County Lines



-  [Travis County - Southern Corner](#)
-  [Bexar County - Eastern Corner](#)
-  [Bexar County - Southern Corner](#)
-  [White Stallion](#)
-  [Coletto Creek](#)
-  [Las Brisas](#)
-  [Las Brisas to Bexar](#)
106 miles
-  [Las Brisas to Travis](#)
153 miles
-  [Coletto Creek to Bexar](#)
75 miles
-  [Coletto Creek to Travis](#)
95 miles
-  [White Stallion to Bexar](#)
135 miles
-  [White Stallion to Travis](#)
132 miles

EPA released proposed coal ash disposal regulations in April

Coal ash is the leftover waste from coal-fired power plants. The ash is a concentrated mix of toxic pollutants.

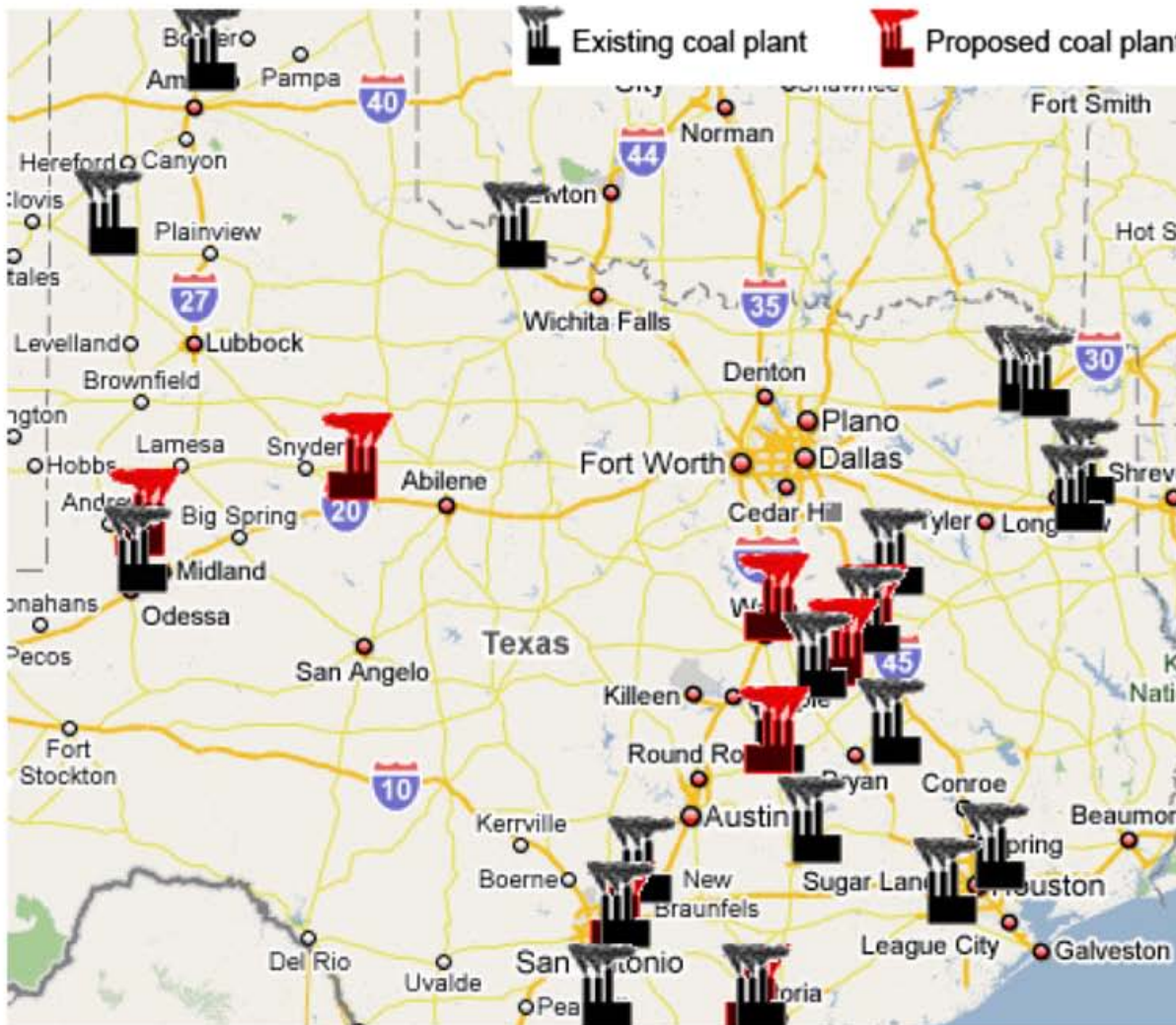
- This waste is the nation's second largest waste stream.
- Ash landfills leach pollution into drinking water supplies, greatly increasing cancer risks for nearby communities
- living near ash ponds increases the risk of damage to the liver, kidney, lungs and other organs
- Risk of being exposed to toxic metals like cadmium, cobalt, lead, and other pollutants at concentrations far above levels that are considered safe
- EPA estimated that up to 1 in 50 nearby residents (a risk 2000 times the EPA's regulatory goals) could get cancer from exposure to arsenic unlined waste ponds that mix ash with coal refuse.
- EPA typically considers cancer risk to be unacceptable when environmental exposures result in more than one additional cancer per 100,000 people.



Texas Ranks #1 in Coal Ash Waste Disposal

Source: NRDC

State Name	Rank in Waste	Tons of Waste	Rank in Toxic Metals	Tons of Toxic Metals	Tons of Waste in Ponds	Tons of Waste in Landfills	Tons of Waste On-Site	Tons of Waste Off-Site	Tons of Waste Sold
Texas	1	13,454,000	1	8,915	576,810	6,490,800	148,480	1,321,800	4,916,110
Pennsylvania	2	11,057,650	4	5,639	1,076,700	2,536,500	586,050	1,018,000	5,840,400
Kentucky	3	8,599,400	6	4,853	2,298,000	3,409,900	470,400	926,900	1,494,200



COAL ASH COUNTRY: Power Plant Waste in Texas

Statistics for Proposed Plants in Texas

Plant	County	Estimated tons of coal ash	Estimated tons of toxic metals
Oak Grove	Robertson	1,314,629	1,372
Spruce 2	Bexar	586,234	612
Limestone 3	Limestone	543,197	569
Summit Power IGCC		439,675	459
Shadow 5	Milam	439,675	459
Texasix	Nolan	439,675	459
Sandy Creek	McClellan	180,966	167
Coloto Creek	Goliad	147,035	136
TOTAL		4,693,086	4,233

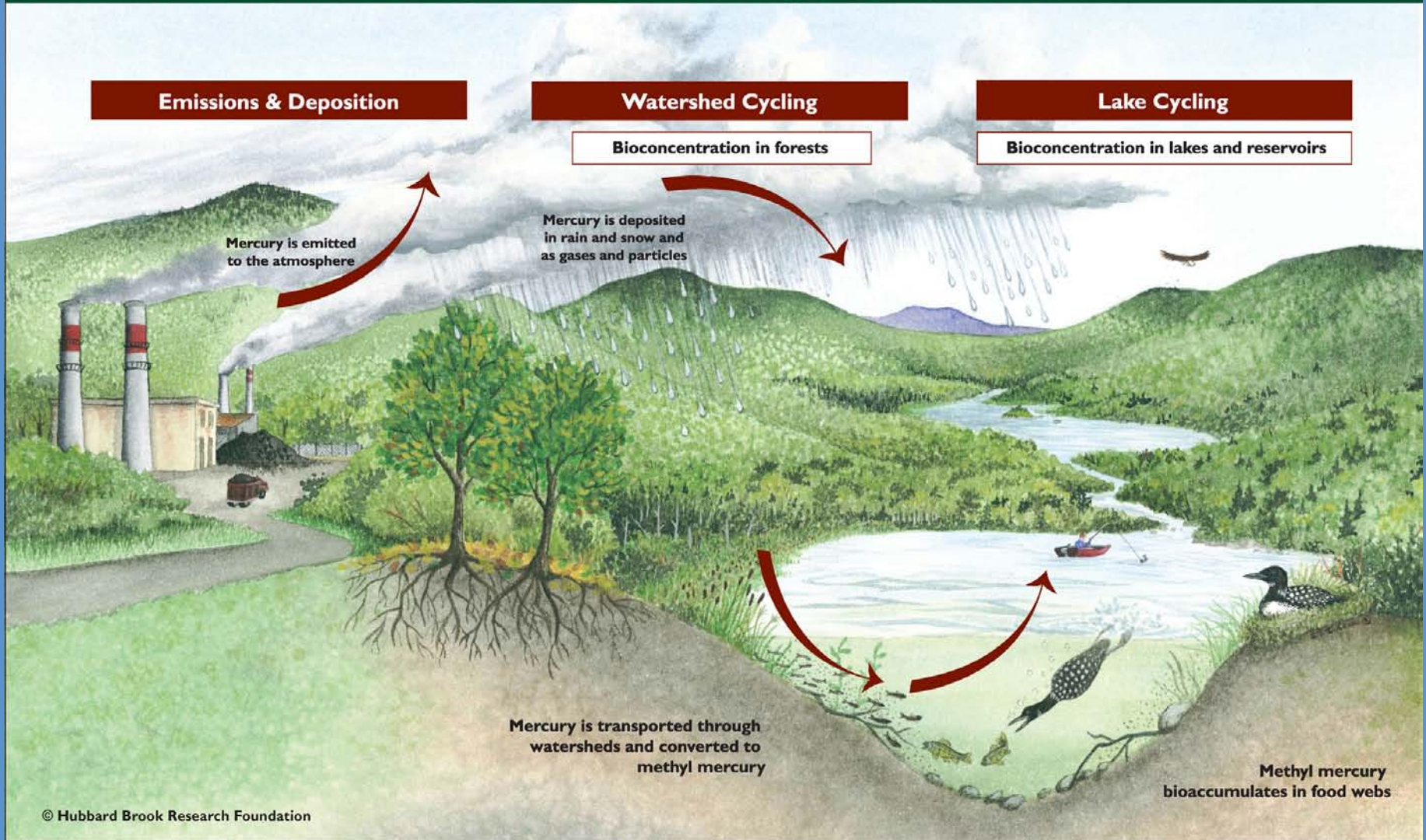
Statistics for Existing Plants in Texas

Plant	County	Tons of coal waste	Tons of toxic metals
Morro Lake	Rusk	2,540,700	1,903
Limestone (TEGE)	Limestone	1,851,500	1,145
Pinkey	Harrison	1,499,400	361
Monticello (TXUGEN)	Titus	1,455,900	1,076
San Miguel (SMIG)	Atascosa	1,282,100	308
Shadow 4 & 5	Milam	907,800	546
W A Parish	Fort Bend	689,000	634
Big Brown	Fresno	655,900	722
Twin Oaks Power Oas	Robertson	456,000	285
Fayette Power Project (LCRA)	Fayette	437,200	275
Welsh (SWEP)	Titus	217,000	323
Tolk	Lamb	211,300	212
Harrington	Potter	205,200	220
J T Dwyer	Bexar	195,300	185
Shadow Station	Milam	192,500	No Data
J K Spruce	Bexar	165,600	136
Oklahoma	Wilbarger	146,000	138
Coloto Creek	Goliad	144,800	138
Gibbons Creek	Grimes	104,500	107
AES Desuperator	Harris	81,000	No Data
Odessa Ector Generating Station	Ector	8,000	No Data
Guadalupe Generating Station	Guadalupe	7,300	No Data

NOTE: This map does not include the four proposed plants that will be burning petroleum coke-Las Brisas, Hunton IGCC, Formosa, White Stallion

Mercury is a Potent Neurotoxin

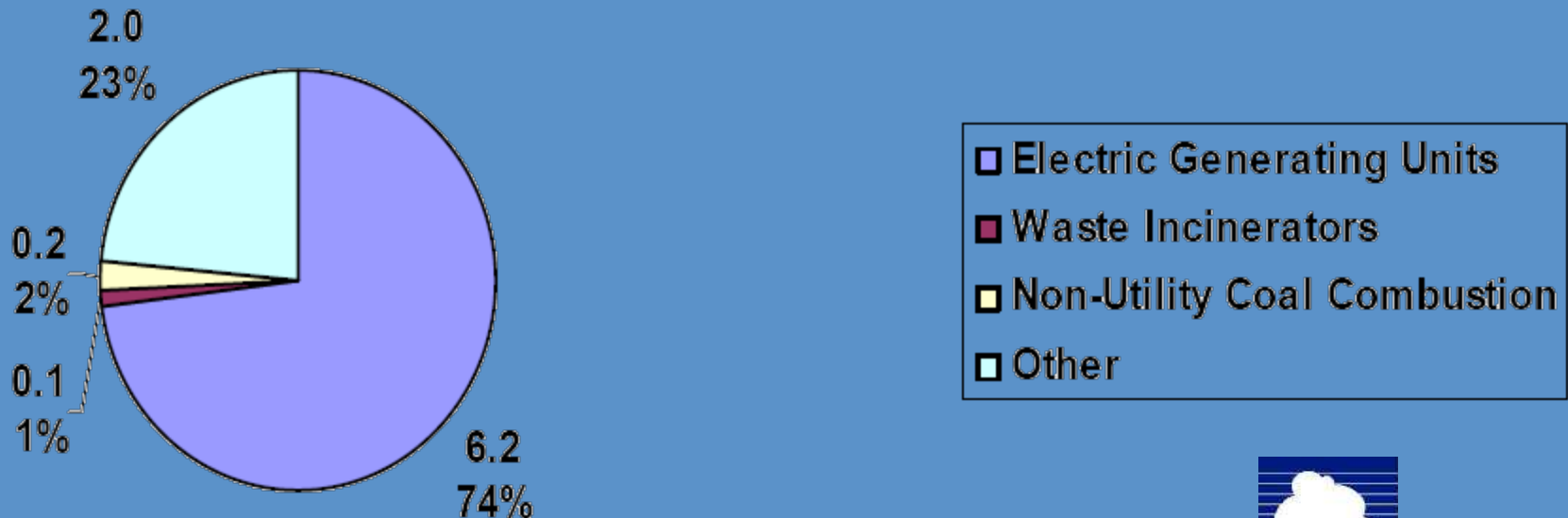
Quicksilver Clouds: How Mercury Enters, Cycles, and Impacts Ecosystems



74% of Mercury Emissions in Texas Comes From Coal Plants

Distribution of Mercury Emissions from Man-Made Sources in Texas

In Tons and Percentage of State Total – 2006 Data



Source: TCEQ, 2006



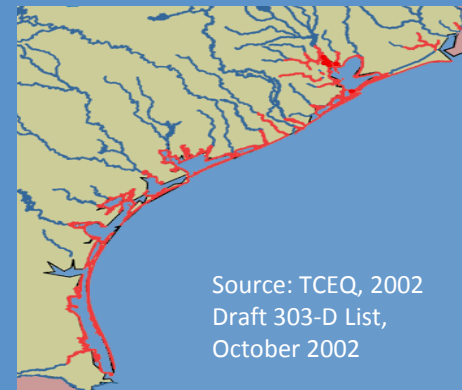
Mercury and Autism

The University of Texas Health Science Center in San Antonio published a new study on April 25th, 2008 showing:

“a statistically significant link between pounds of industrial release of mercury and increased autism rates.” – *Science Daily*

Shark, Swordfish and King Mackerel from the Texas Gulf already contain high levels of mercury. Exposure to mercury leads to learning disabilities and permanent brain damage in children.

Texas Estuaries, Bays and Coastlines that are already contaminated by mercury.



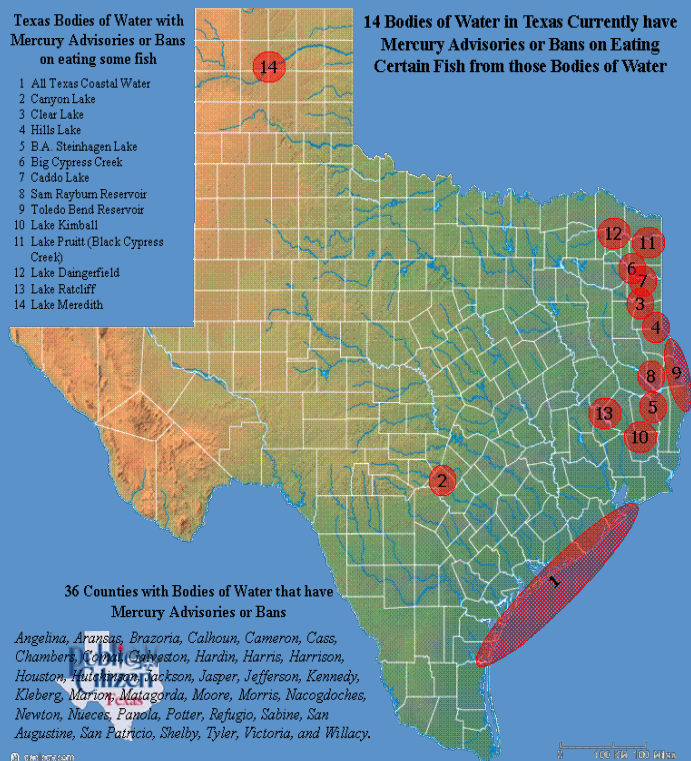
Source: TCEQ, 2002
Draft 303-D List,
October 2002

The darkest patches represent counties where increases in autism rates over the past 10 years have been in the top 20 percent. These counties are frequently near coal plants.

Texas Bodies of Water with Mercury Advisories or Bans on eating some fish

- 1 All Texas Coastal Water
- 2 Canyon Lake
- 3 Clear Lake
- 4 Hills Lake
- 5 B.A. Steinhagen Lake
- 6 Big Cypress Creek
- 7 Caddo Lake
- 8 Sam Rayburn Reservoir
- 9 Toledo Bend Reservoir
- 10 Lake Kimball
- 11 Lake Pruitt (Black Cypress Creek)
- 12 Lake Daingerfield
- 13 Lake Ratcliff
- 14 Lake Meredith

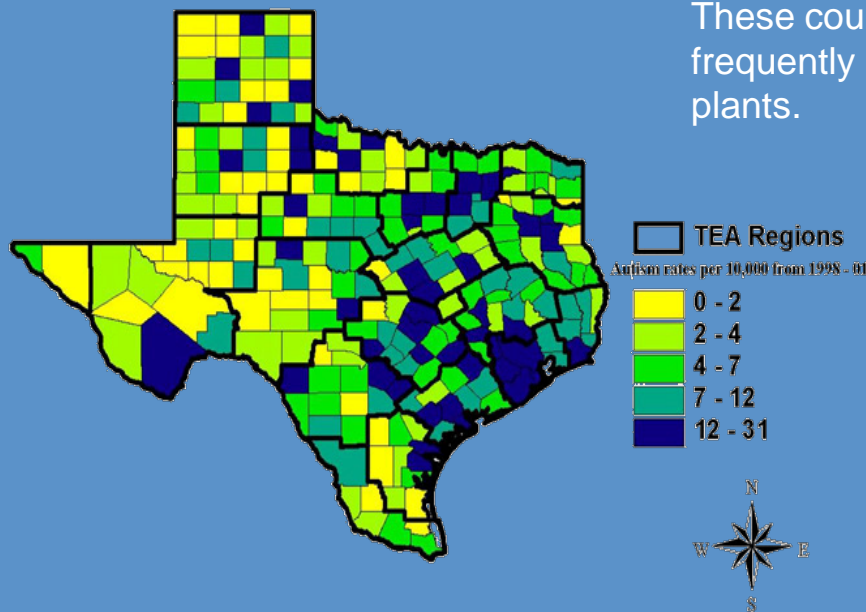
14 Bodies of Water in Texas Currently have Mercury Advisories or Bans on Eating Certain Fish from those Bodies of Water



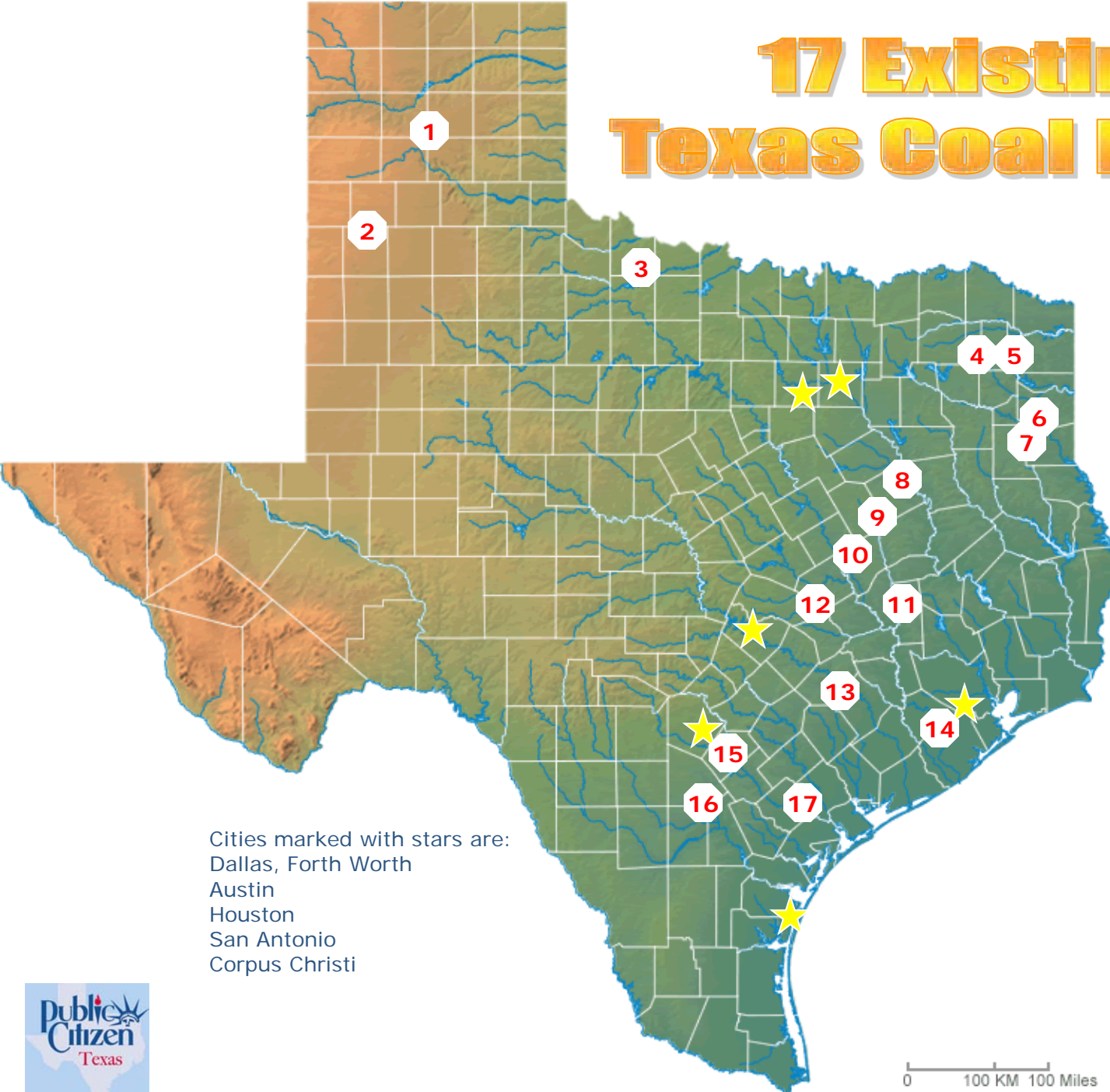
36 Counties with Bodies of Water that have Mercury Advisories or Bans

- Angelina, Aransas, Brazoria, Calhoun, Cameron, Cass, Chambers, Comal, Concho, Hardin, Harris, Harrison, Houston, Jasper, Johnson, Kaufman, Kimble, Kleberg, Marion, Matagorda, Moore, Morris, Nacogdoches, Newton, Nueces, Panola, Potter, Refugio, Sabine, San Augustine, San Patricio, Shelby, Tyler, Victoria, and Willacy.

Autism rates 1998 - 2001 by counties in Texas. Aggregated from administrative data from the Texas Educational Agency (TEA)



17 Existing Texas Coal Plants



1. Harrington
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12. Sandow
13. Fayetteville
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15. Deely Spruce
16. San Miguel
17. Coletto Creek

Cities marked with stars are:
Dallas, Fort Worth
Austin
Houston
San Antonio
Corpus Christi

Cost of Clean Up \$5.5 billion?

First Order Intern Work

- NO_x
 - Selective Catalytic Reduction
 - \$175/kw
- SO₂
 - Scrubbers and Baghouses
 - \$500/kw @ 90%
- Hg
 - Removal
 - \$60,000/lb
- CO₂
 - Removal
 - \$20/lb

Thermoelectric power plants dominate “withdrawal” in Texas:

(bright yellow pie wedge)

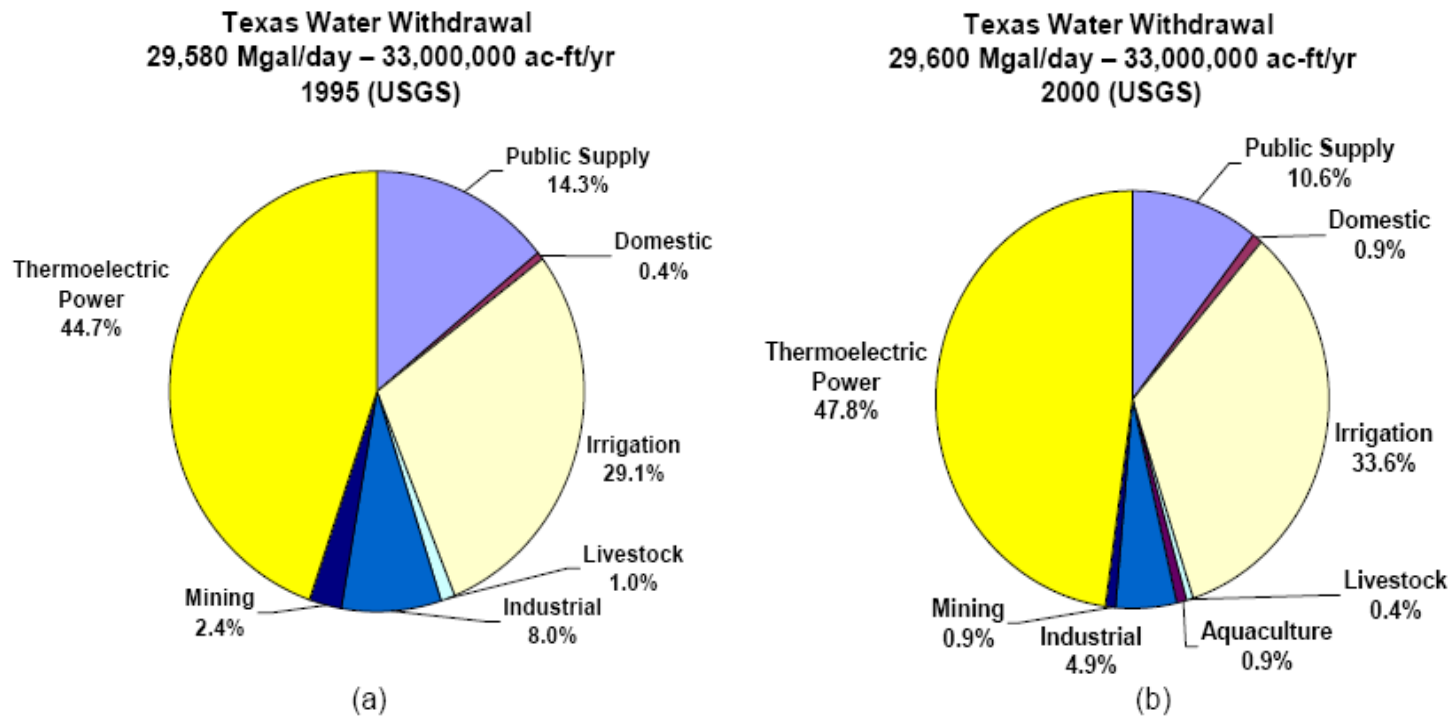
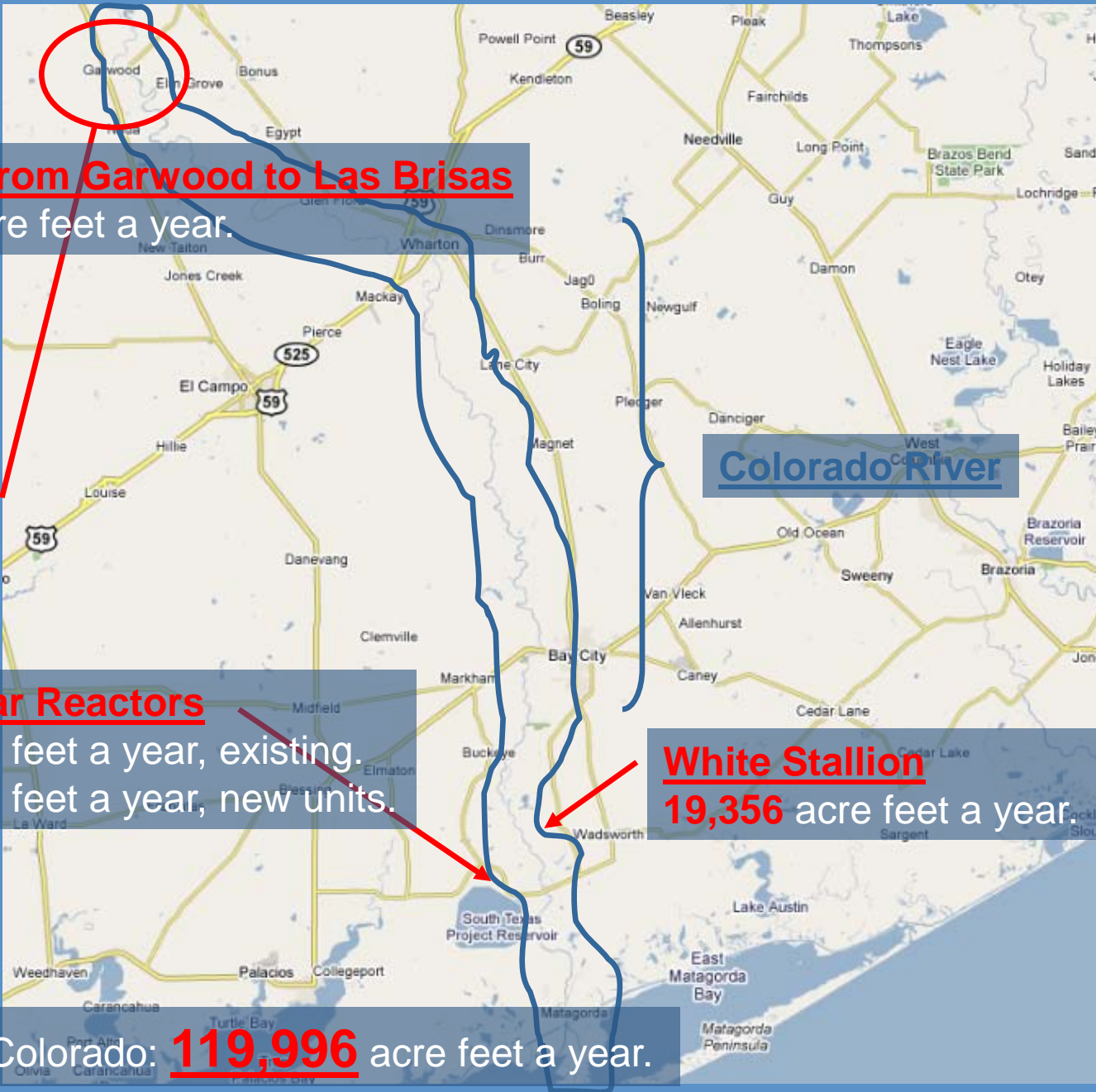


Figure 1.8. Texas (a) and United States (b) water withdrawals in 2000 by sector as reported by the USGS [USGS, 2004].



Pipeline from Garwood to Las Brisas
19,356 acre feet a year.

STP Nuclear Reactors
39,346 acre feet a year, existing.
41,938 acre feet a year, new units.

White Stallion
19,356 acre feet a year.

Total From Colorado: **119,996** acre feet a year.



Coletto Creek

5,789 acre feet a year, existing.

10,485 acre feet a year, new units.

Exelon Nuclear Reactors

49,519 acre feet a year

Total From Guadalupe: **65,793** acre feet a year.

Guadalupe River

Brazos River

Tenaska

11,200 acre feet a year
(based on their figure of 10million gallons/day)

1,120 acre feet a year
(if they use dry cooling)

NRG Limestone

14,822 acre feet a year, existing
(proposed dry cooling for third unit)

Comanche Peak Nukes

34,414 acre feet a year, existing

46,454 acre feet a year, new units

101,000-111,000 acre feet
per year

Oak Grove

28,961 acre feet a
year

Unless otherwise noted, numbers are from or calculated from the Bureau of Economic Geology at The University of Texas at Austin report entitled "Water Demand Projections for Power Generation in Texas" - August 31, 2008 for the Texas Water Development Board.

Nukes, Natural Gas, and Coal All Use Large Amounts of Water While Wind and PV Solar Use Practically None

Concentrating Solar (CSP) does use significant water comparable to fossil fuel plants:
“For cooling towers connected to CSP systems, the estimated water consumption is 0.72-0.90 gal/kWh.”

- TWDB Report

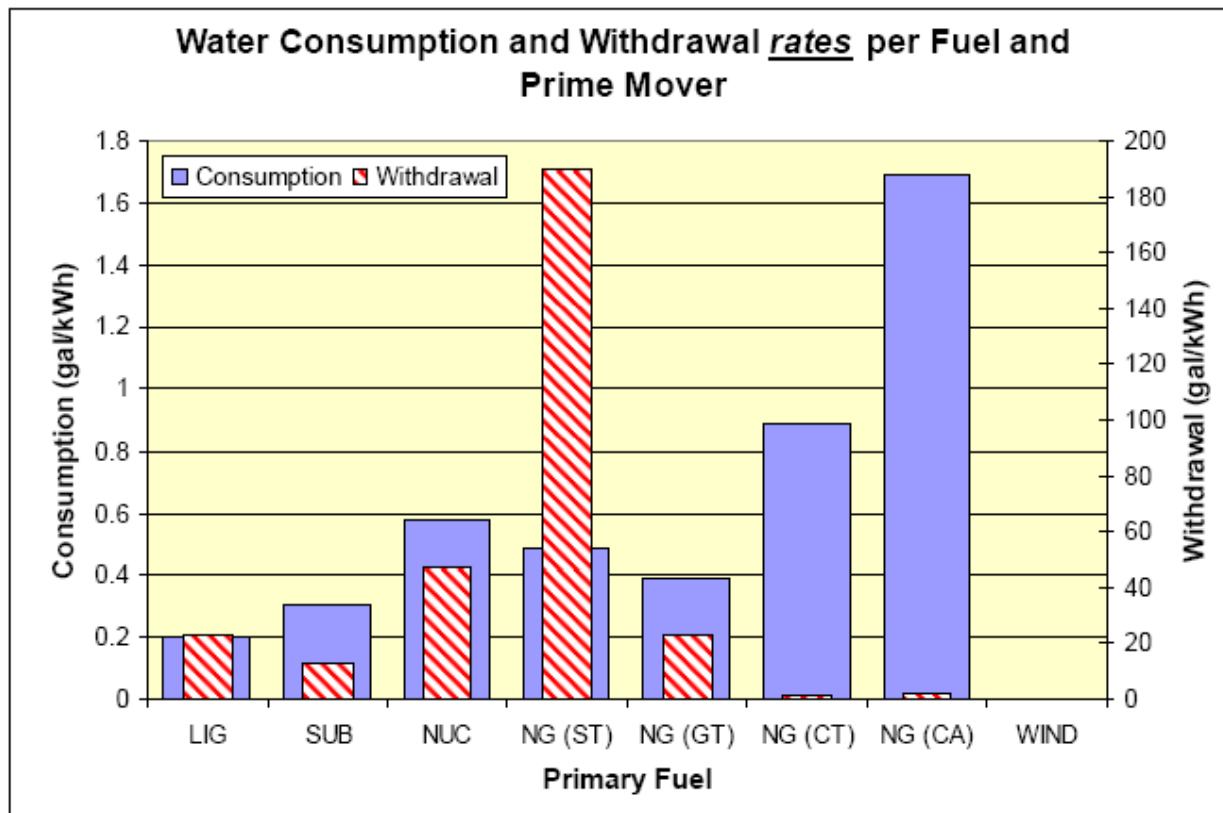


Figure 1.14. Trends of water consumption and withdrawal rates by fuel source for various fuel sources used in Texas [EIA, 2005]. ST = steam turbine, GT = gas turbine not in combined cycle, CT = combustion turbine of combined cycle, CA = steam section of combined cycle.

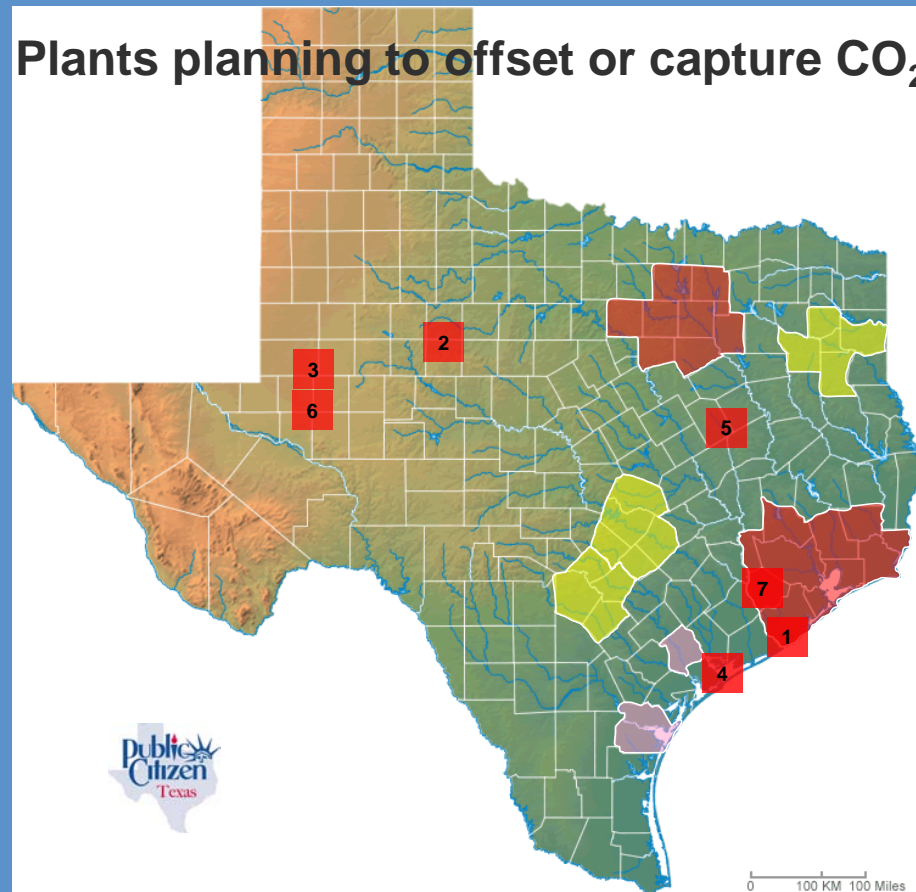
77 Million Tons of New CO₂

will be added to our atmosphere if all newly proposed plants in Texas are permitted and built.

There are 7 facilities being built or proposed in Texas already planning to capture or offset part of their CO₂ emissions.

If we required 90% capture, this would reduce emissions to only 7 million tons of CO₂.

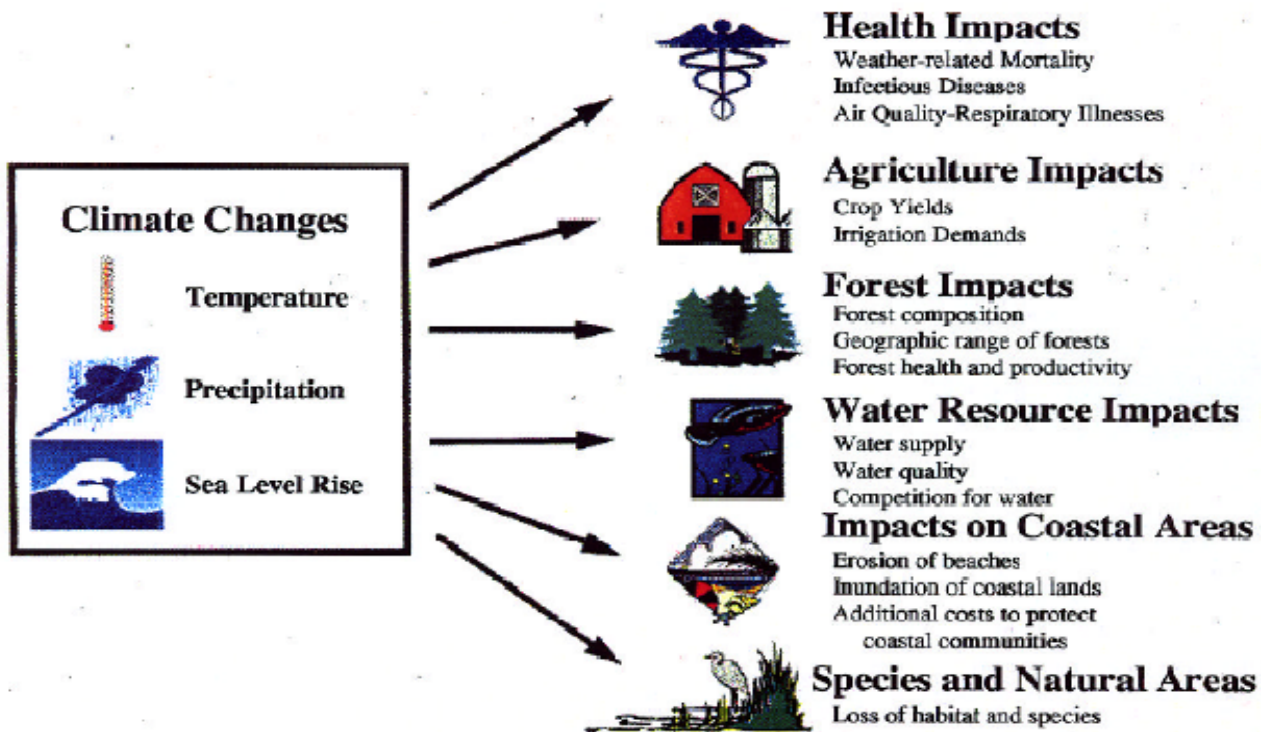
Plants planning to offset or capture CO₂



1. Hunton Gasification Facility	90% capture
2. Tenaska Trailblazer Energy Center	85-90% capture
3. Summit IGCC planned near Midland	90% capture
4. Calhoun County	100% offsets
5. NRG Limestone	50% offsets
6. West Texas Energy Project	90% capture
7. NRG Parish 60MW Experimental CCS	90% capture

What's at Stake in Texas?

Potential Climate Change Impacts



CO2 Implementation

EPA has stated GHG regulation will be tiered and gradual

- 2010: rules for tailpipe emissions, creating new CAFE standards with Dept of Transportation
- 2012-2013: rules for power plants which emit more than 100,000 tons of CO₂e
- 2016: rules for sources which emit more than 75k tons of CO₂e

What about “Clean” Coal?

- Increased stack controls
 - more concentrated coal ash
- Increased water use
- Expensive
 - Separation Equipment \$1B
 - Gasification & CCS \$1B
- Will sequestration work?
- What about mining issues?



Carbon Capture and Sequestration (CCS) can greatly lower a plant's efficiency, and thus increase its water use, as you can see by the chart below:

The **red** and **black** lines show two water use scenarios in which CCS would be implemented into many plants due to a carbon tax.

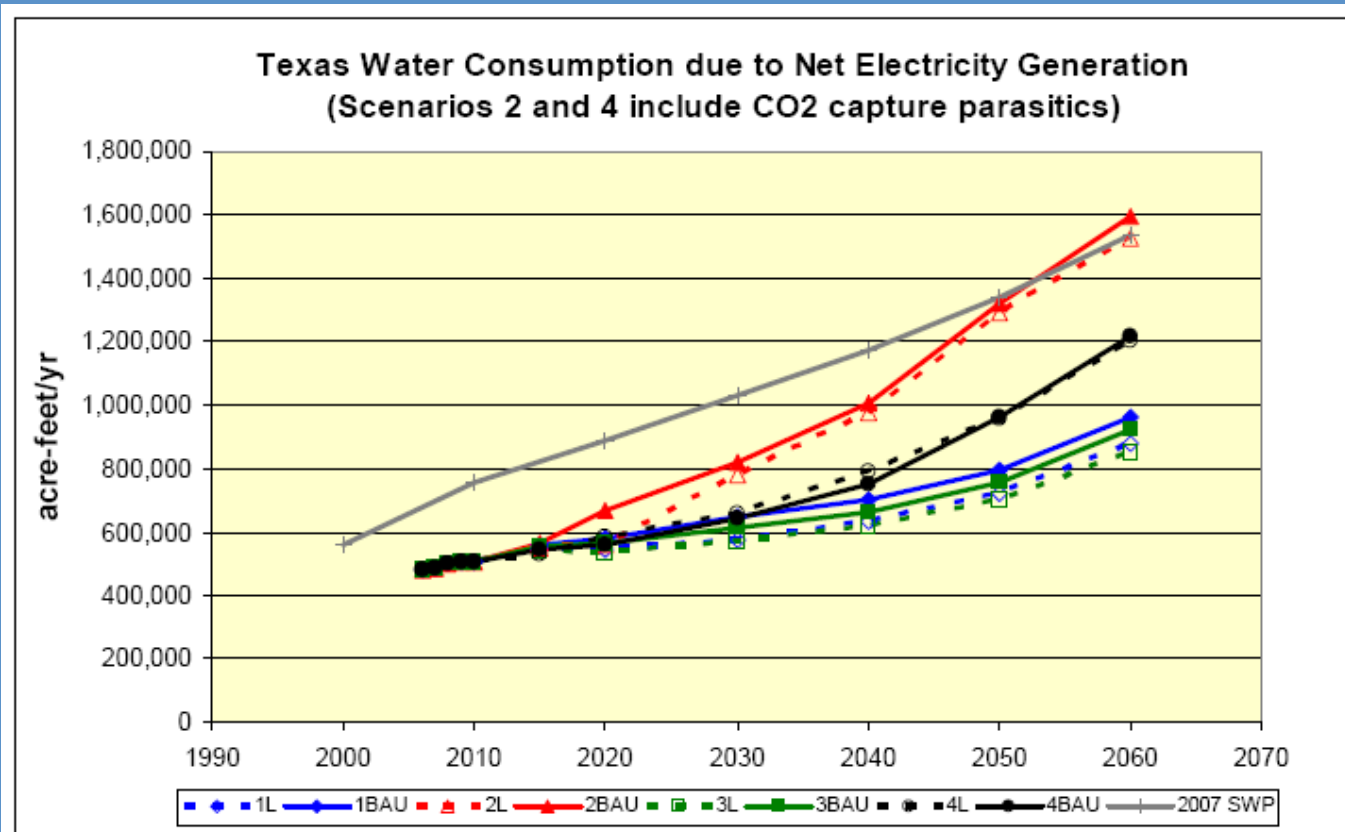


Figure ES-1. The estimates for near term (2006-2015) water consumption for power generation are significantly below the current 2007 State Water Plan (2007 SWP). The water projection for Scenario 2 (involves high natural gas prices and carbon capture systems) results in significantly more water consumption than the other three scenarios.

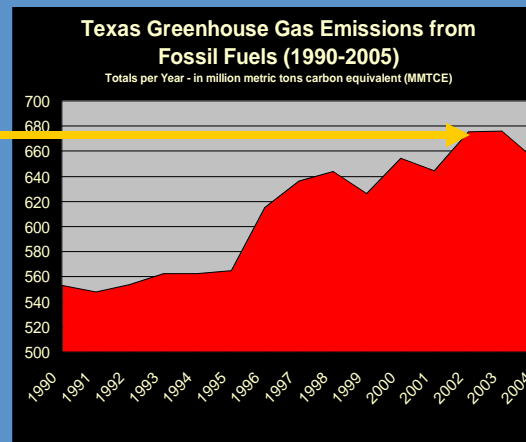
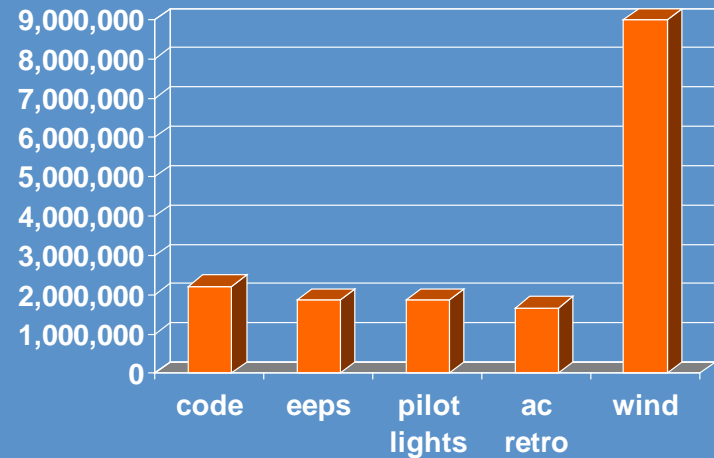
Texas CO2 Would have been Reduced by 8% by Renewables and Efficiency if it were not for the coal plants

estimated reductions through 2017

Texas CO₂ Emissions: 625 million tons per year

Current emission reductions

• Bldg Code 2001 IRC	2,213,759
• Efficiency	1,862,524
• Pilot Lights	1,865,452
• AC Retro	1,673,521
• Wind (Current)	9,000,000
16,700,000 roughly 2.5%	
• If you add Wind (CREZ)	27,517,667
TOTAL (8%)	43,000,000



Growth in Texas' GHG Emissions

Source: Energy Information Administration.

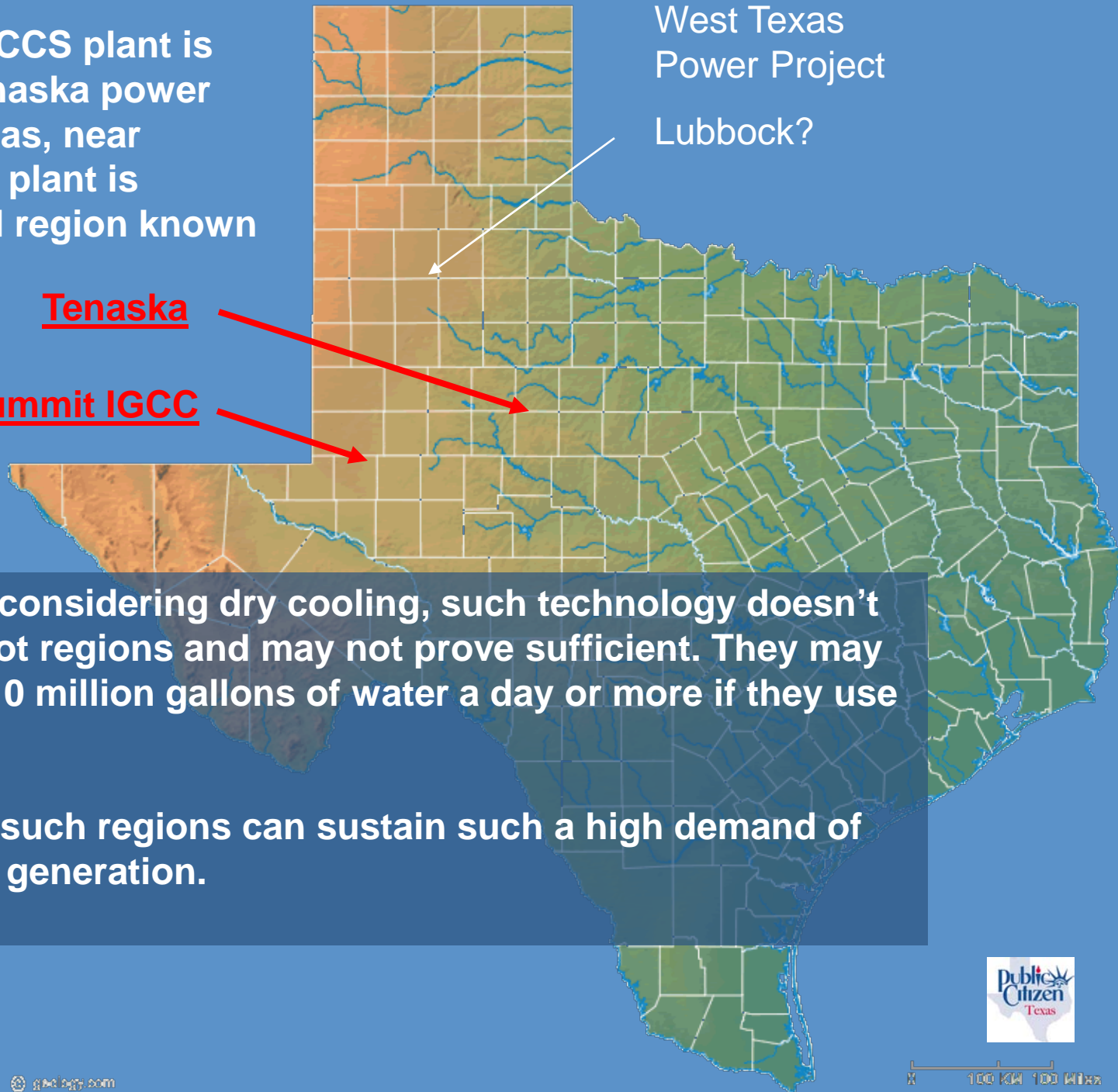


An example of a CCS plant is the proposed Tenaska power plant in West Texas, near Sweetwater. This plant is located in an arid region known for droughts.

Tenaska

Summit IGCC

West Texas
Power Project
Lubbock?



Though they are considering dry cooling, such technology doesn't work as well in hot regions and may not prove sufficient. They may end up needing 10 million gallons of water a day or more if they use wet cooling.

It is unlikely that such regions can sustain such a high demand of water for electric generation.

What about Tenaska?

765 MW pulverized coal plant (600 net) with 85-90% CO₂ capture using an amine wash technology

Plusses

- 1st in the country to develop a PC separation project
- If it works it can be retrofit

Problems

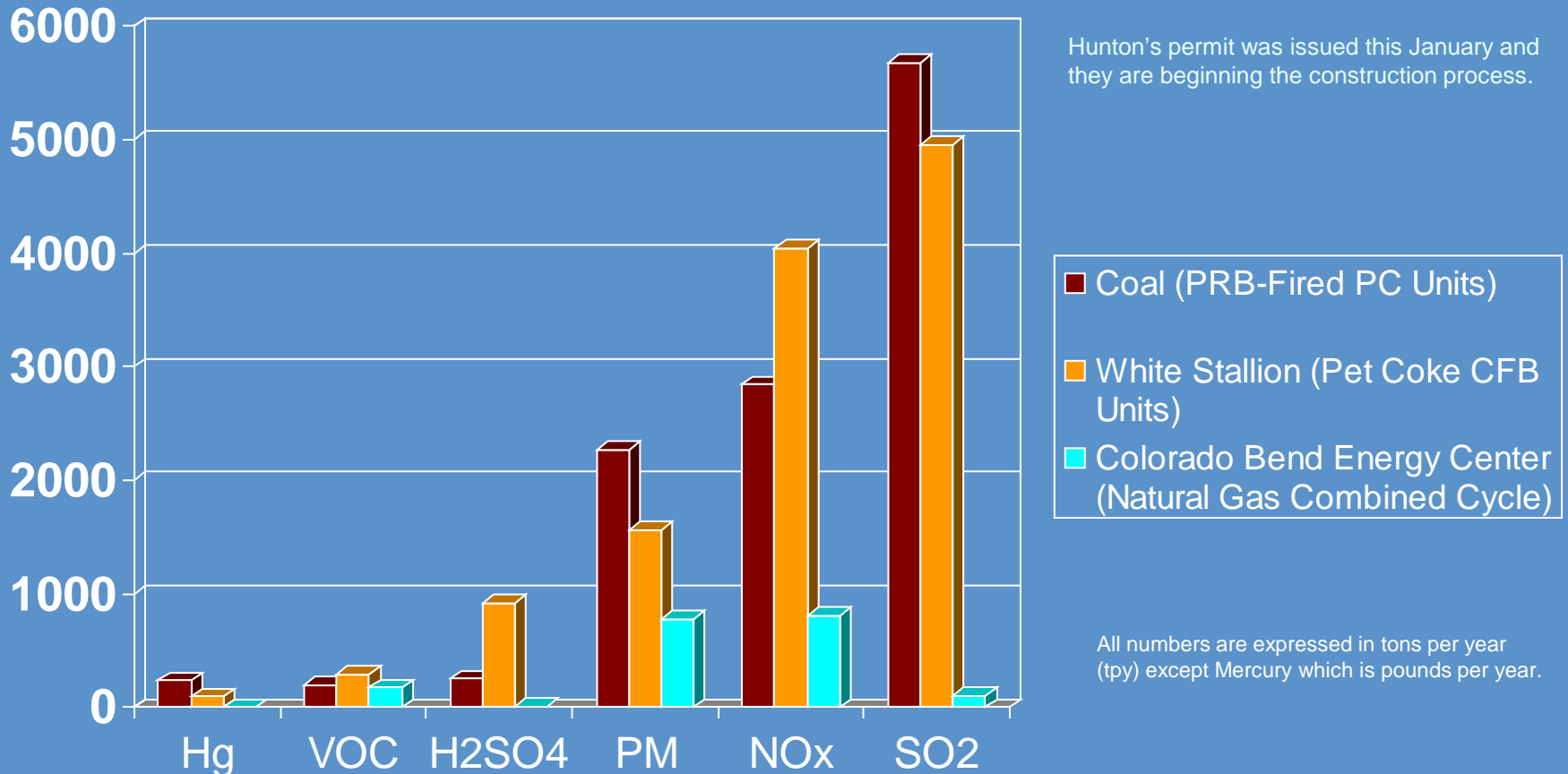
- Co₂ not in permit
- Coal ash pit may leach into Abilene water supply watershed
- Water?



Gasification vs. Conventional Power

Emissions comparison between IGCC and other technologies currently in use.

White Stallion claims to use the “*Most environmentally advanced, cleanest, commercially proven, emission lowering technology available,*” but as shown below this is clearly not the case. The **Hunton IGCC** facility in Houston is a gasification plant which heats petroleum coke to produce a synthetic gas comprised almost entirely of methane. This gas will be pumped into natural gas pipelines and can be burned at natural gas plants, including brand new, state-of-the-art plants similar to the **Colorado Bend Energy Center** just south of Wharton. This syngas will have emissions virtually identical to traditional natural gas. This results in a fraction of the emissions compared to conventional burning of pet coke like what’s being proposed at White Stallion. During the gasification process, Hunton is able to separate out and sell off the toxic pollutants that would otherwise be released into the atmosphere (like mercury and sulfur) to chemical plants and other industries. This generates more revenue streams and profit for their plant.



Hunton’s permit was issued this January and they are beginning the construction process.

- Coal (PRB-Fired PC Units)
- White Stallion (Pet Coke CFB Units)
- Colorado Bend Energy Center (Natural Gas Combined Cycle)

All numbers are expressed in tons per year (tpy) except Mercury which is pounds per year.

Hg = Mercury, VOC = Volatile Organic Compounds, H2SO4 = Sulfuric Acid, PM = Particulate Matter, NOx = Nitrogen Oxides, SO2 = Sulfur Dioxide

Sources: Emissions from White Stallion are from their TCEQ draft permit. PRB-fired PC emissions were obtained from previously submitted permit applications for Big Brown 3, Lake Creek 3, Martin Lake 4, Monticello 4, Morgan Creek 7, Tradinghouse 3 & 4, and Valley Unit 4. Emissions from Colorado Bend Energy Center were taken from their permit.

Emission levels are adjusted for a plant size of 1200 MW, the size of the proposed White Stallion petroleum coke plant.

Lawsuits that May Affect Action on Global Warming

- Public Citizen v TCEQ
 - Hearing in January 2011

- Texas v EPA
 - DC Appellate Court

- Petition to Reconsider
Endangerment Finding

- If denied this will create another pathway to the appellate court



Efficiency could meet most of demand for energy. Renewables, CHP on site solar and natural gas could meet the rest

PUC Report on Energy Efficiency potential in Texas (*the Itron Report*)

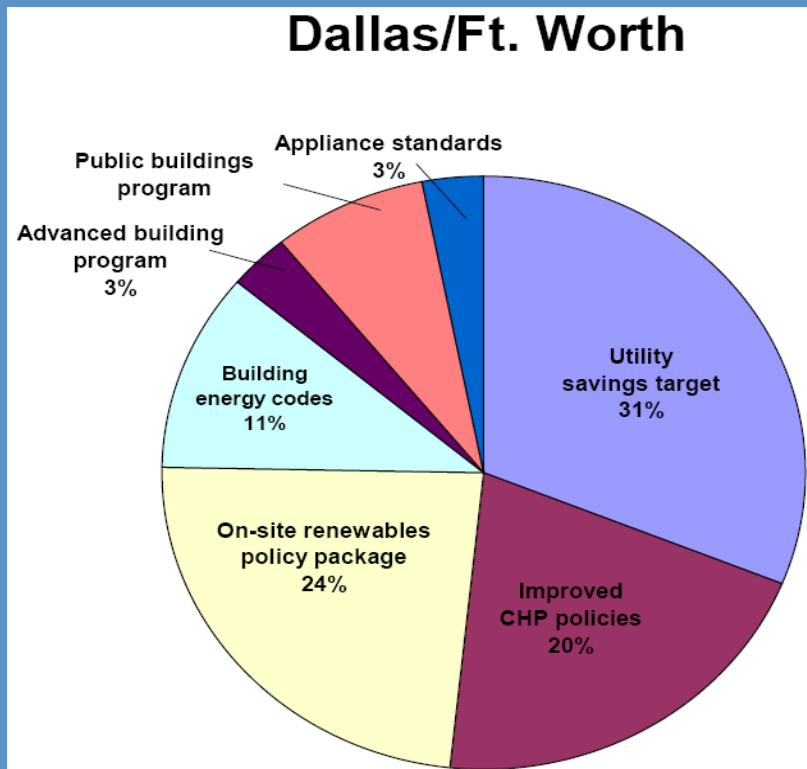
-Reduction of 23% of peak demand cost-effective

American Council for an Energy Efficient Economy (ACEEE) 2007 Report

-76-101% of demand growth can be met with efficiency, CHP, onsite renewable energy

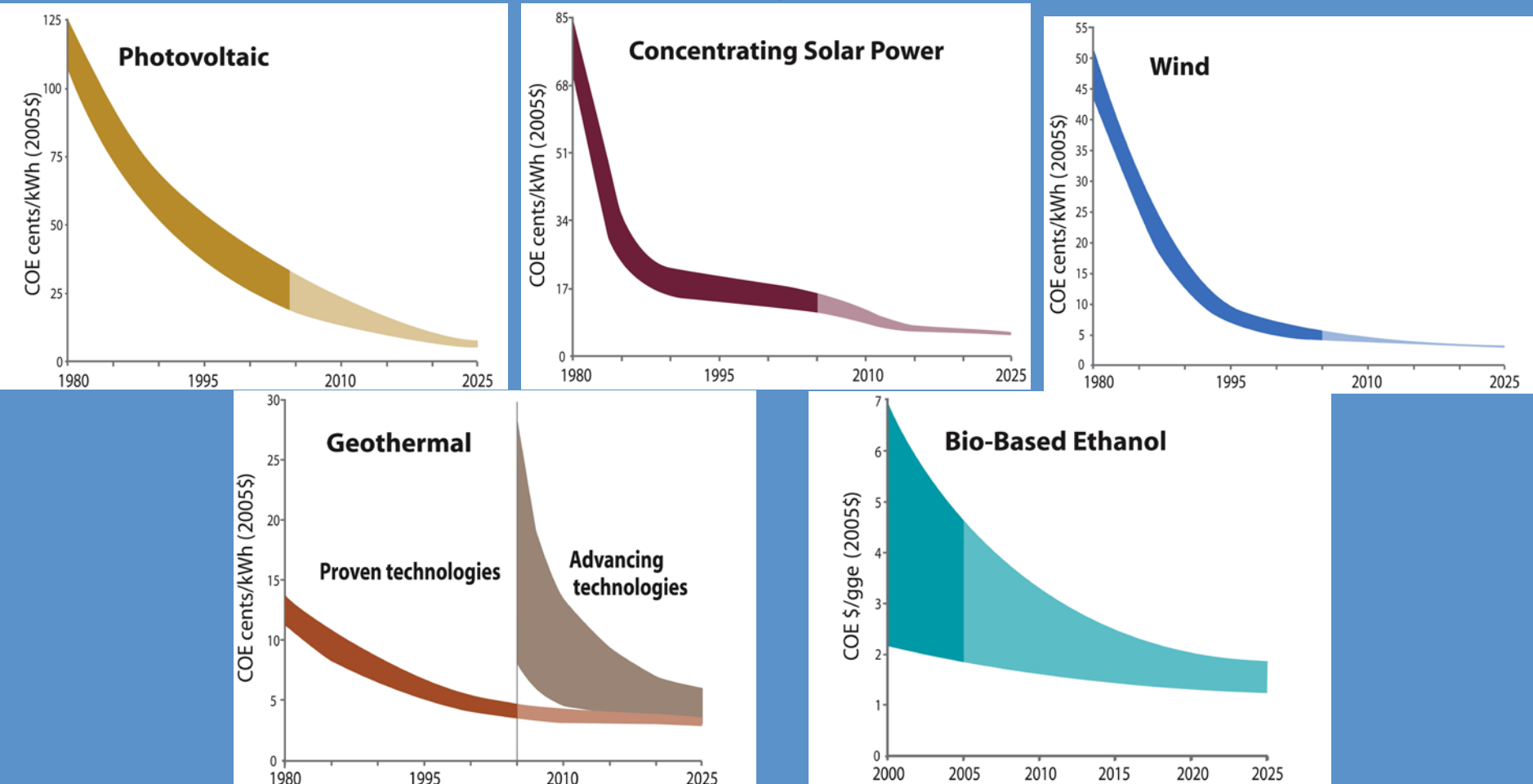
-23,000+ jobs in DFW, Houston area alone

Could Avert 101% of Need for New Power Plants



Renewable Energy Cost Trends

Levelized cost of energy in constant 2005\$¹

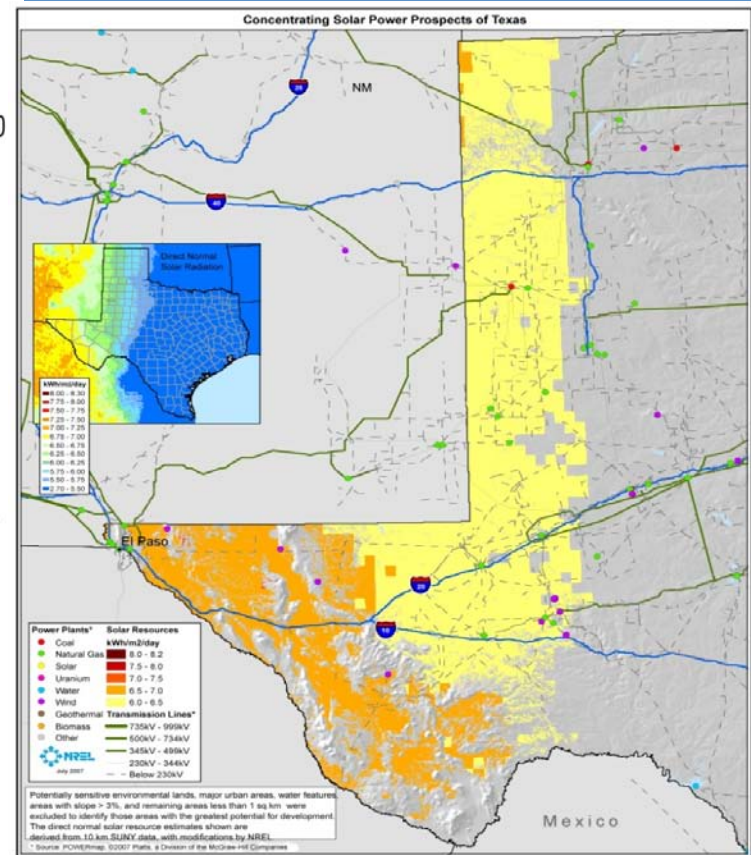
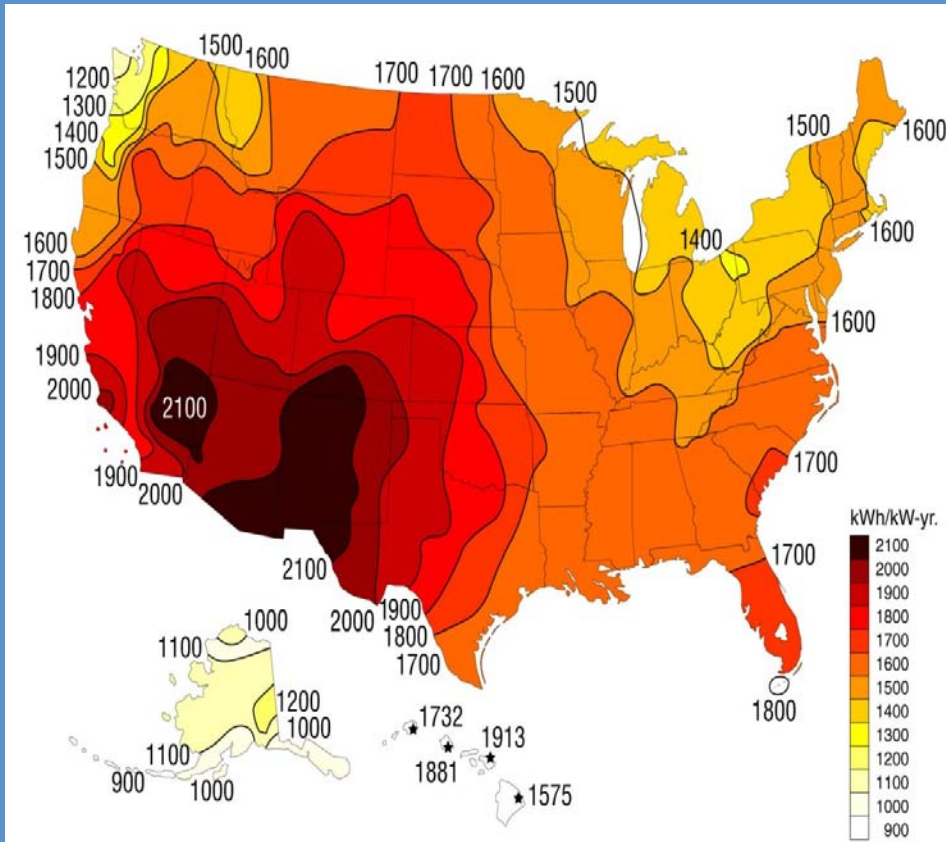


Source: NREL Energy Analysis Office (www.nrel.gov/analysis/docs/cost_curves_2005.ppt)

¹These graphs are reflections of historical cost trends NOT precise annual historical data. DRAFT November 2005

R&D and Market Growth Lower Costs - Setting a 5,000 MW goal by 2025 will assure prices drop further and that developers are assured of a market

Solar is abundant in Texas



New Solar Plants in Texas are Popping Up all Over

- San Antonio
 - Blue Wing
 - Sun Edison three 10 mw projects
- Austin
- Pflugerville
- San Marcos



Tap Geothermal for Base Load Energy Potential

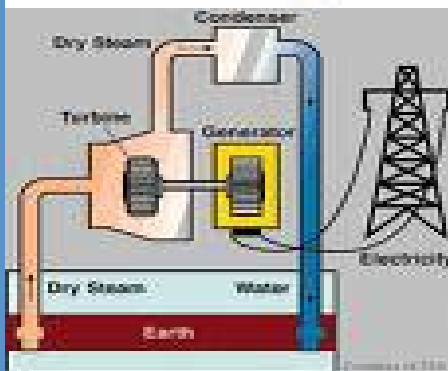
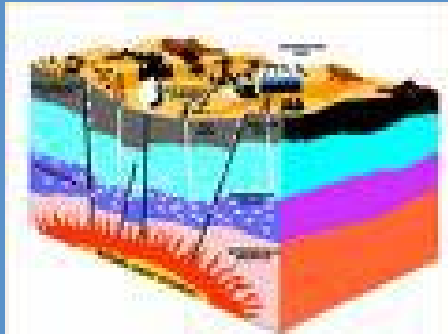
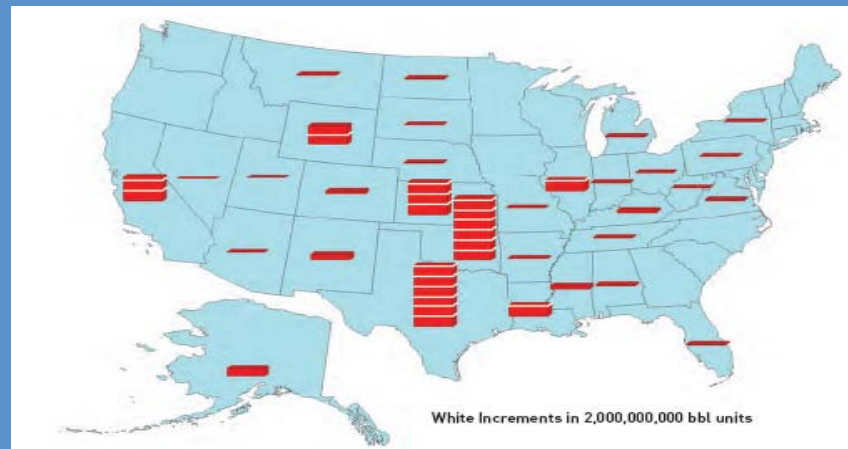


Table 2.3 Equivalent geothermal power from coproduced hot water associated with existing hydrocarbon production in selected states (a complete listing is given in Appendix A.2.2).

State	Total Water Produced Annually, in 1,000 kbbl	Total Water Production Rate, kGPM	Equivalent Power, MW @ 100°C	Equivalent Power, MW @ 140°C	Equivalent Power, MW @ 180°C
Alabama	203,223	18	18	47	88
Arkansas	258,095	23	23	59	112
California	5,080,065	459	462	1,169	2,205
Florida	160,412	15	15	37	70
Louisiana	2,136,573	193	194	492	928
Mississippi	592,518	54	54	136	257
Oklahoma	12,423,264	1,124	1,129	2,860	5,393
Texas	12,097,990	1,094	1,099	2,785	5,252
TOTALS	32,952,141	2,980	2,994	7,585	14,305



Combined Heat and Power Plants can provide 20-25% of our future energy needs using 1/3 the energy

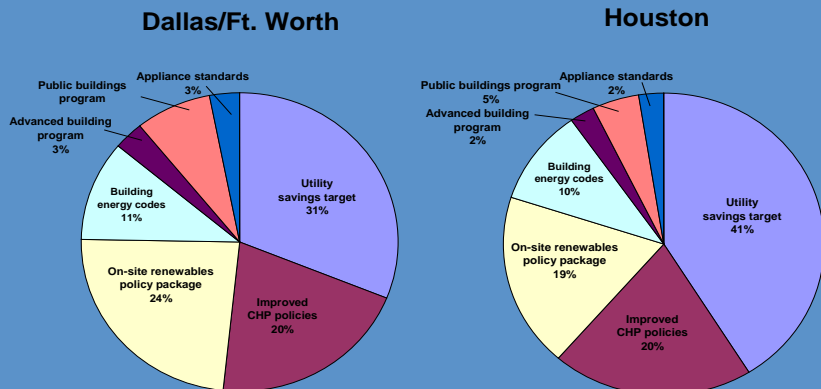


Recycle energy 3 times

1. For electricity
2. For hot water
3. For cooling

Perfect for:

- Hospitals
- Hotels
- Campuses
- Some light industrial





• Storage:

- it's cheaper than coal or nukes
- turns "intermittent" energy into a reliable peak performer

Storage can take many forms,

1. Batteries
2. Thermal - Heat and Ice
3. Compressed Air Energy Storage
4. Super Capacitors
5. Flywheels

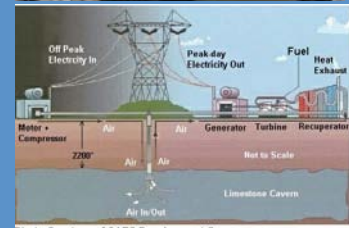
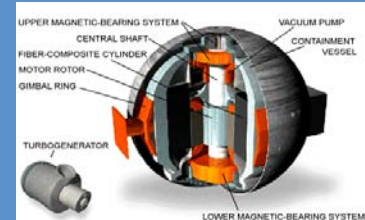
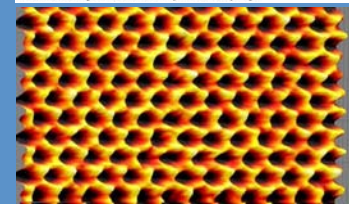


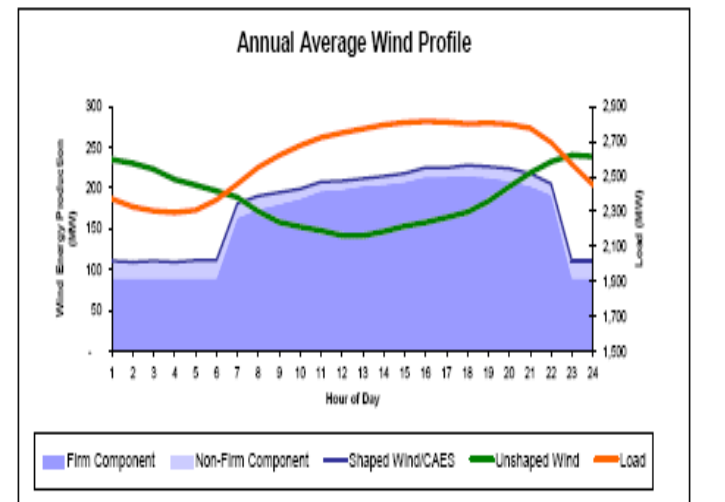
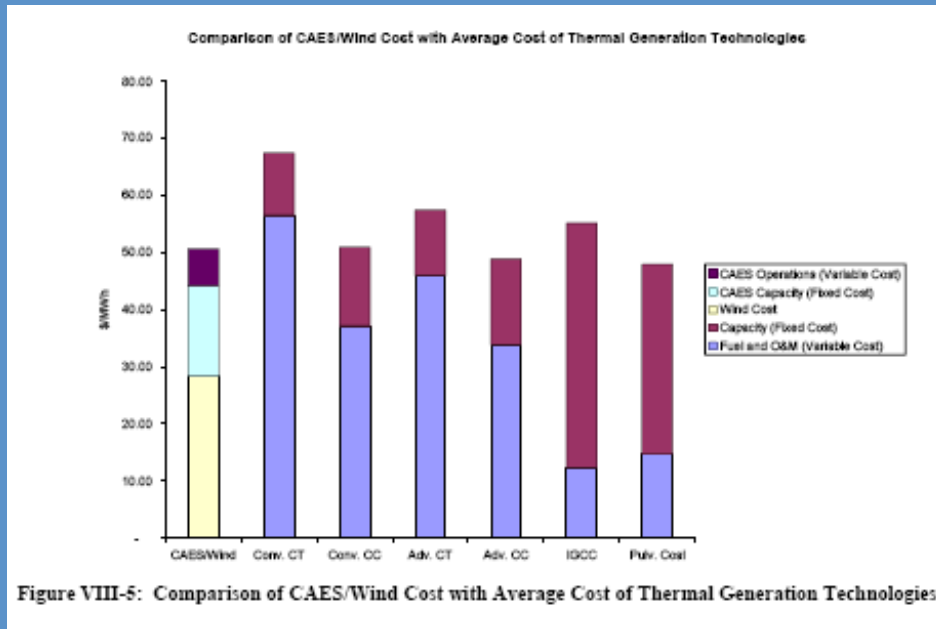
Photo Courtesy of CAES Development Company



Energy Storage can help

SECO study found CAES storage:

- Cost less than gas or coal with CO₂
- Turns night-time wind to peak performer



Cheaper, Cleaner, Cooler Ways to ReEnergize Texas

Texas is at a fork in the road, and we are about to spend billions on retrofitting old plants to meet Texas's energy needs.

The Governor's Council on Competitiveness studied energy options for Texas and found that increased energy efficiency could result in the deferral or elimination of 21,899 megawatts, or almost all new generation needed to meet expected demand through 2030.

High risk: Coal and Nuclear, are all very expensive and destructive to human health and the environment.

Lower Risk

Better Building Codes

- A national group of architects developed the 2030 challenge to increase building efficiency by 50%, which was also adopted by the U.S. Council of Mayors, the League of Cities, ASHRE and AIA

Insulation

- Homes lose an average of 26% of their air conditioning due to leaking duct work

Window Improvements

- Approximately 30% of the unwanted heat that enters homes comes in through windows

Solar Water Heating

- Can save average of 50-80% on heating bills

Air Conditioning

- Efficient air energy conditioners can reduce use by 38%.

Geothermal Heating

- A geothermal heat pump can cut electricity costs by 30-60% and they deliver 3-4 times more energy than they consume

Efficiency

- Decreases waste
- Increases competitiveness
- Creates jobs at home

Renewables

- No carbon cost
- Free fuels
- Needs new energy storage tech

Combined Heating & Power (CHP)

- Can generate electricity and heat at 70-80% efficiency, twice that of a new coal plant, while emitting less pollution
- Provides electricity, hot water and cooling





Next Session

- ***Power plant emissions reductions will play a big roles***
 - Smog, coal combustion wastes, mercury, CO2
- ***Efficiency will become more of a player***
 - stimulus funds,
 - Building codes
 - Expanded PUC programs
- ***Renewables/ Solar will continue to drop in costs***
 - End of European subsidies
 - Increased silicon production
 - Geothermal will become a player
- ***Storage will become a major issue***
 - CCNs
 - Storage portfolio Standard