Cheaper, Cleaner, Cooler Ways to Meet our Needs for New Energy

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Five Crises or Opportunities

1. Air pollution
2. Global Warming
3. Increasing Energy Bills
4. Reserve Margin
5. ERCOT Including all Available of Resources

Next steps

Implementing HB 3693
Preparing for the Next Session
HB 3693 – a big step forward

- Expands energy efficiency goals to 15% of growth in demand by 2008 and 20% by December 31, 2009
  - Requires the utilities to study whether 30% of demand growth is achievable by 2011, and whether 2050% is achievable by 2016
  - Creates an energy efficiency cost recovery factor, and incentive to reward utilities for exceeding the minimum goals
- Municipally owned utilities above 500,000 MWh should administer energy savings incentive programs
- Electric Cooperatives shall consider implementing energy efficiency programs to reduce annual growth in demand
- Requires state funded entities to set a goal of reducing energy use by 5% per year for 6 years
- PUC and ERCOT are required to account for impacts of projected energy savings and demand impacts from:
  - standard offers,
  - market transformation,
  - combined heat and power,
  - demand response,
  - solar incentives,
  - programs in public buildings, etc
  Update the building energy code and develop a HERS based rating system for existing homes
- Net metering must be provided by the utility
Ozone/Pollution

• Ozone is damaging to lung tissue
  – Asthma attacks will increase
  – Induces respiratory inflammation
  – Reduces existing lung function
• Ozone forms in temperatures over 90°F
• Houston is often the smog capital of the U.S.
• 9-12 additional counties may violate the newly proposed lower ozone standard
Today, In Texas & Nationally, Power Plants Are The Largest Source Of Industrial Air Pollution

*In Texas power plants emit more pollution than the chemical and refining industries combined!*

Powering the average home every month produces

- 1,686 lbs of CO₂ (global warming)
- 3.9 lbs of SO₂ (acid rain)
- 2.16 lbs of NOₓ (smog)

In 2004 power plants emitted

- 252 million tons CO₂
- 524,372 tons of SO₂
- 184,483 tons of NOₓ
Power Plants Emissions Effect Air Quality Across Texas

Existing plants Affect DFW, Longview, Austin, San Antonio

9 new coal plants:
5 of which are permitted - 4 still in the process
Health Impacts from Existing Power Plants are Costly To D/FW Health and Economy

Estimated Health Impacts in the DFW area alone:

- 290 early deaths
- 476 heart attacks
- 10,263 asthma attacks
- 288 hospitalizations
- 547 E/R visits - asthma

At just one Dallas Hospital:

The Children’s Medical Center reported annual expenditure of $825 million on respiratory care....

“Asthma and related respiratory conditions were the primary diagnoses for 1,398 children who required hospitalization at Children's and 5,346 visits to the emergency center”.

Estimates based on emissions from existing power plants in Texas. Modeling done by Abt and Associates who do modeling for EPA. Based on peer reviewed process for modeling health impact. Reported in Dirty Air/Dirty Power by the Clean Air Task Force June 2004
Texas Emits more Global Warming Gasses from Electric Generation than Other States
The Earth’s Greenhouse Effect

About half the solar energy absorbed at the surface evaporates water, adding the most important greenhouse gas to the atmosphere. When this water condenses in the atmosphere, it releases the energy that powers storms and produces rain and snow.

About 30% of incoming solar energy is reflected by the surface and the atmosphere.

The surface cools by radiating heat energy upward. The warmer the surface, the greater the amount of heat energy that is radiated upward.

Only a small amount of the heat energy emitted from the surface passes through the atmosphere directly to space. Most is absorbed by greenhouse gas molecules and contributes to the energy radiated back down to warm the surface and lower atmosphere. Increasing the concentrations of greenhouse gases increases the warming of the surface and slows loss of energy to space.
Historical and Observed CO₂/Temperature Linkage
Where do Greenhouse gas emissions come from in Texas?

- Industrial: 33%
- Utility: 33%
- Transportation: 29%
- Residential/Commercial: 5%

Future Warming

- Scientists predict an increase in temperature from 2.7-11°F over the next century.
- Texas’ July heat index is expected to rise by 25 degrees over this century.
- The EPA has found that Dallas’ heat-related deaths could triple by 2050.
- The United Nations weather agency predicts that large cities will suffer twice as many deaths from heat waves by 2020.

- Surface temperatures will likely increase
- Land will heat more than the ocean
- Less water for cooling
- Hotter winters
- Nighttime temperatures will warm more than daytime temperatures
- More hot days and heat waves, fewer cold waves
- In East Texas, we can expect an average temperature increase of 5-10°F by 2100.
What's at Stake in Texas?

Potential Climate Change Impacts

Climate Changes
- Temperature
- Precipitation
- Sea Level Rise

Health Impacts
- Weather-related Mortality
- Infectious Diseases
- Air Quality-Respiratory Illnesses

Agriculture Impacts
- Crop Yields
- Irrigation Demands

Forest Impacts
- Forest composition
- Geographic range of forests
- Forest health and productivity

Water Resource Impacts
- Water supply
- Water quality
- Competition for water

Impacts on Coastal Areas
- Erosion of beaches
- Inundation of coastal lands
- Additional costs to protect coastal communities

Species and Natural Areas
- Loss of habitat and species
Solutions To Global Warming And Power Plant Pollution

• Energy Efficiency HB 3693 – retrofits
• Energy Management
• Building Codes, Green Buildings and Net Zero buildings
  – 2030 goal of US Conference of Mayors,
• Renewable Energy
  – Wind, solar thermal, geothermal, solar electric
• CHP
7 Ways to Reduce CO$_2$
U.S. Electricity Generation by Fuel, 1980-2030
(billion kilowatthours)

History

Projections

Coal

Natural Gas

Nuclear

Renewables

Petroleum

Annual Energy Outlook 2007

Proceedings of the Fifteen and a Half Symposium on Improving Building Systems in Hot and Humid Climates, San Antonio, TX, December 17-18, 2007
World Energy-Related Carbon Dioxide Emissions, 1990-2030 (billion metric tons)

International Energy Outlook 2007

Proceedings of the Fifteen and a Half Symposium on Improving Building Systems in Hot and Humid Climates, San Antonio, TX, December 17-18, 2007
29 Other State’s Are Taking Action to Reduce Global Warming

**New England Governor’s Plan**
- Reduce emission levels to at least the 1990 levels by 2010
- Reduce emission levels 10% below 1990 levels by 2020.
- Try for sustainability ~80% current levels by 2050

**Governor Pataki of New York**
- Reduce state agency electricity usage through energy efficiency improvements (35% below 1990 levels by 2010).
- Commit to purchasing renewable energy for state buildings (10% by 2005, 20% by 2010).
- Increase alternative use in state fleet vehicles (At least 50% of new vehicle purchases will operate on alternative fuel by 2005, 100% by 2010).

**Other states are requiring GHG reduction at power plants**
CO₂ Reductions … Technical Potential*

*Achieving all targets is very aggressive, but potentially feasible.

<table>
<thead>
<tr>
<th>Technology</th>
<th>EIA 2007 Reference</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency</td>
<td>Load Growth ~ +1.8%/yr</td>
<td>Load Growth ~ +1.1%/yr</td>
</tr>
<tr>
<td>Renewables</td>
<td>90 GWe by 2030</td>
<td>70 GWe by 2030</td>
</tr>
<tr>
<td>Nuclear Generation</td>
<td>12.5 GWe by 2030</td>
<td>64 GWe by 2030</td>
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<tr>
<td>Advanced Coal Generation</td>
<td>No Existing Plant Upgrades</td>
<td>150 GWe Plant Upgrades</td>
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<tr>
<td>CCS</td>
<td>None</td>
<td>Widely Deployed After 2020</td>
</tr>
<tr>
<td>PHEV</td>
<td>None</td>
<td>10% of New Vehicle Sales by 2017; 2%/yr Thereafter</td>
</tr>
<tr>
<td>DER</td>
<td>&lt; 0.1% of Base Load in 2030</td>
<td>5% of Base Load in 2030</td>
</tr>
</tbody>
</table>
**U.S. Electric Generation - Full Portfolio**

- **Coal**
- **Gas**
- **Oil**
- **Hydro**
- **Solar**
- **Biomass**
- **Nuclear**
- **Wind**
- **Demand with No Policy**
- **Demand Reduction**

**Full Portfolio**

- **Trillion kWh per Year**

- **The vast majority of electricity supply is CO₂-free**

- **Gas and non-captured coal are the only supply options paying a CO₂ cost**
Recent study by Optimal Energy found:

- Energy Efficiency could save 80% of the growth in demand
- Each dollar in energy savings initiatives would generate $4.40 in savings
- Save energy at a cost of less than 2 cents per kilowatt-hour vs. 5¢ for coal
Efficiency Renewables and CHP could save 76%-101% of the growth in demand in Texas.

**Dallas/Ft. Worth**
- Utility savings target: 31%
- On-site renewables policy package: 24%
- Improved CHP policies: 20%
- Building energy codes: 11%
- Public buildings program: 3%
- Advanced building program: 3%
- Appliance standards: 3%

**Houston**
- Utility savings target: 41%
- On-site renewables policy package: 19%
- Improved CHP policies: 20%
- Building energy codes: 10%
- Public buildings program: 5%
- Advanced building program: 2%
- Appliance standards: 2%

Proceedings of the Fifteen and a Half Symposium on Improving Building Systems in Hot and Humid Climates, San Antonio, TX, December 17-18, 2007
An Alternate Path-
developed by Environmental Defense and others

Reserve Margin - Crisis Averted

- ERCOT (Projected)
- After Efficiency
- After Efficiency + Demand Response
- After All Clean Tech
- Target Reserve Margin (12.5%)
Commissioner Smitherman's View Of The Future Doesn’t Include Energy Efficiency Or Demand Management
Ercot demand forecast 2007-12

From Presentation by Commissioner Barry Smitherman
At the GULF COAST POWER ASSOCIATION FALL 2007 CONFERENCE & EXHIBITION
OCTOBER 3 & 4, 2007
THEORY IS CLEAN; LIFE IS MESSY. CONTINUING DEVELOPMENTS IN THE ERCOT MARKET.
ERCOT’s Forecast Doesn’t Include Efficiency

![Table of Capacity, Demand, and Reserves in the ERCOT Region](image)

- **2007 Report on the Capacity, Demand, and Reserves in the ERCOT Region**
- **Summer Summary**

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
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<tr>
<td><strong>Load Forecast:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Total Summer Peak Demand, MW</td>
<td>63,754</td>
<td>65,135</td>
<td>66,608</td>
<td>67,995</td>
<td>65,469</td>
<td>70,733</td>
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<td>less LAARs Serving as Responsive Reserve, MW</td>
<td>1,125</td>
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<tr>
<td>less LAARs Serving as Non-Spinning Reserve, MW</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>less BULs, MW</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Firm Load Forecast, MW</td>
<td>62,669</td>
<td>64,010</td>
<td>65,483</td>
<td>66,860</td>
<td>68,331</td>
<td>69,608</td>
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</table>

- **Resources:**

<table>
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<tr>
<th></th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
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<tbody>
<tr>
<td>Installed Capacity, MW</td>
<td>61,424</td>
<td>61,424</td>
<td>61,424</td>
<td>61,424</td>
<td>61,424</td>
<td>61,424</td>
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<tr>
<td>Capacity from Private Networks, MW</td>
<td>6,513</td>
<td>6,217</td>
<td>6,217</td>
<td>6,217</td>
<td>6,217</td>
<td>6,217</td>
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<tr>
<td>Effective Load-Carrying Capability (ELCC) of Wind Generation, MW</td>
<td>238</td>
<td>238</td>
<td>238</td>
<td>238</td>
<td>238</td>
<td>238</td>
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<tr>
<td>RMR Units under Contract, MW</td>
<td>188</td>
<td>188</td>
<td>188</td>
<td>188</td>
<td>188</td>
<td>188</td>
</tr>
<tr>
<td>50% of Non-Synchronous Ties, MW</td>
<td>553</td>
<td>553</td>
<td>553</td>
<td>553</td>
<td>553</td>
<td>553</td>
</tr>
<tr>
<td>Switchable Units, MW</td>
<td>2,848</td>
<td>2,848</td>
<td>2,848</td>
<td>2,848</td>
<td>2,848</td>
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<tr>
<td>Available mothballed Generation, MW</td>
<td>165</td>
<td>165</td>
<td>165</td>
<td>165</td>
<td>165</td>
<td>165</td>
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<tr>
<td>Planned Units (not wind) with Signed I &amp; A Permit, MW</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>ELCC of Planned Wind Units with Signed I &amp; A, MW</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total Resources, MW</td>
<td>71,970</td>
<td>72,740</td>
<td>72,652</td>
<td>72,827</td>
<td>73,372</td>
<td>74,136</td>
</tr>
</tbody>
</table>

- **Reserve Margin**

| Reserve Margin | 14.6% | 12.6% | 10.1% | 8.3% | 6.7% | 5.9% |

*Other Potential Resources:*

| mothballed capacity, mw | 553 | 9,153 | 11,459 | 15,911 | 17,664 | 17,717 |
| 60% of Non-Synchronous Ties, MW | 0 | 5,197 | 5,228 | 5,113 | 5,318 | 5,354 |
| Planned Units in Full Interconnection Study Phase, MW | 553 | 553 | 553 | 553 | 553 | 553 |
| Planned Units in Full Interconnection Study Phase, MW | 0 | 3,404 | 3,818 | 10,245 | 11,793 | 11,810 |

Proceedings of the Fifteen and a Half Symposium on Improving Building Systems in Hot and Humid Climates, San Antonio, TX, December 17-18, 2007
Those who underestimate buyout kings like Henry Kravis may do so at their peril….Now comes word that one of the group’s earliest chess moves — its agreement to shelve TXU's plans to build coal-fired power plants — may be doubly rewarding for them. Not only did it get them the buy-in from some environmental groups, but now it appears that the move may help them boost their returns. …, keeping the coal plants out of circulation will help boost electricity rates for TXU's other plants in the state.

The state’s grid operator says excess generating capacity of 14.6% this summer could fall to 5.9% by the summer of 2012 — well below the 12.5% that is considered the “safety margin.”
Cooler Power: Texas Leads the Nation in Renewable Energy Potential

Source: Texas State Energy Conservation Office.
Texas Has Been VERY Successful Promoting Wind

Over 3352 MW Built since 1999
5076 MW by 2008
States goal is 5880- by 2015!
The Texas RPS has Developed Wind- but it Has Failed to Develop Solar and Other Clean Generating Resources

We need to set 1% aside for solar and farm based renewable energy

Why?

- No solar or small renewable set aside
- Insurance requirements
- Buy back rates aren’t clear

Solar is cost effective in remote and low voltage applications
Solar is heavily used by the oil and gas and communications industries---but has not been widely used for bulk power
Waste gasses from concentrated animal feeding operations can power generators
Biogasses from crop wastes can power generators, too
Texas Leads the Nation in Solar Potential
Thin Film Solar will be Critical to Developing Net Zero Energy Homes
If Sales Volume Increases PV Will Cost Less than Coal & Gas

Natural Gas
- high fuel $
- low plant $

Coal
- low fuel $
- high plant $

Complete PV System $

PV Collector $

Source: Strategies Unlimited
T.M. Peterson, EPRI
Geothermal 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).

<table>
<thead>
<tr>
<th>State</th>
<th>Total Water Produced Annually, in 1,000 bbls</th>
<th>Total Water Production Rate, KOPM</th>
<th>Equivalent Power, MW @ 100°C</th>
<th>Equivalent Power, MW @ 140°C</th>
<th>Equivalent Power, MW @ 180°C</th>
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</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>203,223</td>
<td>18</td>
<td>18</td>
<td>47</td>
<td>88</td>
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<tr>
<td>Arkansas</td>
<td>258,095</td>
<td>23</td>
<td>23</td>
<td>59</td>
<td>112</td>
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<tr>
<td>California</td>
<td>5,080,045</td>
<td>459</td>
<td>462</td>
<td>1,149</td>
<td>2,205</td>
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<tr>
<td>Florida</td>
<td>160,412</td>
<td>15</td>
<td>15</td>
<td>37</td>
<td>70</td>
</tr>
<tr>
<td>Louisiana</td>
<td>2,136,573</td>
<td>193</td>
<td>194</td>
<td>492</td>
<td>928</td>
</tr>
<tr>
<td>Mississippi</td>
<td>592,518</td>
<td>54</td>
<td>54</td>
<td>136</td>
<td>257</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>12,432,244</td>
<td>1,124</td>
<td>1,129</td>
<td>2,840</td>
<td>5,393</td>
</tr>
<tr>
<td>Texas</td>
<td>12,397,990</td>
<td>1,094</td>
<td>1,099</td>
<td>2,785</td>
<td>5,252</td>
</tr>
<tr>
<td>TOTALS</td>
<td>32,952,141</td>
<td>2,960</td>
<td>2,994</td>
<td>7,505</td>
<td>14,305</td>
</tr>
</tbody>
</table>

White increments in 2,500,000,000 bbl units
Renewable Energy Cost Trends:
R&D and Market Growth Lower Costs

Wind

PV

Geothermal

Solar thermal

Biomass

Source: NREL Energy Analysis Office
Updated: June 2002

Levelized cents/kWh in constant $2000
Our Challenge after HB 3693: How To Estimate And Integrate The Potential Savings Into The Current And Future Demand Forecasts

Potential savings:
- PUC programs
- Political subdivisions
- Demand management
- Rate design
- CHP
- On-site renewable
- Solar hot water
- Appliances
- Geothermal

Players:
- PUC
- ERCOT
- Political Subdivisions
  - City Councils and codes
- Builders
- Homebuyers
- Congress
- Legislature
- EPA
- Coops and Munis

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Our Opportunities

• Developing comprehensive regional studies that fully characterize all potential ways we could save or manage energy thru 2025

• Examine the regional variations in current and projected temperatures, air pollution, commercial partners and culture

• Create new ways to reach and teach Texans and trades people about efficiency opportunities
Next Steps

• Getting public entities to do as much efficiency as possible

• Documenting the savings

• Developing building retrofits

• Developing plan for the next session
It’s far better to act and be a little wrong than to fail to act and have been catastrophically wrong!

“The Time to act is now. Acknowledging the reality of a well documented problem is critical: taking swift and decisive action to solve it is the mark of leadership.”

Dallas Morning News—on July 11, 2005

“From Talk to Action”
The End