

Climate Change: What is going on in Texas?

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US EPA
February 8, 2011
Future of Texas CCS -2011 and Beyond
Austin, Texas

Climate Change Air Overview

- Across the Federal government, partnerships and programs promote opportunities to conserve fossil fuels, improve energy efficiency, recover methane and sequester carbon.
- EPA has issued regulatory actions under the Clean Air Act and in some cases other statutory authorities, IE, CWA and Montreal Protocol to address issues related to climate change.

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Action

- On December 7, 2009, the Administrator signed two distinct findings regarding greenhouse gases under section 202(a) of the Clean Air Act:
- **Endangerment Finding:** The Administrator finds that the current and projected concentrations of the six key well-mixed greenhouse gases — carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆) — in the atmosphere threaten the public health and welfare of current and future generations.
- **Cause or Contribute Finding:** The Administrator finds that the combined emissions of these well-mixed greenhouse gases from new motor vehicles and new motor vehicle engines contribute to the greenhouse gas pollution which threatens public health and welfare.
- These findings do not themselves impose any requirements on industry or other entities. However, this action is a prerequisite to finalizing the EPA's [proposed greenhouse gas emission standards for light-duty vehicles](#), which EPA proposed in a joint proposal including the Department of Transportation's proposed CAFE standards on September 15, 2009.

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- Clean Air Act program rulings and affected climate change regulations programs
 - Mandatory Reporting Rule for GHG's.
 - Transportation sector through fuel economy standards and use of biofuels, (3 year delay).
 - Final Tailoring Rule and Permitting of the larger facility emissions.
 - Voluntary climate change programs shift gears and in some cases need to shut down due to close industry ties.

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Mandatory Reporting Rule: What GHGs are Reported? Threshold is 25,000 metric tons of CO₂e.

- CO₂
- CH₄ (methane)
- N₂O (nitrous oxide)
- Fluorinated GHGs
 - HFCs (hydrofluorocarbons)
 - PFCs (perfluorocarbons)
 - SF₆ (sulfur hexafluoride)
 - **Other fluorinated gases**

Climate Change Air Overview

- **Key Elements of the Rule**
 - Annual reporting of GHG by:29 source categories
 - 5 types of suppliers of fuel and industrial GHG
 - Motor vehicle and engine suppliers (except light duty sector)
- 25,000 metric tons CO₂e per year reporting threshold for most sources; capacity-based thresholds where feasible
- Monitoring begins January 1, 2010; first reports due March 31, 2011
- Direct reporting to EPA electronically
- EPA verification of emissions data

Climate Change Air Overview

- **How much is 25,000 MTCO₂ e?**
 - Equivalent to Annual greenhouse gas emissions from the energy use of approximately 2,300 homes
 - Annual greenhouse gas emissions from approximately 4,600 passenger vehicles
- Majority of commercial building owners not likely to meet reporting threshold
- Applicability Tool available online to help facilities assess whether they are required to report

Climate Change Air Overview

Renewable Fuel Standard

EPA is responsible for developing and implementing regulations to ensure that transportation fuel sold in the United States contains a minimum volume of renewable fuel. The Renewable Fuel Standard (RFS) program regulations were developed in collaboration with refiners, renewable fuel producers, and many other stakeholders.

The RFS program was created under the Energy Policy Act (EPA) of 2005, and established the first renewable fuel volume mandate in the United States. As required under EPA Act, the original RFS program (RFS1) required 7.5 billion gallons of renewable fuel to be blended into gasoline by 2012.

Under the Energy Independence and Security Act (EISA) of 2007, the RFS program was expanded in several key ways:

- EISA expanded the RFS program to include diesel, in addition to gasoline;
- EISA increased the volume of renewable fuel required to be blended into transportation fuel from 9 billion gallons in 2008 to 36 billion gallons by 2022;
- EISA established new categories of renewable fuel, and set separate volume requirements for each one.
- EISA required EPA to apply lifecycle greenhouse gas performance threshold standards to ensure that each category of renewable fuel emits fewer greenhouse gases than the petroleum fuel it replaces.

RFS2 lays the foundation for achieving significant reductions of greenhouse gas emissions from the use of renewable fuels, for reducing imported petroleum, and encouraging the development and expansion of our nation's renewable fuels sector.

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OMB Completes Review of EPA Requirement For Vehicle Renewable Fuel Content in 2011

- The White House Office of Management and Budget completed review Nov. 22 of a draft final Environmental Protection Agency rule that would set requirements for renewable fuel content in motor fuels for 2011.
- The final rule would follow a proposal announced by EPA July 12 and published July 20 that has a far lower requirement for cellulosic ethanol than is required by the 2011 Energy Independence and Security Act (Pub. L. No. 110-140) (75 Fed. Reg. 42,238 [132 DEN A-7, 7/13/10](#)).
- Cellulosic ethanol is produced from grass, sawdust, agricultural waste, and similar sources.
- The renewable fuel level proposed by EPA for cellulosic ethanol, a range between 6.5 million and 25.5 million gallons, is one-tenth or less of the 250 million gallons the law requires in 2011.
- The proposal followed statutory requirements in setting levels for ethanol and other renewable fuel in gasoline and diesel fuel in 2011.
- The Energy Independence and Security Act requires the nation's motor fuel supply to include 36 billion gallons of ethanol or other renewable fuel by 2022, including 16 billion gallons of cellulosic ethanol. For 2011, the law requires 13.95 billion gallons of renewable fuel.
- In the proposed rule, EPA said the 13.95 billion gallons of renewable fuel in 2011 would amount to 7.95 percent of the nation's fuel supply. Under the law, EPA every year sets the percentage of renewable fuel required to meet the levels set in the law.
- Energy Information Administration Administrator Richard G. Newell wrote a [letter](#); Oct. 20 to EPA Administrator Lisa Jackson projecting that cellulosic production in 2011 in the United States will be 3.94 million gallons from four production facilities.

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EPA and the National Highway Traffic Safety Administration (NHTSA) are taking coordinated steps to enable the production of a new generation of clean vehicles, though reduced GHG emissions and improved fuel efficiency from on-road vehicles and engines. These next steps include developing [first-ever GHG regulations for heavy-duty engines and vehicles](#), as well as [further light-duty vehicle GHG regulations](#). These steps were outlined by President Obama in a [memorandum on May 21, 2010](#).

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Need to Reduce Greenhouse Gases and Reduce Fuel Use from Vehicles

- Our country has two intertwined and critically important needs - to address global climate change and to reduce oil consumption. EPA and NHTSA are developing a national program to meet these needs by reducing GHG emissions and fuel use from on-highway transportation sources. The effect of these actions will be to reduce GHG emissions, improve energy security, increase fuel savings, and provide regulatory certainty for manufacturers.
- Transportation sources emitted 28 percent of all U.S. GHG emissions in 2007 (f1) and have been the fastest-growing source of U.S. GHG emissions since 1990. The mobile sources addressed in this regulatory announcement – light-duty vehicles and heavy-duty vehicles – accounted for 23 percent of all U.S. GHG emissions in 2007. (f2)

(f1) - http://epa.gov/climatechange/emissions/downloads09/GHG2007entire_repo_01-508.pdf

(f2) - <http://epa.gov/climatechange/endangerment/downloads/Endangerment%20TSD.pdf>

Climate Change Air Overview

Standards for Heavy-Duty Engines and Vehicles

- Building on EPA's and NHTSA's successful collaboration and the overwhelming stakeholder support for establishing harmonized fuel economy and GHG emission standards for light-duty vehicles built in model years 2012-2016, EPA and NHTSA will work to develop strong, coordinated national GHG and fuel efficiency standards for heavy-duty vehicles that will begin with model year 2014.
- The agencies will propose and take comment on strategies, including those designed to increase the use of existing technologies, to achieve substantial annual progress in reducing transportation sector GHG emissions and fossil fuel consumption from the truck sector, consistent with the Administration's energy and climate security goals. The agencies will seek comment on standards flexible enough to account for the unique market structure of the trucking industry and the diverse demands of heavy-duty vehicle applications. They will also seek to harmonize with applicable state standards.
- To inform their work, EPA and NHTSA will seek input from an array of stakeholders, including, but not limited to, vehicle and engine manufacturers, fleet owners and operators, and environmental organizations. The agencies will also work with the State of California and other states in this process, and will consider the findings and recommendations of the National Academies of Science. EPA's preliminary analysis indicates that the heavy-duty standards under consideration have the potential to reduce GHG emissions by approximately 250 million metric tons and save over 500 million barrels of oil over the life of vehicles produced in the first five years of the program.

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EPA-420-F-10-059, November 2010

- [Supplemental Notice of Intent](#)
- [Upcoming Proposed Rule](#)
- [For More Information](#)
- The U.S. Environmental Protection Agency (EPA) and the National Highway Traffic Safety Administration (NHTSA), on behalf of the U.S. Department of Transportation, are releasing a joint Supplemental Notice of Intent (NOI) to begin developing new standards for greenhouse gas (GHG) and fuel economy for light-duty vehicles in model years (MY) 2017-2025. This Supplemental Notice follows the joint NOI released on September 30, 2010, 1 ([footnotes](#)) and is meant to aid the public's understanding of many key issues facing the agencies as we continue the process of developing the upcoming rulemaking.

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Light-Duty Regulations

- EPA and NHTSA have been working together on developing a National Program of harmonized regulations to reduce greenhouse gas emissions and improve fuel economy of light-duty vehicles. The agencies issued a [Final Rulemaking](#) establishing standards for 2012-2016 model year vehicles on April 1, 2010. The agencies are now in the process of developing a rulemaking to set standards for model years 2017-2025. Below, information is presented on each of the rulemaking phases that have been completed.
- **EPA/NHTSA Supplemental Notice of Upcoming Joint Rulemaking to Establish 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and CAFE Standards** On November 30, 2010, EPA and NHTSA issued a Supplemental Notice of Intent (NOI) which follows the [Notice of Intent](#) released on September 30, 2010, to begin developing new standards for greenhouse gas (GHG) and fuel economy for light-duty vehicles in model years (MY) 2017-2025. This Supplemental Notice is meant to aid the public's understanding of many key issues facing the agencies as we continue the process of developing the upcoming rulemaking. This Supplemental NOI highlights many of the key comments received in response to the September NOI, and to the [Interim Joint Technical Assessment Report \(TAR\)](#) issued by EPA, NHTSA, and the California Air Resources Board, associated with that Notice. The Supplemental NOI also discusses the agencies' plans for many of the key technical analyses that will be undertaken in developing the upcoming proposed rulemaking.
 - Fact Sheet: [EPA and NHTSA Issue a Supplemental Notice in the Process for Setting Future Greenhouse Gas and Fuel Economy Standards for Passenger Cars and Light Trucks](#) [PDF Version] (3 pp, 487K, EPA-420-F-10-059, November 2010)
 - [Pre-Publication Notice \(PDF\)](#) (20 pp, 125K, November 30, 2010)

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ACTION

- On May 13, 2010, the U.S. Environmental Protection Agency (EPA) issued a final rule that establishes a common sense approach to addressing greenhouse gas emissions from stationary sources under the Clean Air Act (CAA) permitting programs. This final rule sets thresholds for greenhouse gas (GHG) emissions that define when permits under the New Source Review Prevention of Significant Deterioration (PSD) and title V Operating Permit programs are required for new and existing industrial facilities.
- This final rule "tailors" the requirements of these CAA permitting programs to limit which facilities will be required to obtain PSD and title V permits. Facilities responsible for nearly 70 percent of the national GHG emissions from stationary sources will be subject to permitting requirements under this rule. This includes the nation's largest GHG emitters—power plants, refineries, and cement production facilities.
- Emissions from small farms, restaurants, and all but the very largest commercial facilities will not be covered by these programs at this time.
- The rule establishes a schedule that will initially focus CAA permitting programs on the largest sources with the most CAA permitting experience. The rule then expands to cover the largest sources of GHG that may not have been previously covered by the CAA for other pollutants. Finally, it describes EPA plans for any additional steps in this process.
- The CAA permitting program emissions thresholds for criteria pollutants such as lead, sulfur dioxide and nitrogen dioxide, are 100 and 250 tons per year (tpy). While these thresholds are appropriate for criteria pollutants, they are not feasible for GHGs because GHGs are emitted in much higher volumes.

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- Without this tailoring rule, the lower emissions thresholds would take effect automatically for GHGs on January 2, 2011. PSD and title V requirements at these thresholds would lead to dramatic increases in the number of required permits—tens of thousands of PSD permits and millions of title V permits. State, local, and tribal permitting authorities would be overwhelmed and the programs' abilities to manage air quality would be severely impaired.
- EPA will phase in the CAA permitting requirements for GHGs in two initial steps.

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- **Step 1. (January 2, 2011 –June 30, 2011)**
- Only sources currently subject to the PSD permitting program (i.e., those that are newly-constructed or modified in a way that significantly increases emissions of a pollutant other than GHGs) would be subject to permitting requirements for their GHG emissions under PSD.
- For these projects, only GHG increases of 75,000 tpy or more of total GHG, on a CO₂e basis, would need to determine the Best Available Control Technology (BACT) for their GHG emissions.
- Similarly for the operating permit program, only sources currently subject to the program (i.e., newly constructed or existing major sources for a pollutant other than GHGs) would be subject to title V requirements for GHG.
- During this time, no sources would be subject to Clean Air Act permitting requirements due solely to GHG emissions.

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- **Step 2. (July 1, 2011 to June 30, 2013)**
- Step 2 will build on Step 1. In this phase, PSD permitting requirements will cover for the first time new construction projects that emit GHG emissions of at least 100,000 tpy even if they do not exceed the permitting thresholds for any other pollutant. Modifications at existing facilities that increase GHG emissions by at least 75,000 tpy will be subject to permitting requirements, even if they do not significantly increase emissions of any other pollutant.
- In Step 2, operating permit requirements will, for the first time, apply to sources based on their GHG emissions even if they would not apply based on emissions of any other pollutant. Facilities that emit at least 100,000 tpy CO₂e will be subject to title V permitting requirements.
- EPA estimates that about 550 sources will need to obtain title V permits for the first time due to their GHG emissions. The majority of these newly permitted sources will likely be solid waste landfills and industrial manufacturers. There will be approximately 900 additional PSD permitting actions each year triggered by increases in GHG emissions from new and modified emission sources.

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Additional Step 3 Outlined in this Rule

- In this final rule, EPA commits to undertake another rulemaking, to begin in 2011 and conclude no later than July 1, 2012. That action will take comment on an additional step for phasing in GHG permitting, and may discuss whether certain smaller sources can be permanently excluded from permitting. EPA also plans to explore a range of opportunities for streamlining future GHG permitting that have the potential to significantly reduce permitting burdens. EPA will propose viable streamlining options in the "Step 3" rulemaking.
- Step three, if established, will not require permitting for sources with greenhouse gas emissions below 50,000 tpy.
- EPA will not require permits for smaller sources in step three or through any other action until at least April 30, 2016.

Climate Change Air Overview

Other Steps Outlined in this Rule

- By the end of April 2015, EPA will complete a study on remaining GHG permitting burdens that would exist if we applied the program to smaller sources. We will consider the results of the study to complete a rule by April 30, 2016 further addressing Clean Air Act permitting for these facilities. In that rule we may decide that successful streamlining will allow us to phase in more sources, but we may also decide that certain smaller sources need to be permanently excluded from permitting.

Implementation

- Step 1 of this final rule will take effect on January 2, 2011. The final rule asks states to inform EPA whether they must make rule changes to implement the new GHG emissions thresholds, and when such changes will be adopted. If there are cases where this cannot happen by January 2, 2011, EPA will take appropriate action to ensure that the existing CAA permitting rules do not apply to sources excluded by today's rule.
- EPA also plans to develop supporting guidance and other information to assist permitting authorities as they begin to address permitting actions for GHG emissions for the first time. EPA will be actively working with states on technical information and data needs related to identifying BACT requirements for PSD permits. The guidance would first cover source categories that typically emit GHGs at levels exceeding the thresholds established through this rulemaking.

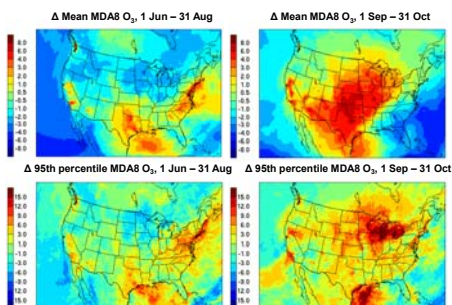
Climate Change Air Overview

- The final GHG tailoring rule addresses emissions of a group of six GHG's
 - Carbon dioxide (CO₂)
 - Methane (CH₄)
 - Nitrous oxide (N₂O)
 - Hydrofluorocarbons (HFCs)
 - Perfluorocarbons (PFCs)
 - Sulfur hexafluoride (SF₆)
 {Note: Other Fluorinated Gases is not listed.}

Climate Change Air Overview

- November 2010, EPA issued in PDF format Guidance Document on PSD and Title V Permitting Guidance for Greenhouse Gases. This document describes the approaches needed to be taken in calculating, albeit it is not a legal binding document, only guidance in preparing the permit materials needed.
- However the following slides are presented to show the level of complexity in decision making processes and policy.

Results – Change in Air Quality Due to Future Climate Change



Nolte et al., J. Geophys. Res., 2008.

Outcome from CIRAQ Climate Change Only Experiments

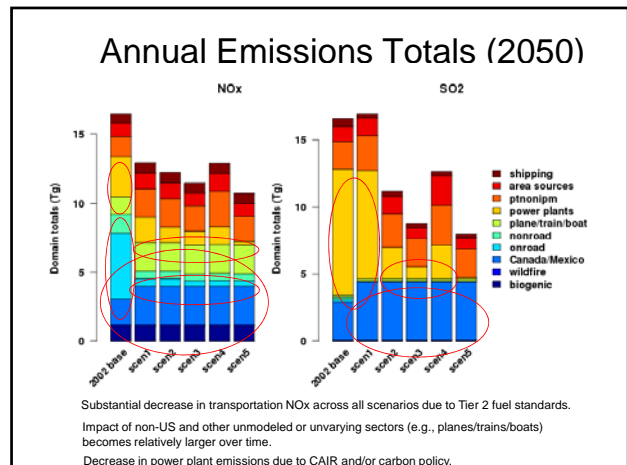
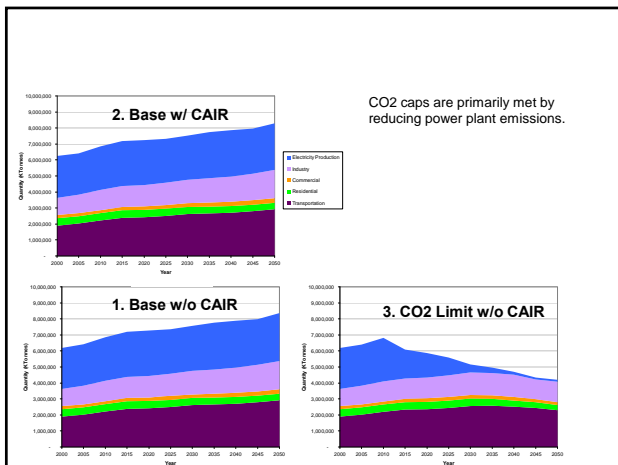
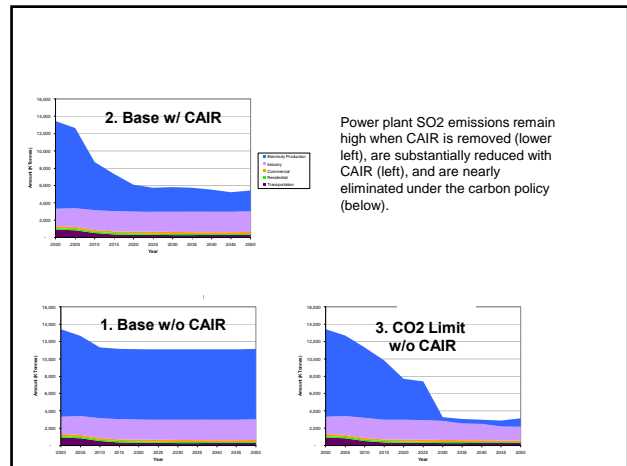
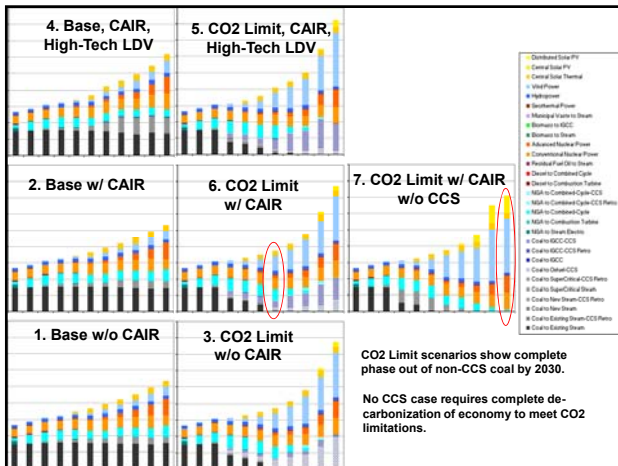
- Future climate could cause increases of summer average 8-h max ozone of 2-5 ppb in parts of central and eastern U.S.
- Changes to 95th percentile concentration were larger (6-12 ppb), suggesting more severe ozone episodes.
- Widespread ozone increases over Sept-Oct months, suggesting lengthening of ozone season.
- Need to consider increasing background methane concentrations alongside climate change.
- Effect on PM concentrations more complex and uncertain.
- With other STAR-supported research, contributed to NCEA Interim Assessment report, CCSP Synthesis & Assessment Product 3.2, and EPA Administrator's issuance of Endangerment Finding for GHGs.

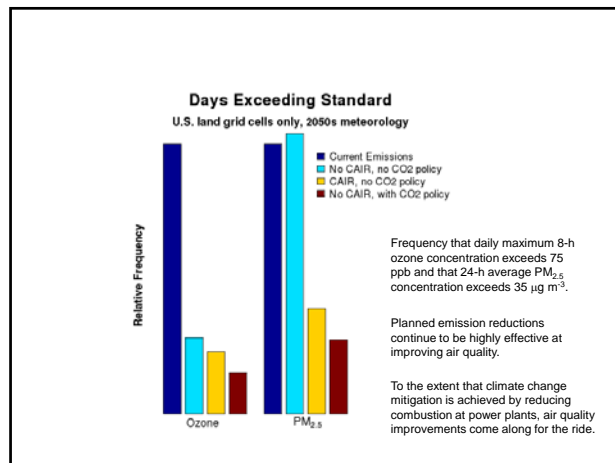
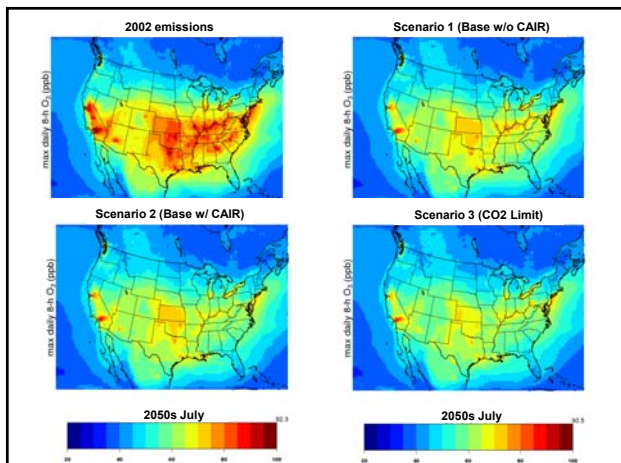
Future Air Quality Under Alternative Emission Scenarios

- In collaboration with NRMRL, emission scenarios generated using MARKAL ("MARKet ALlocation")
 - Economic model of the U.S. energy system
 - Represents thousands of technologies for major energy-consuming sectors (e.g., electricity production, transportation, industrial, residential, commercial)
 - Simulates competition of technologies and fuels for market share, identifying optimal (least cost) technology pathways and tracks resulting fuel use and emissions
- National and 9-Region versions available
- MARKAL outputs linked to CMAQ's standard emissions modeling framework for use with CMAQ chemical transport model.

MARKAL Scenarios Examined

- Baseline projection without Clean Air Interstate Rule (CAIR) constraints
- Baseline projection, with CAIR but no carbon policy
- Carbon policy (based on Lieberman-Warner-Boxer), without CAIR
- Baseline projection with aggressive adoption of high-tech light duty vehicles
- Carbon policy with aggressive adoption of high-tech light duty vehicles
- Carbon policy with CAIR
- Carbon policy without CAIR and without assuming availability of carbon capture and storage technology (CCS).





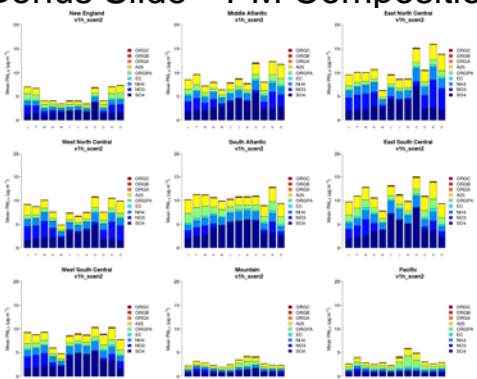
Conclusions and Future Work

- Variation across MARKAL scenarios smaller than decrease from current levels; all scenarios have large NO_x decreases at 2050 due to Tier 2 standards for light-duty vehicles.
- Uncontrolled/unmodeled sectors become relatively more important.
- For these cost assumptions in MARKAL, carbon policy scenario at 2050 more stringent for NO_x and SO₂ than original CAIR caps.
- This study relied on one GCM climate scenario. EPA is developing regional climate downscaling methods to support further studies of the linkages between climate change and air quality.

Acknowledgments

- Dan Loughlin (NRMRL)
- Bill Benjey
- Rob Pinder
- Charles Chang (CSC)
- Tanya Otte
- George Pouliot
- Jon Pleim
- Alice Gilliland

Bonus Slide—PM Composition



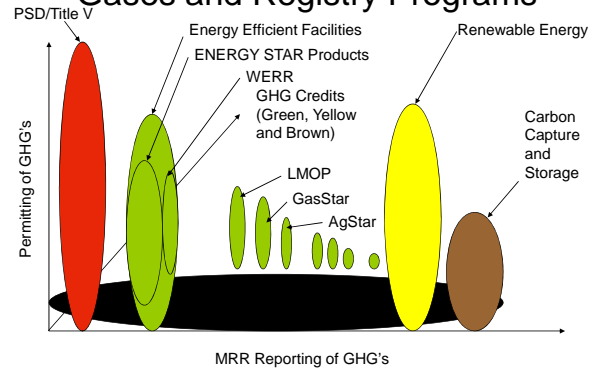
Climate Change Voluntary Programs

- Performance Track is dissolved as a program and DOE's industrial assistance program takes on new emphasis to develop data sets to rate industry performance.
- Climate Leaders is moved to backburner since DOE's Climate Vision program works with industrial manufacturers associations and develops energy performance data analysis
- The other climate change voluntary programs get a plus up in participation since the umbrella programs now promote movement to energy performance tracking and use of clean energy.

Climate Change Voluntary Programs

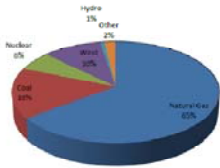
- ENRGY STAR new Homes more than 1.12 million constructed, Old Homes Performance HPwES is off and running with utility sponsors!
- ENERGY STAR Buildings(ESB) reporting are more than 120,000 facilities in the US and even overseas. ESB labeling is now called a registry.
- Waste Energy Recovery Registry promotes clean energy.
- Green Power is now able to be tracked by end users in commercial and industrial facilities.

Introduction to Greenhouse Gases and Registry Programs

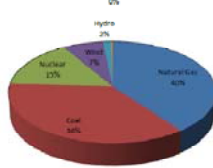


ERCOT in 2009

2009 ERCOT Generation Capacity by Fuel Type



2009 ERCOT Energy Generation by Fuel Type

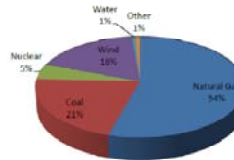


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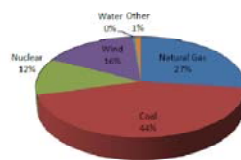
ERCOT in 2013

Assuming 18,000 MW of wind, approximately 5,600 MW of new coal, 4,300 MW of new natural gas

2013 Installed Capacity

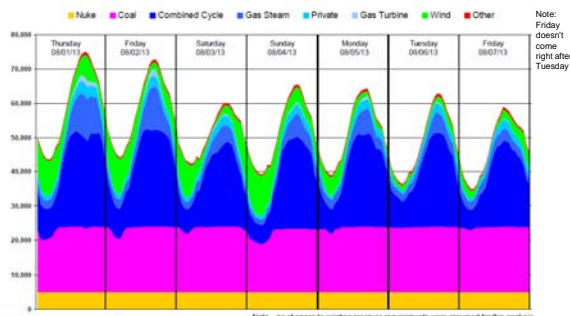


2013 Energy Generation



13

2013 Peak Load Week - Generation by Fuel Type



Note: Friday doesn't come right after Tuesday

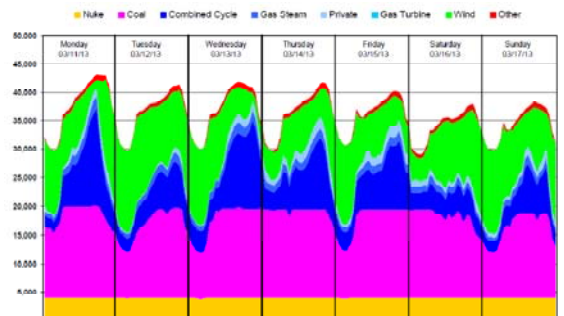
ERCOT | 18 August 2009

Note - no changes to existing reserves requirements were assumed for this analysis

ERCOT Public

Smitherman, et al

2013 High Wind Week - Generation by Fuel Type



ERCOT | 18 August 2009

Note - no changes to existing reserves requirements were assumed for this analysis

ERCOT Public

Looking at Today and in the Short Term Future

- We get quite a few interesting points to stress about Texas and the wind farm expansion.
- Notice no emphasis on demand response or energy efficiency in the Texas reductions. Coal fired power plants are on the horizon though. So emissions scenario will have heavier coal power footprint and renewable energy paths to consider.
- What happens to this energy need if emphasis is somehow placed on energy efficiency and renewable energy through some tax incentive. Federal is in place through to 2013. Texas currently has "Investor Owned Utility" programs that are the model of the US and options for its future.

Thank You!

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