

Update on Texas Low Emissions Diesel (TxLED) Program and Biodiesel

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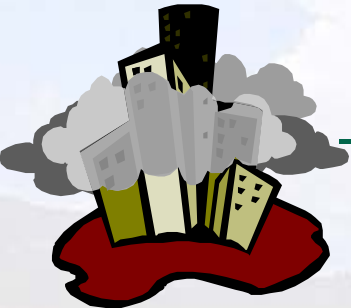
Discussion Topics

- Status of Houston/Galveston/Brazoria SIP
- TxLED overview
 - TxLED compliance methods
 - TxLED additive approval methods
- Biodiesel overview
 - Biodiesel impact on emissions



Houston-Galveston-Brazoria

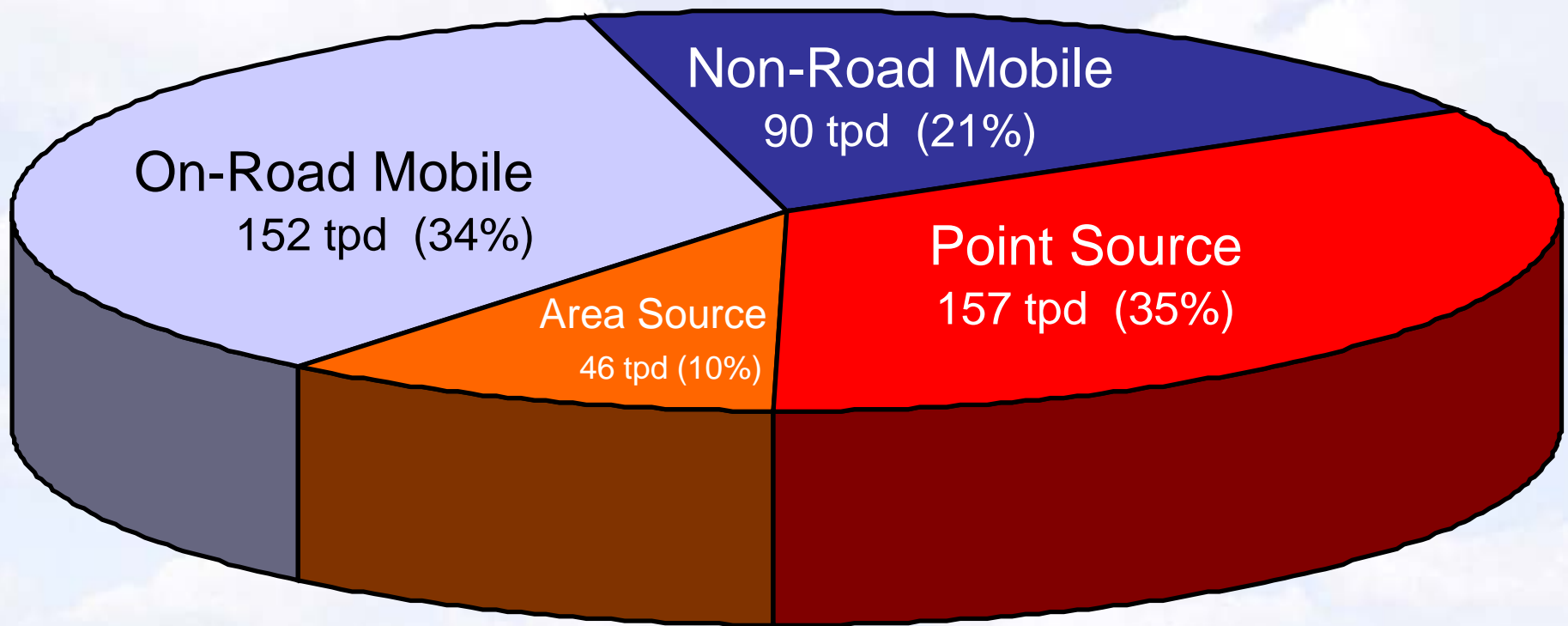
- Eight-Hour Ozone Standard Designation:
 - Moderate (**Severe**)
- Attainment Deadline:
 - June 15, 2010 (**June 15, 2019**)
- SIP Due to EPA:
 - June 15, 2007
 - Adopted by the commission, May 23, 2007
 - Submittal shows progress to date, control strategies, next steps





HGB 2009 Emissions Inventory

NO_x: Source Category Estimates



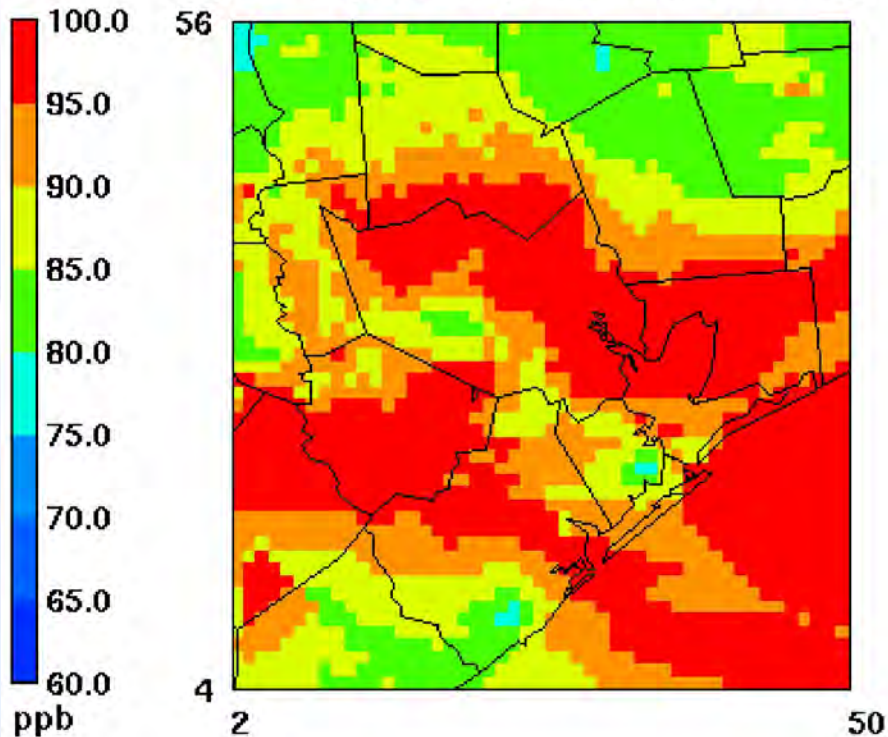
Source: TCEQ Emissions Inventory
TCEQ Contact: Dick Karp



Baseline Ozone DV 2000 Compared with Future Ozone DV 2009

Baseline Ozone Design Value

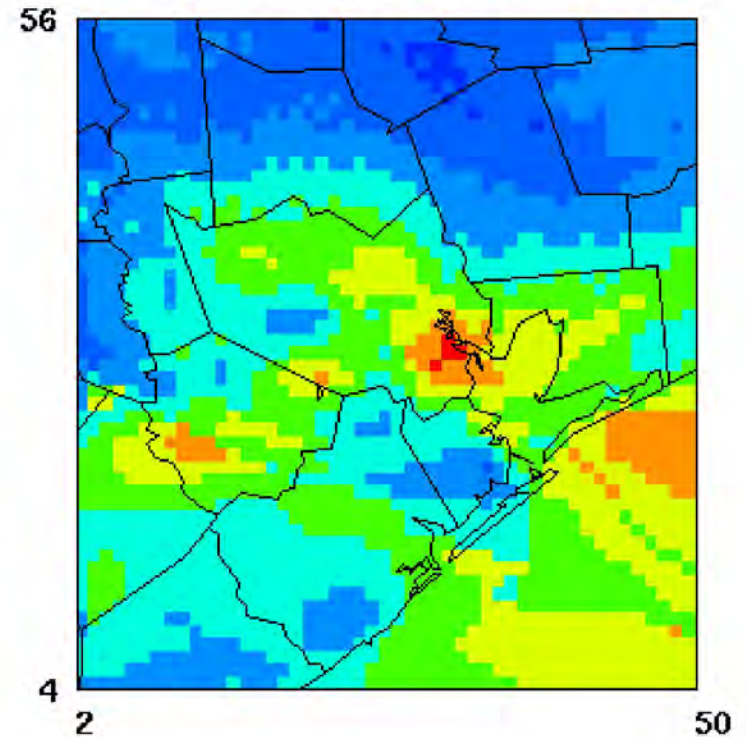
Aug 18 - Sep 6, 2000 (Baseline Ozone > 70 ppb)



Min=77.3 at (34,21), Max=113.8 at (4,26)

Future Ozone Design Value

Aug 18 - Sep 6, 2009 (Baseline Ozone > 70 ppb)



Min=64.1 at (30,51), Max=96.0 at (31,30)

Source: Source: TCEQ Air Quality Division; Geo-Statistical Kriging of 2000 & 2009 baseline modeling (B2000c & F2009h.cs00)

Staff Contact: J.Smith, Ph.D.

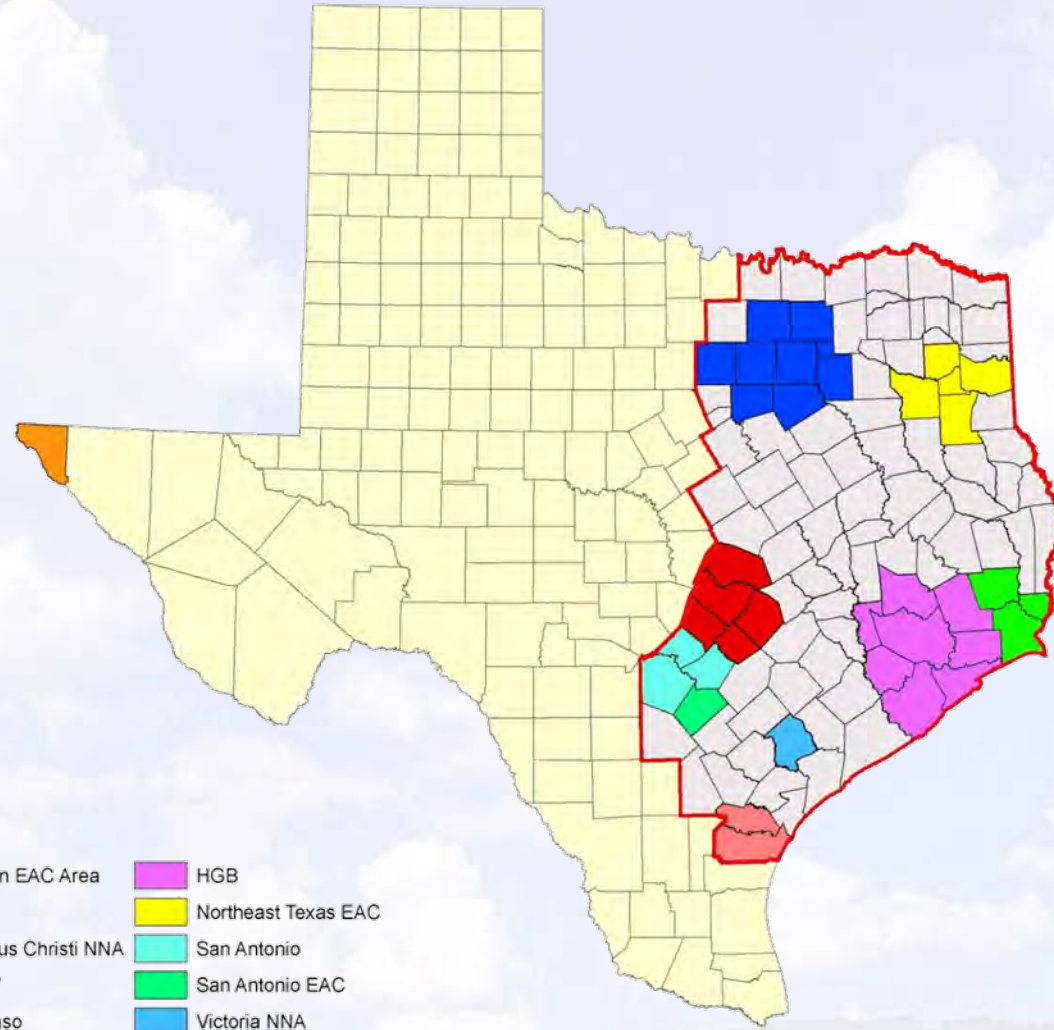


TxLED Overview








- TCEQ adopted regulations for Texas low emission diesel fuel (TxLED) as an air quality control strategy in the State Implementation Plan (SIP)
- Goal of the TxLED rules: lower NO_x emissions from diesel-powered motor vehicles and non-road equipment operating within the 110 counties in the eastern half of Texas
- TxLED rules fully implemented by TCEQ on January 31, 2006



TxLED Counties



Legend

- | | | | |
|---|--------------------|---|---------------------|
|  | Austin EAC Area |  | HGB |
|  | BPA |  | Northeast Texas EAC |
|  | Corpus Christi NNA |  | San Antonio |
|  | DFW |  | San Antonio EAC |
|  | El Paso |  | Victoria NNA |



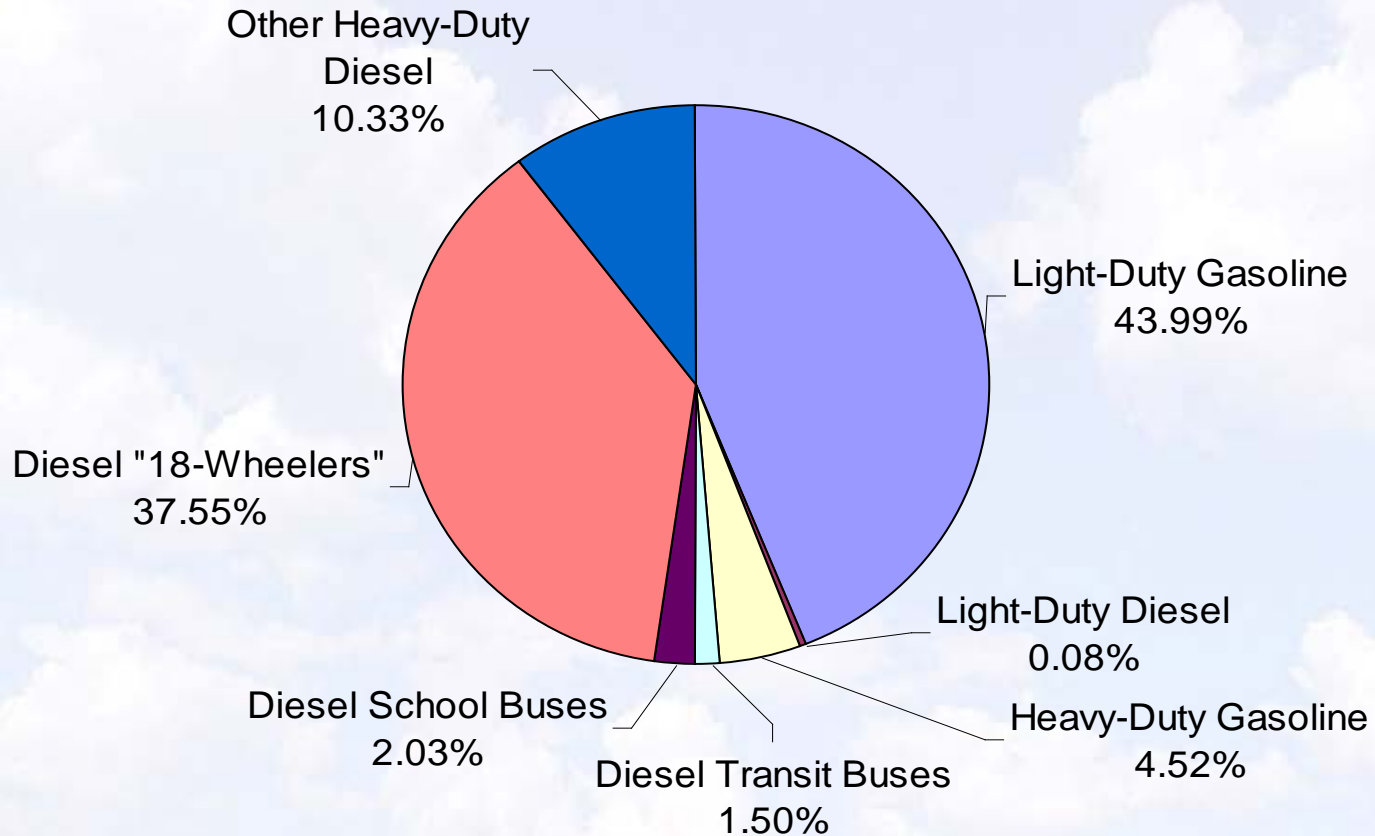
Diesel Inventory in 2009 - HGB

- 51% of On-road NO_x emissions are from diesel
- 41% of Non-road NO_x emissions are from diesel
- Total diesel emissions: 28% of all NO_x



2009 Houston/Galveston/Brazoria NOx Emissions Inventory

On-Road Mobile



Source: TCEQ Emissions Inventory

TCEQ Contact: Chris Kite

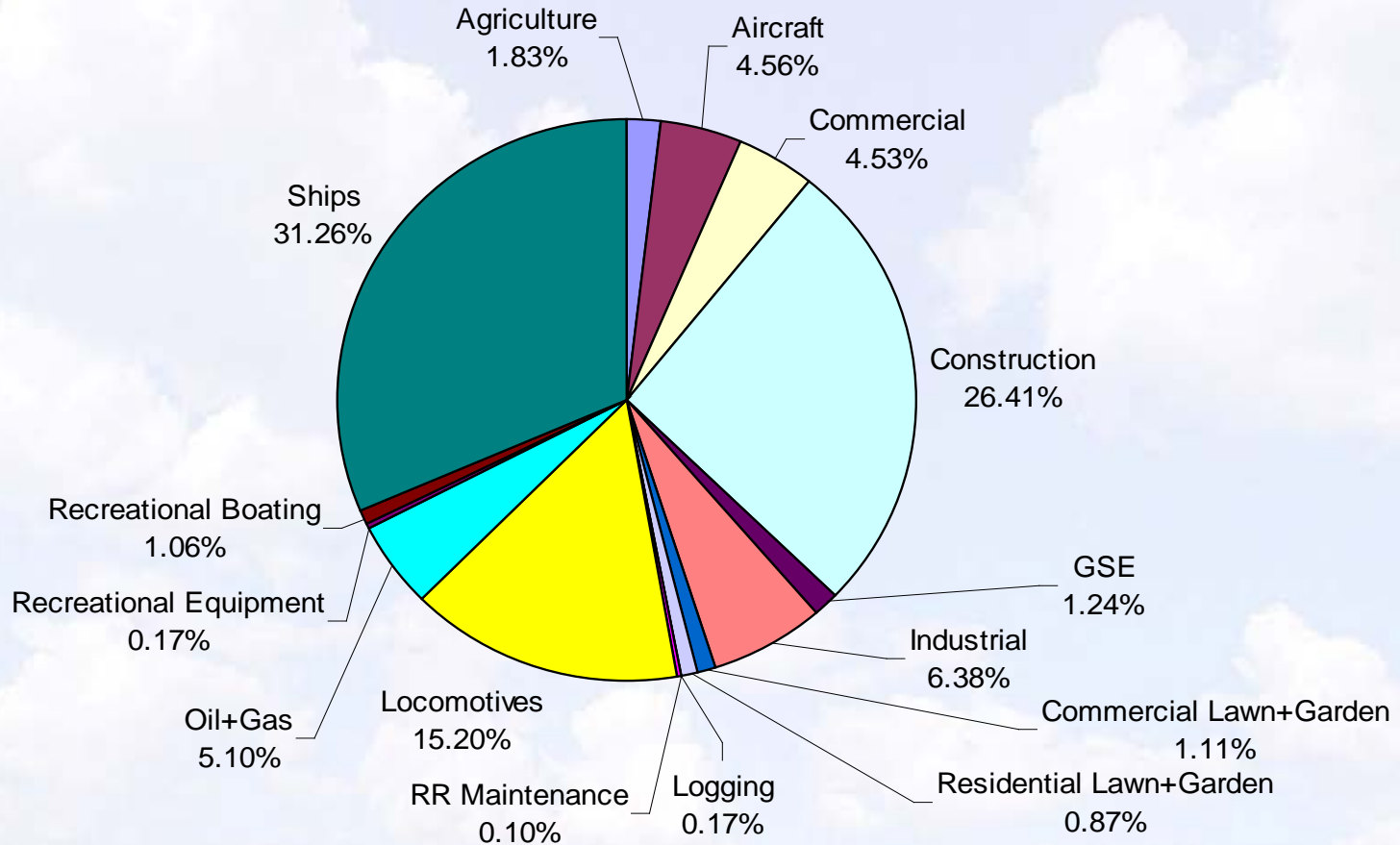
Updated: February 28, 2007





2009 Houston/Galveston/Brazoria NOx Emissions Inventory

Non-Road Mobile



Source: TCEQ Emissions Inventory

TCEQ Contact: Jim MacKay

Updated February 23, 2007



Definitions

- **Diesel** – Any fuel that is commonly or commercially known, sold, or represented as:
 - Grade No. 1-D or Grade No. 2-D diesel fuel, in accordance with the active version of ASTM D975 (Standard Specification for Diesel Fuel Oils), and
 - Marine Distillate fuel X (DMX), Marine Distillate fuel A (DMA), or Marine Gas Oil (MGO) in accordance with the active version of the ISO 8217 Specifications for Marine Fuels. (October 1, 2007)
- **TxLED** - Any diesel fuel that is sold or made available for sale that may ultimately be used to power a diesel engine in the 110 Texas counties covered by the Texas low emission diesel (TxLED) program and complies with the TxLED regulations.
- **Additive** - Any substance intentionally added to diesel fuel that is:
 - (A) registered with the EPA in accordance with 40 CFR 79; or
 - (B) added to diesel for the purpose of reducing exhaust emissions from motor vehicles or non-road equipment and is exempted from the EPA registration requirements.
- **Biodiesel** – A fuel comprised of mono-alkyl esters of long chain fatty acids produced from vegetable oils or animal fats, designated B100.



TxLED Compliance Method (option 2)

- Produce or import CARB diesel
 - Option 1. The diesel fuel must comply with the California diesel fuel regulations in effect as of January 18, 2005.
 - Option 2. The diesel fuel must comply with the specifications of a CARB certified alternative diesel formulation that was approved by CARB before January 18, 2005.



Alternative Diesel Formulation Testing Procedures

- TxLED rules allow the TCEQ to approve *alternative diesel formulations* if the proposed formulation is tested according to the procedures specified in the rule:
 - Submit a proposed test protocol for approval
 - Test procedures are objective and scientific
 - The emissions comparison must show that the NO_x and PM emissions from the applicant's proposed formulation are less than the NO_x and PM emissions from the reference fuel
 - After consultation with EPA, the test results are approved



TxLED Alternative Formulations

- **Lubrizol PuriNOx™ Summer Blend Fuel**
- **AGE Refining Low Emission Diesel**
- **ORYXE Energy International, Inc. OR-LED2 diesel fuel additive blended with ASTM D975-compliant Grade No. 2-D diesel fuel**
- **ORYXE Energy International, Inc. OR-LED3 diesel fuel additive blended with ASTM D975-compliant Grade No. 1-D or 2-D diesel fuel**
- **ORYXE Energy International, Inc. OR-LED3 diesel fuel additive blended with a B20 or less blend of ASTM D6751-07 B100 biodiesel and ASTM D975-compliant Grade No. 1-D or 2-D diesel fuel**
- **White Sands LLC CB-LE diesel fuel additive blended with ASTM D975-compliant Grade No. 1-D or 2-D diesel fuel having a minimum cetane number of 50.6 and a maximum aromatic hydrocarbon content of 28.6 % by volume.**
- **Kern Oil & Refining Co. KOR-4c diesel additive blended with ASTM D975-compliant Grade No. 2-D diesel fuel. (CARB Executive Order G-714-031A)**



TxLED Compliance Method (option 4)

- Produce diesel under an *alternative emission reduction plan* (AERP) that has been approved by the TCEQ that contains a substitute fuel strategy that will achieve equivalent emission reductions



TxLED Compliance Method (option 4)

- AERPs are limited to the following options:
 - Using the EPA Unified Model, the average fuel properties of the on-road diesel fuel being supplied to affected counties must achieve at least a 5.5% NO_x reduction in 2007 and a 6.2% NO_x reduction from non-road diesel
 - Use of credits from early gasoline sulfur reductions
 - Combination of Options 1 and 2



Biodiesel Blended Formulations

- TxLED rules allow the TCEQ to accept the use of biodiesel in TxLED **if** the specific biodiesel/diesel fuel blend (i.e., B20) or specific biodiesel/ diesel/fuel additive blend has been approved by the TCEQ as a TxLED alternative diesel formulation



Expiration of AERP for Producers of Biodiesel Blends

- TCEQ adopted a revision to the TxLED rules on May 9th to extend the expiration date of all *alternative emission reduction plans*, including the plan under which biodiesel is currently allowed to be sold in the TxLED areas to December 31, 2007
- The rule revision provides biodiesel producers additional time to complete testing as necessary to ensure compliance with TxLED regulations
- Any biodiesel blend produced for use in the TxLED areas after December 31, 2007, must be approved by the TCEQ as a TxLED alternative diesel formulation



Potential Biodiesel Market

Texas Petroleum Diesel Sales	Gallons per Year (Current)
Non-Road Diesel	3,900,500,000
On-Road Diesel	3,861,937,287
Total:	7,762,437,287
Texas Biodiesel Production	
	Gallons of B20
Current B20 Capacity	493,750,000
Estimated Future B20 Capacity	1,155,500,000
Potential B20 Market Impact	
	Percent of Current Diesel Sales
Current Production Capacity	6%
Estimated Future Production Capacity	15%

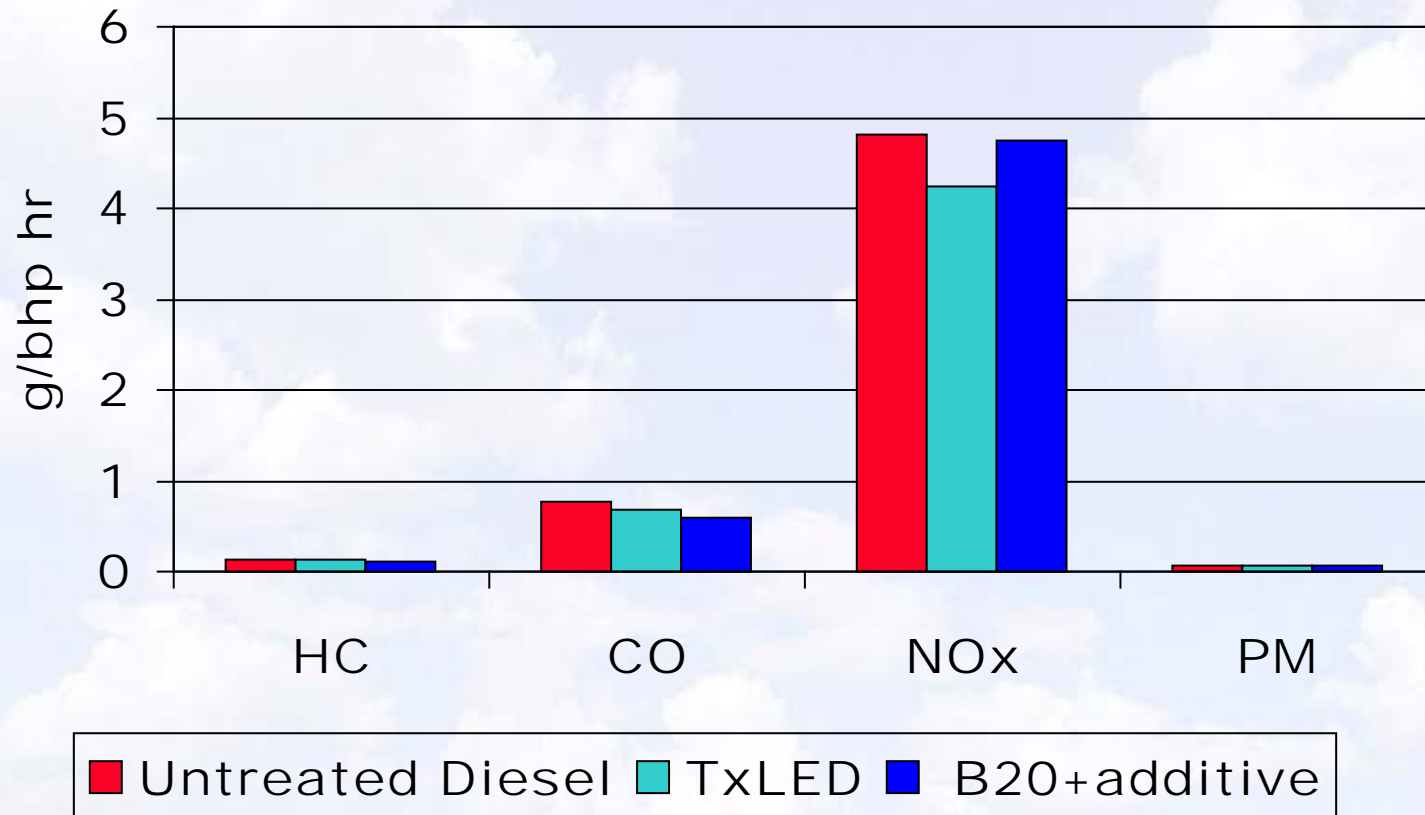


Biodiesel Impact on Emissions

- There is evidence to indicate that biodiesel blends have higher NO_x emissions than TxLED
- NO_x emissions from pure biodiesel (B100) may be up to 10% higher than regular diesel
- NO_x emissions from biodiesel blends will be proportionate to that number
 - For example, a B20 blend (20% biodiesel and 80% TxLED) may have a 2% increase in NO_x over TxLED



B20 Test Results (March 2006)





Biodiesel Impact on Emissions

- The U.S. EPA has said that studies have shown that the use of B20 biodiesel blends may increase NO_x emissions by 2% on average
 - *EPA final rulemaking: Regulation of Fuels and Fuel Additives: Renewable Fuel Standard Program, May 1, 2007*



NTRD Grants

- In 2005, the TCEQ offered biodiesel and other diesel fuel additive producers the opportunity to apply for financial grants through the TCEQ's New Technology Research and Development (NTRD) Program to help alleviate the costs associated with the emissions testing needed to demonstrate a biodiesel blend's equivalency to TxLED
- The TCEQ selected 15 biodiesel related projects to receive \$1.8M in NTRD grant funds to test biodiesel formulations for TxLED approval
- In May 2007, the NTRD program solicited applications for a grant of up to \$250,000 for the emissions testing of an alternative diesel formulation containing biodiesel and/or other diesel fuel additives for TxLED approval. The grant application period closed June 1 and applications are currently being reviewed for selection.



Status of NTRD grant-funded biodiesel testing projects

- Testing has been completed on four of the 15 grant projects selected in 2005
 - Two of the tested formulations did not satisfy the regulatory requirements to be approved by TCEQ
 - Positive results from the other two tested formulations resulted in one formulation being approved, while the other formulation is still being reviewed for approval
- The remaining biodiesel testing grant projects selected in 2005 have expired due to inactivity or stopped for other reasons



CARB's Revised Draft Advisory on Biodiesel in California Diesel

- On December 15, 2006, CARB presented a Revised Draft Advisory on Biodiesel Use.
 - Recommended Biodiesel Fuel Characteristics:
 - Biodiesel portion meets ASTM D6751 (15ppm sulfur)
 - Diesel portion complies with California diesel regulations
 - Resulting blend contains no more than 20 percent biodiesel



CARB's Proposed Biodiesel Research Study

- On March 20, 2007, CARB announced draft plans for a Biodiesel research study with three primary subject areas.
 - Biodiesel emissions evaluation (\$750,000)
 - Fully evaluate emissions
 - Address NOx impact
 - NOx formation and mitigation evaluation (\$450,000)
 - Investigate the mechanism of NOx formation and evaluate possible NOx mitigation options
 - Multi-media evaluation (\$400,000)
 - Evaluate impact of biodiesel and biodiesel blends relative to CARB ULSD fuel
 - Consider feedstocks common to California



EPA's Proposed Biodiesel Research Study

- On January 25, 2007, EPA announced proposed plan to conduct a comprehensive Biodiesel research study to determine the actual NO_x emissions impact of using biodiesel blends in diesel engines.
- TCEQ will participate as a member of the Steering Committee for the study.