

Alternative Diesel Fuel: Challenges and Uncertainties

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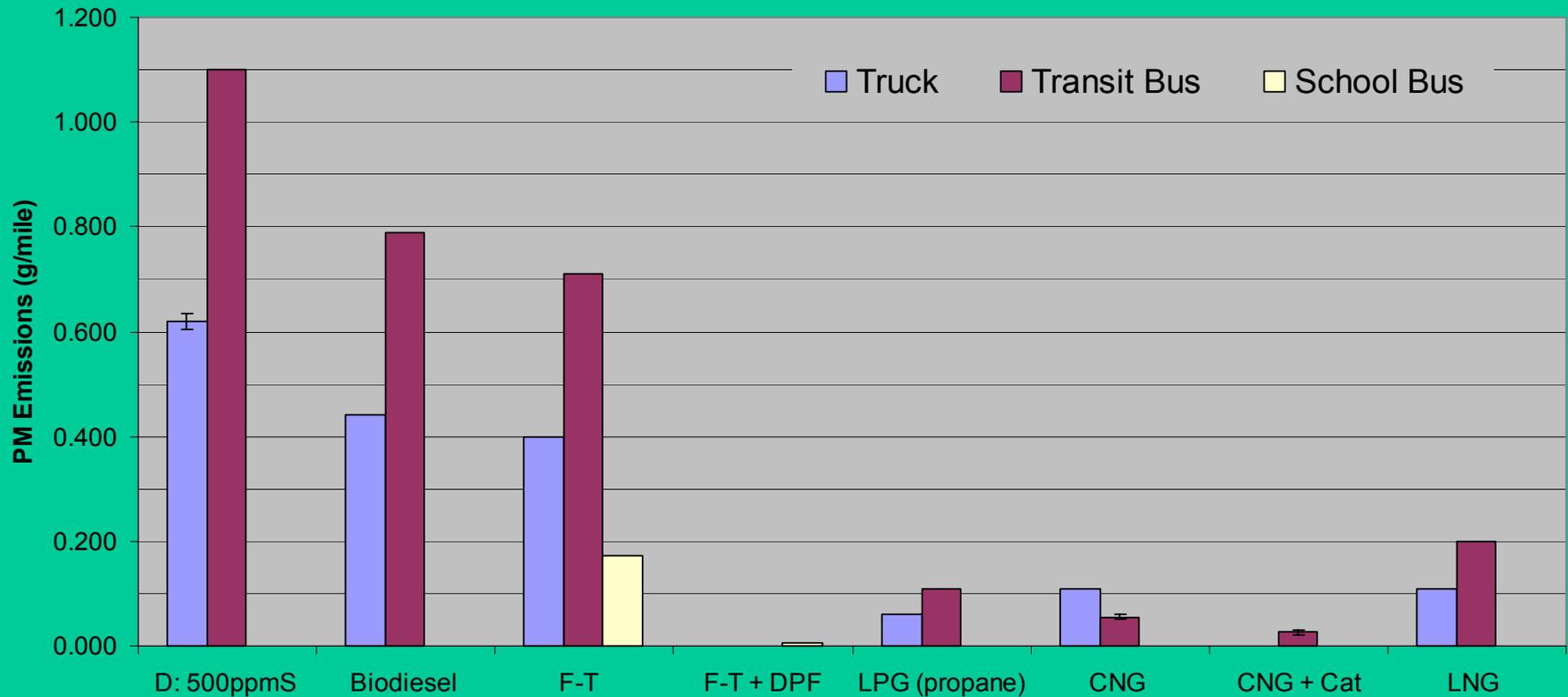
Union of Concerned Scientists

Key environmental and public health concerns re: alt diesel fuels

- Air pollution
 - PM, NOx, toxics, other pollutants
- Global warming
 - Greenhouse gas emissions
- Other environmental impacts
 - Land/water impacts of coal mining
- CA's over-dependence on petroleum
- Unstable energy markets

GOAL: Promote the longer-term development of truly clean technologies/fuels

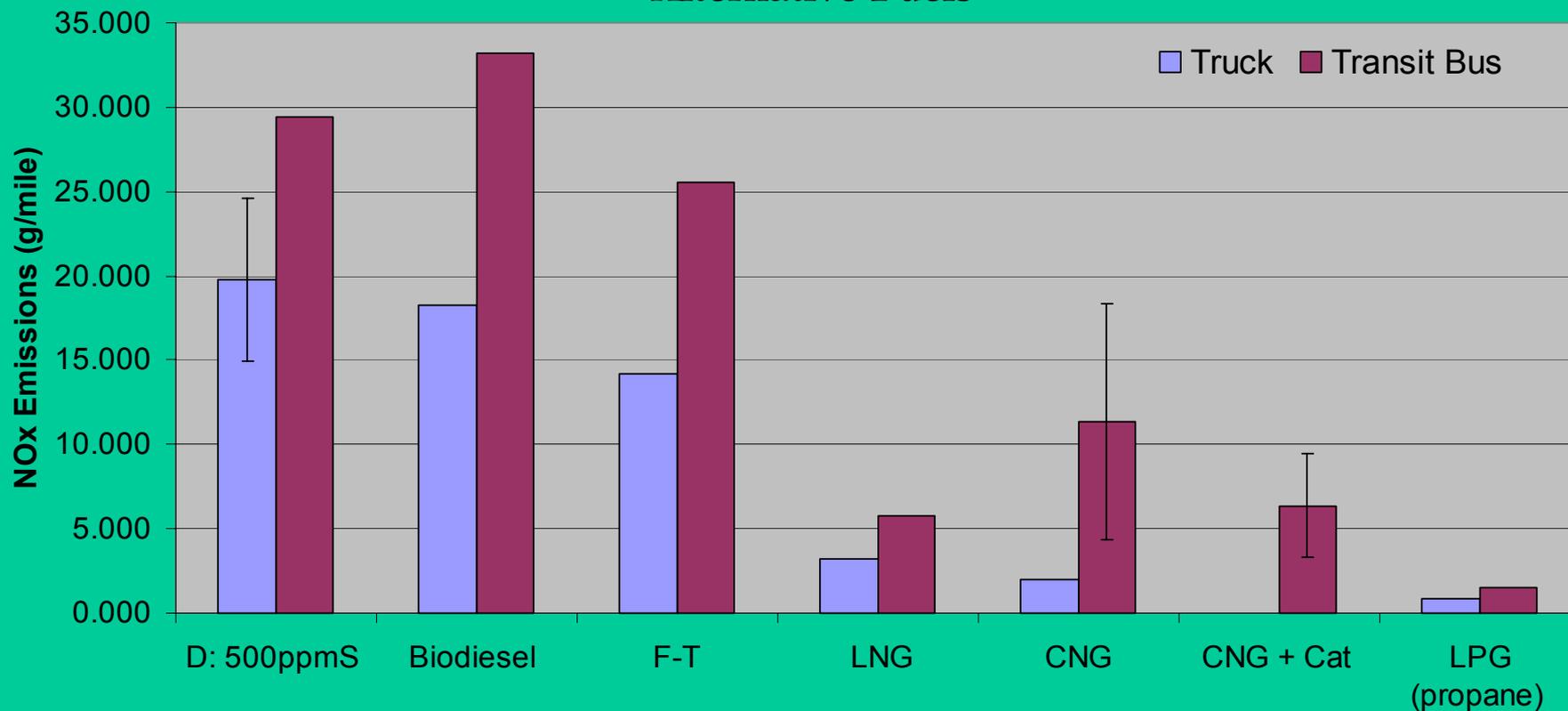
Heavy-Duty Vehicle PM Emissions, Alternative Fuels



Source: Diane Bailey, Natural Resources Defense Council.

- 1) T. Beer et. al., "Comparison of Transport Fuels," Final Report to the Australian Greenhouse Office, 2001.
- 2) Ayala et al. Draft: ARB's study of emissions from 'Late-model' diesel and CNG heavy-duty transit buses.
- 3) Chatterjee et. al. SAE 2001.
- 4) Clark et. al., Diesel & CNG Transit Buses, 1999
- 5) Clark et.al. JAWMA; 52: 89-94. 2002.
- 6) Gragg K. MTC 2001.
- 7) Lanni et al. SAE. 2001-01-0511.
- 8) LeTavec et al. Average Vehicle Test Results (School Buses, CSHVR Driving Cycle).
- 9) Lev-On M et al. SAE. 2002-01-0432.
- 10) London Bus Study, cited in: International Experience on Ultra Low Sulfur Diesel and Biodiesel, Micheal P. Walsh, January 2000.
- 11) P.J.E. Ahlvik and A.R.L. Brandberg, SAE paper # 2000-01-1882.

Heavy-Duty Vehicle NO_x Emissions, Alternative Fuels



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 5) Clark et.al. JAWMA; 52: 89-94. 2002. 6) Gragg K. MTC 2001. 7) Lanni et al. SAE. 2001-01-0511. 8) LeTavec et al. Average Vehicle Test Results (School Buses, CSHVR Driving Cycle). 9) Lev-On M et al. SAE. 2002-01-0432. 10) London Bus Study, cited in: International Experience on Ultra Low Sulfur Diesel and Biodiesel, Micheal P. Walsh, January 2000. 11) P.J.E. Ahlvik and A.R.L. Brandberg, SAE paper # 2000-01-1882.

Comparing Biodiesel 100 with Conventional Diesel

Impact	Pro/Con	Biodiesel 100
Public health *	Con & Pro	
<i>Nitrogen oxides</i>	Con	6% to 15% increase
<i>Particulate soot</i>	Pro	30% to 70% reduction
<i>Air toxics</i>	Pro	60-90% reduction
<i>Carbon monoxide</i>	Pro	43% reduction
<i>Hydrocarbons</i>	Pro	56% reduction
Global warming	Pro	70% to 80% reduction
Energy security	Pro	Domestic supplies
Hazardous waste	Pro	Biodegradable
Fuel economy	Con	Loss of 10%
Fuel cost	Con	About double the price

Source for emissions data: NREL (2002) and NREL (2003).

Comparing F/T with Conventional Diesel

Impact	Pro/Con	Fischer-Tropsch, 100%
Public Health (1)	Pro	
<i>Particulate soot</i>		11% reduction
<i>Nitrogen oxides</i>		6-20% reduction
<i>Carbon monoxide</i>		28% reduction
<i>Hydrocarbons</i>		22% reduction
Global warming	Con	Probable increase in GHG (2,3)
Energy security	Con & Pro	Current sources from Africa & Indonesia; Potential for domestic
Energy use	Con	Greater energy use (4)
Land/water impacts	Con & Pro	Depends on process
Fuel economy	Unclear	Possible reduction
Fuel cost	Con	5-10 cents per gallon

Sources: NREL (2002) for criteria pollutant data; ORNL (2002) for GHG data

- Analysis assumes EPA diesel. CARB diesel will have fewer NOx emissions benefits
- F/T plants from flared gas or cogen with steam export could have lower GHG emissions than diesel. However, conventional F/T plants that are standalone or that export electricity would have higher GHG emissions.
- Coal gasification was not examined by Wang, 2002.
- Only FTD using flared gas had lower energy use. However, UCS believes that flared gas should be banned, and that actual energy use has been underestimated for FTD.

Conclusions

- Serious reservations about F/T diesel
 - May increase emissions of GHG
 - Energy markets potentially unstable
 - Coal gasification currently a primary source
 - * Need to ensure that the process for deriving F/T is environmentally sound
- Biodiesel provides benefits, but at a cost
 - Excess NO_x pollution remains a problem
 - Price of fuel may drive users to conventional diesel
- Alternative fuels, like natural gas, offer superior emissions benefits