

Economic Opportunities For Improve Freight Efficiency

John Woodrooffe

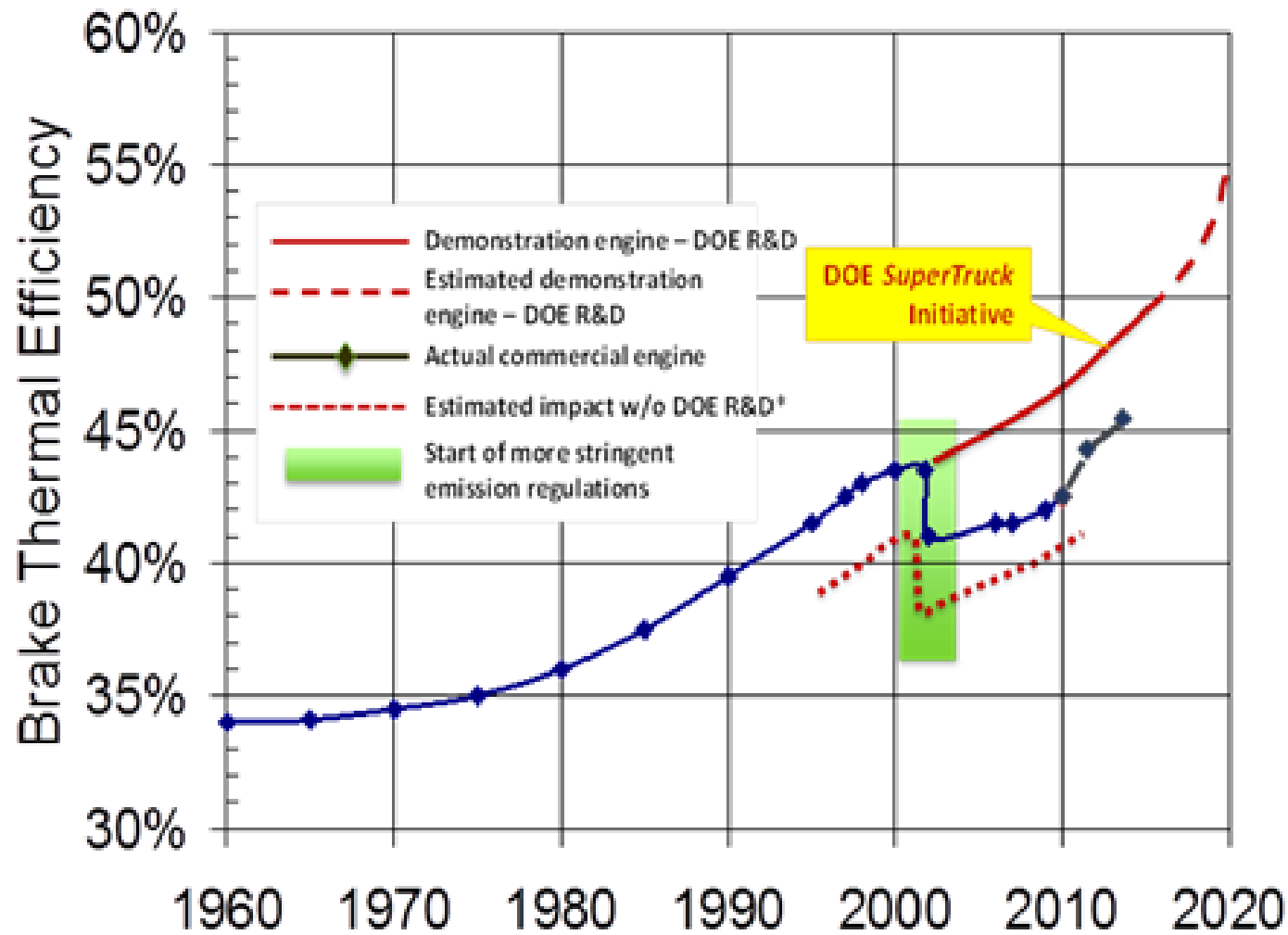
Presented to:

ITS World Congress

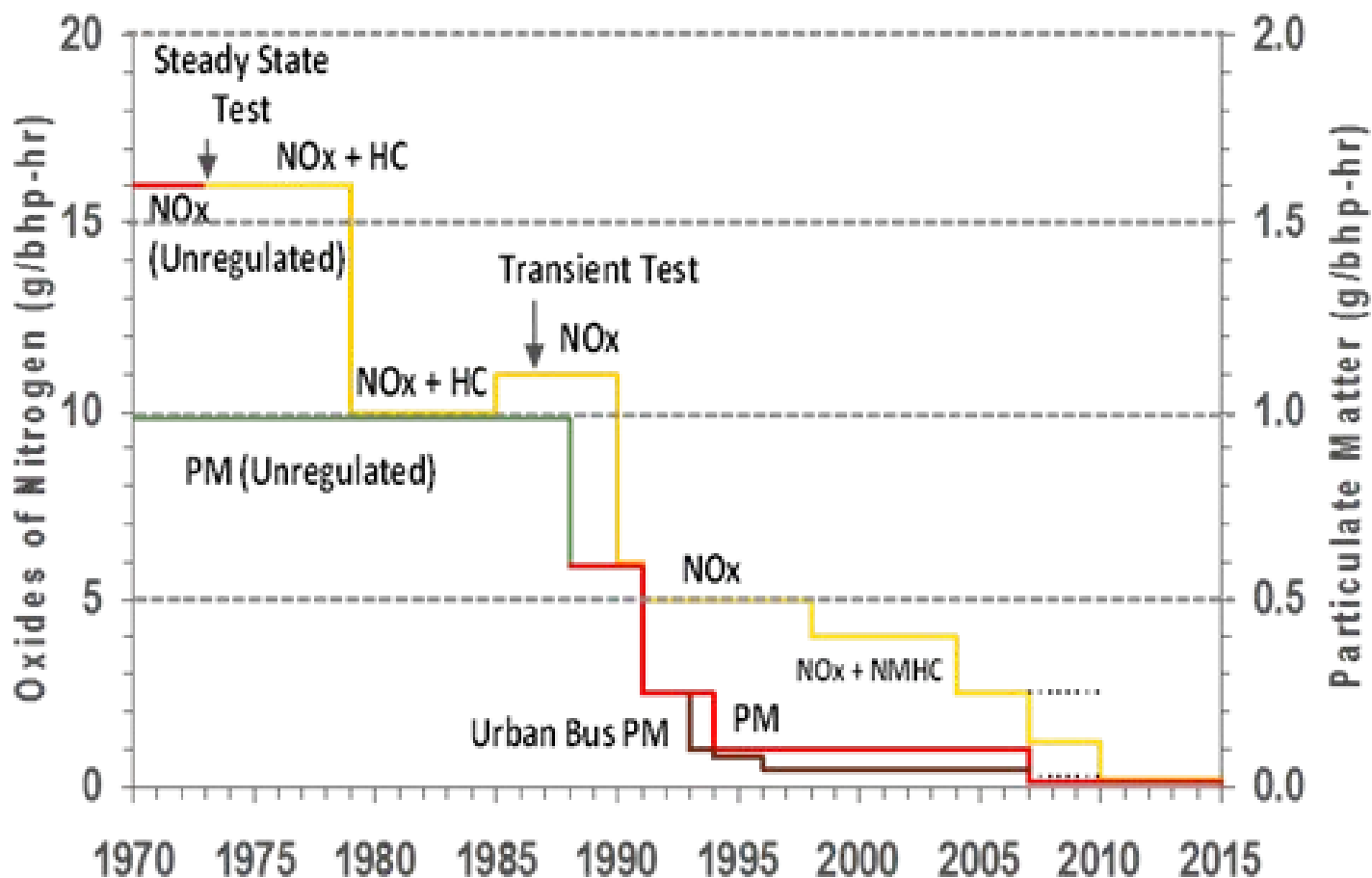
Bordeaux France

October 8, 2015

Engine Efficiency



Historical trend in emissions from heavy-duty diesel engines



Improved Vehicle Productivity

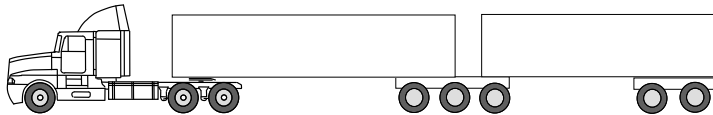
The goal – Reduce truck travel

- Optimize vehicle cargo capacity
- Use multimodal approach`
- Improve freight loading and packing
- Improve logistics - maximize loading and back haul

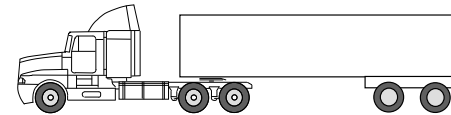
Many of these requirements need ITS Solutions

Fuel and GHG Comparison

unrestricted access vehicles



Canadian B-train

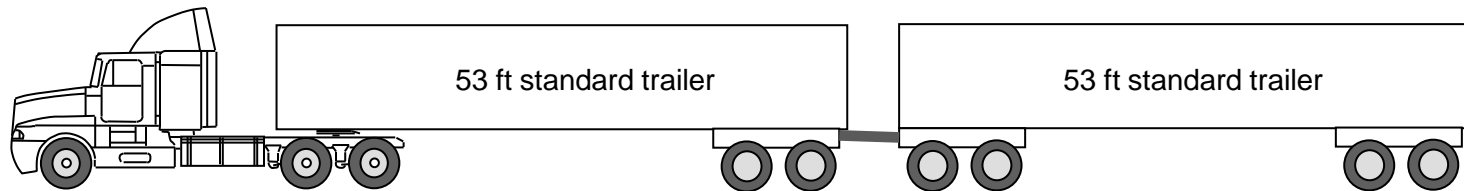


US Tractor semitrailer

Country & Vehicle	Cargo unit Fuel (liter/tonne-km)	Cargo unit CO ₂ (g CO ₂ /tonne-km)	Fuel and GHG Advantage per unit cargo
Canada B-Train	0.037	98.79	68%
US Tractor semi	0.063	165.9	-

Long vehicle combinations

Significant fuel and emissions savings



Fuel Use and Emissions

Estimated Potential Realistic Improvement in Fuel Efficiency and CO2 Emission Reduction

Aspect	Realistic Gain in Fuel efficiency CO2 Reduction	Level of technical challenge	Technical timeframe and comments
Tires	13%	Moderate	Much of this benefit currently available – remaining benefit expected 5 – 10 years
Aerodynamics	10%	Easy	Much of this benefit currently available – development ongoing
Engine	16%	Difficult	Very challenging and costly to achieve – 15 – 20 years, would likely require regulation
High productivity vehicles	10% - 20%	Easy	Not limited by technology or development time. Requires policy change only. Politically sensitive.

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10% Reduction in Truck VMT

Benefit study variable	Injury severity	Reductions assuming 10% reduction in exposure	Estimated annual benefits (\$US Billion)
Estimated safety benefits attributed to a 10% reduction in truck travel distance	no apparent injury	21562	0.20
	possible injury	2,929	0.44
	evident injury	2,724	0.68
	disabling injury	1,453	0.87
	Killed	330	2.54
	Total safety cost saving attributed to 10% reduction in exposure		4.73
Estimated fuel and emissions benefits attributed to a 10% reduction in truck travel distance	Category	Quantity saved	Annual cost saving (\$US Billion)
	Diesel fuel reduction	10.6 billion liters	10.60
	CO2 reduction	28.3 Million metric tons CO2	0.680
Combined benefits	Total estimated annual savings		16.01



Conclusion

- Aerodynamics improvements particularly on trailers is the source of future aerodynamic benefit.
- Traveling at reduced highway speed has significant aerodynamic benefit with little cost.
- Diesel engine thermal efficiency appears to be reaching a limit – now at 42% future ~50%.
- Tires are approaching a limit for rolling resistance reduction.
- High productivity vehicles provide the best return on investment.

Thank You!

John Woodrooffe

jhfw@umich.edu

(734) 276-5550