

Challenges for Energy Efficiency in Liberalised Markets

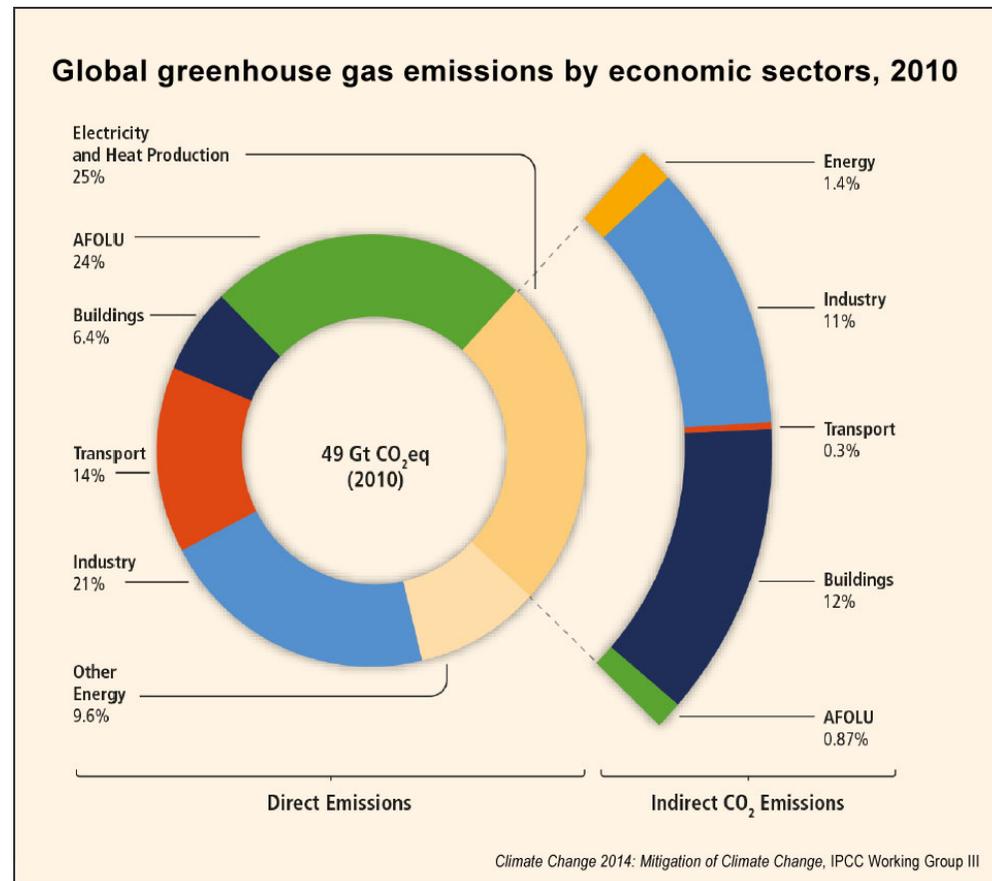
BP Madrid Forum on Energy &
Sustainability

Thomas C Briggs
Head of Transportation Energy Policy
September 30, 2015

Energy Efficiency: What is the Prize?



- Energy consumption may grow by **37% by 2035** with **95%** of this growth from non-OECD countries meaning **25%** growth in CO₂
- Industry and building sectors account for **95%** of all electricity consumed
- Industry and buildings account for nearly all heating and cooling requirements at **40%** of global demand, **70%** generated from fossil fuels
- The effect of energy efficiency in vehicles means a doubling of the vehicle fleet by 2035 will result in **just 1%** annual increase in transport fuel demand.



Energy Efficiency: What is BP doing?



- Energy usage and efficiency must be considered in our business plans
- Refining and Petchems Operating Energy Efficiency incentives - but with limits



- BP Ventures group investing in new technologies and efficiency technology.
- BP Shipping operations have “virtual arrival” adjusting ship speeds to match port availability, plus other design efficiency measures
- BP Ultimate fuel delivers fuel economy benefits of up to 2.7% for petrol and 4.6% for diesel

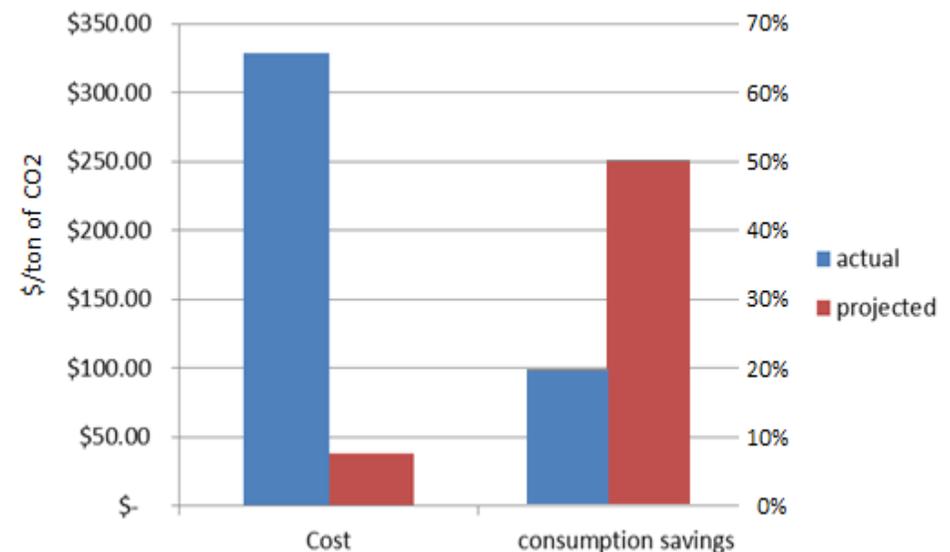
- Castrol Edge delivers up to 3.4% fuel economy improvements
- New Shareholder Resolution: disclosure of operation emissions management. Including energy efficiency, flare reduction and methane emission reduction
- Compliance with EED



The Energy Efficiency Prize: Addressing the “Energy Paradox” (may need to delete)



- ***Beneficial energy efficiency technologies are not adopted despite clear financial incentives – why is this?***
- The gap between calculated and real savings rendering savings unattractive in addition to the time/effort required
- A US study found differences between projected and actual cost of CO2 abatement and consumption figures for efficiency measures
- ROI was -2.2% over 16 years
- Abatement cost equated to \$329/ton of CO2 saved vs. The White House figure of \$38/ton
- Energy efficiency will be very important but the savings models are seemingly inaccurate



My experience of the energy paradox: the Eco-Hybrid Tumble Dryer



- Commission Tumble Dryer Regulation No.932/2012 Eco-Design Directive
- “Eco-Hybrid” best in class 9kg condensing dryer: annual consumption of 259 Kwh far below a typical American unit - 600 Kwh/pa
- Results:
 1. Expensive purchase price
 2. Very long drying cycle 2-3 hours
 3. More energy consumed due need to use the more energy intensive cycle

How is this possible?

Default eco mode to pass regulatory muster vs the functionality used in real life by consumers



The energy paradox challenge in transport: Which car is greener?



Ford Fiesta 1.0L Eco-boost

- 109g CO₂/km
- 60mpg



Porsche 918 Spyder

- 70g CO₂/km
- 19 km EV mode range
- 875 bhp (608 bhp from ICE)



Nissan Leaf

- 0 g/km – TTW
- 90 - 110 g/km – WtW (USA 2010 grid)

The gap between “Eco” promotion and reality

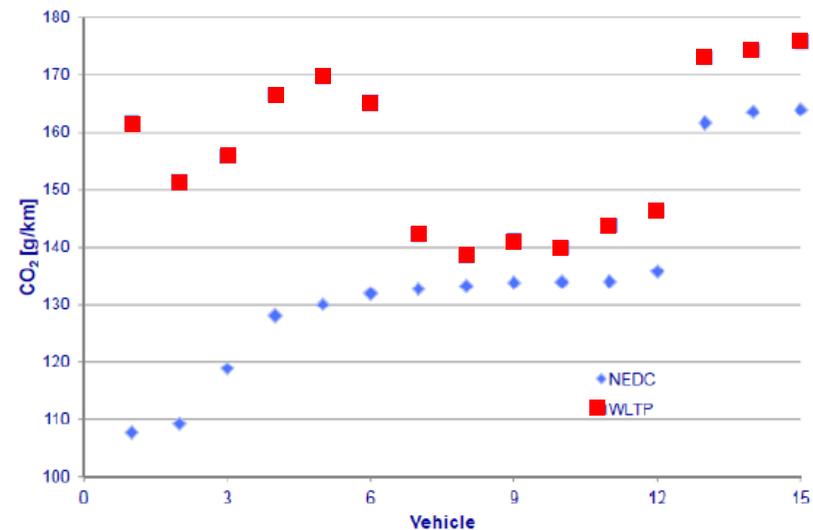
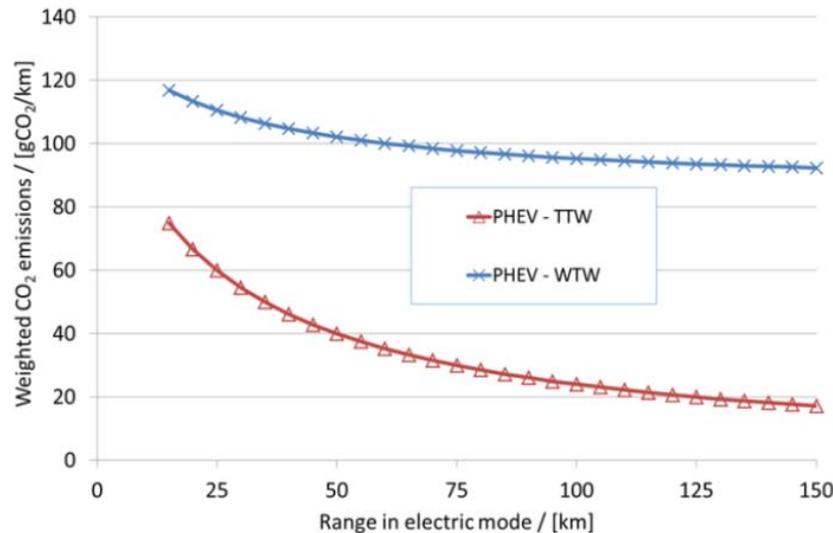


Test Cycle Formula Game for EVs:

$$m_{CO_2} = \frac{(D_e m_1 + D_{av} m_2)}{D_e + D_{av}}$$

Gap in Real Driving vs. Test Cycle

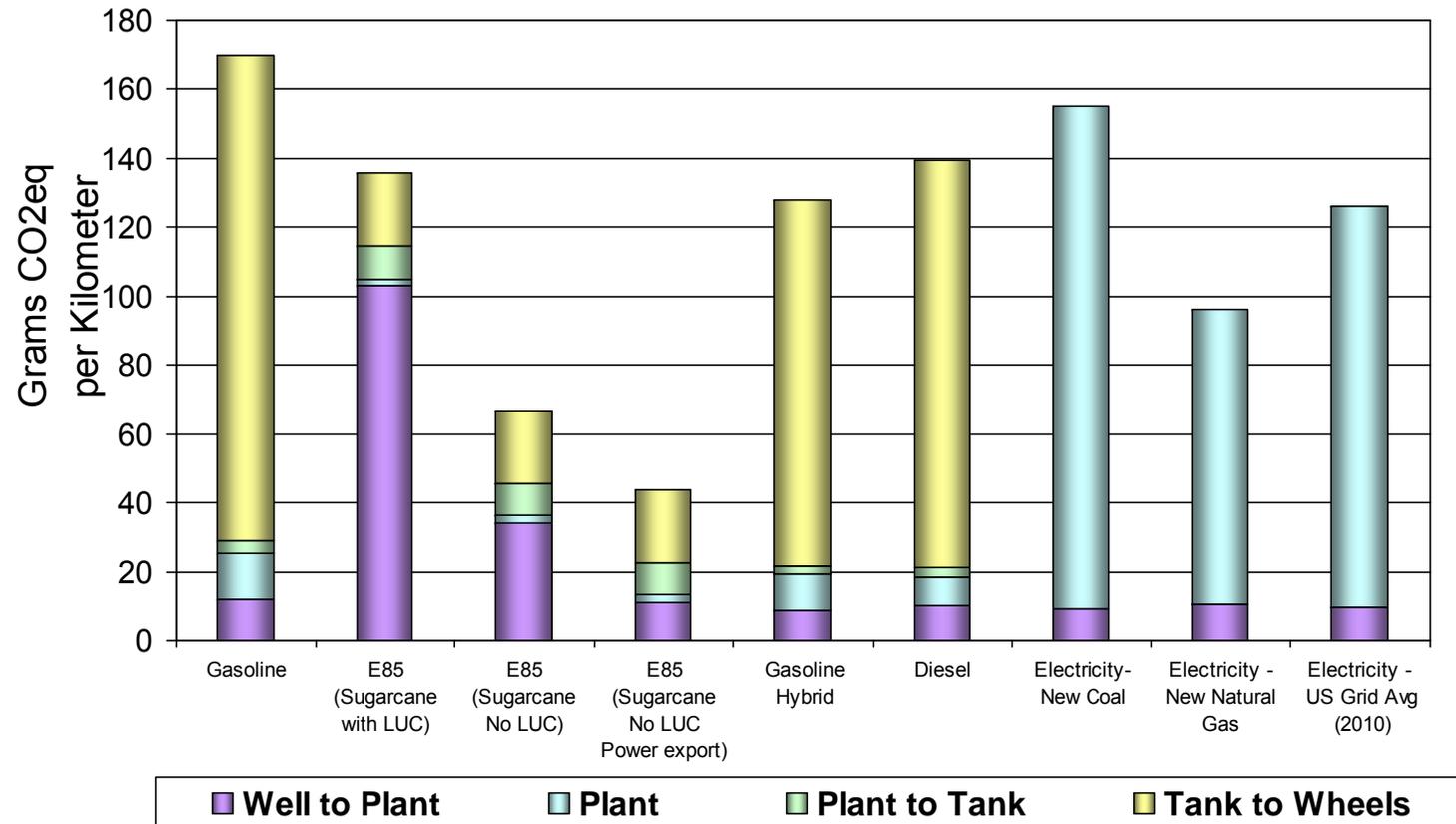
- Variation in vehicle CO2 emissions when tested under NEDC and WLTP conditions
- The NEDC cycle is not representative of real world driving, savings are therefore over estimated



Well to Wheel vs. Tank to Wheel

- Decarbonisation of the grid is required to see real low emissions from EVs

WtW vs TtW (mid sized vehicle)



Are price incentives more efficient?



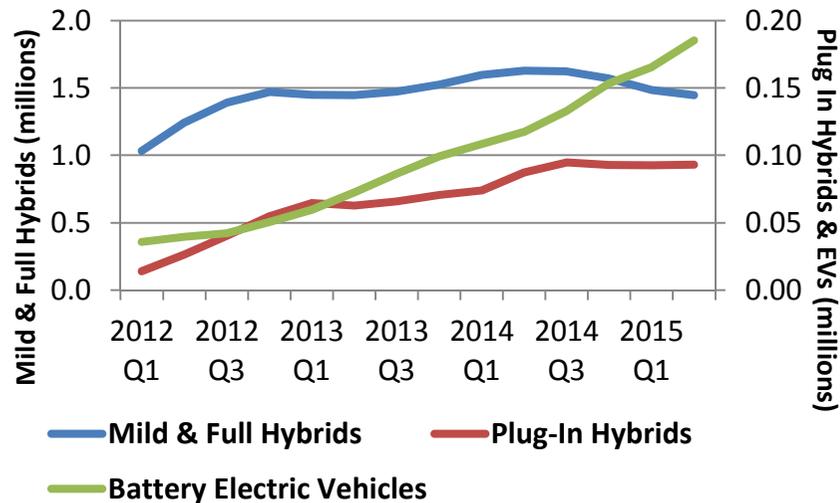
- According to MIT:
 - estimates show the US fuel economy standard is 5-14x less cost effective than a fuel tax when targeting an identical reduction in gasoline consumption
 - EU CO2 efficiency targets shows tightening vehicle efficiency targets below 95g would have a negative effect on the macro-economic impact on the EU economy
 - Current emission standards are around 3.5x more costly than emissions trading scenarios
 - MIT estimates the 78g EU target could cost €42.5bn more than an emissions trading scheme including transport



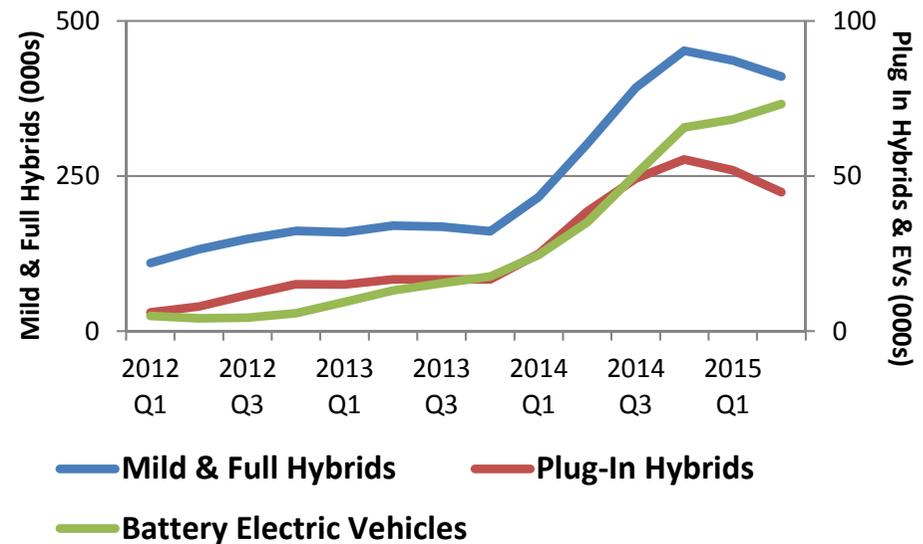
Consumer vehicle preferences US and RoW



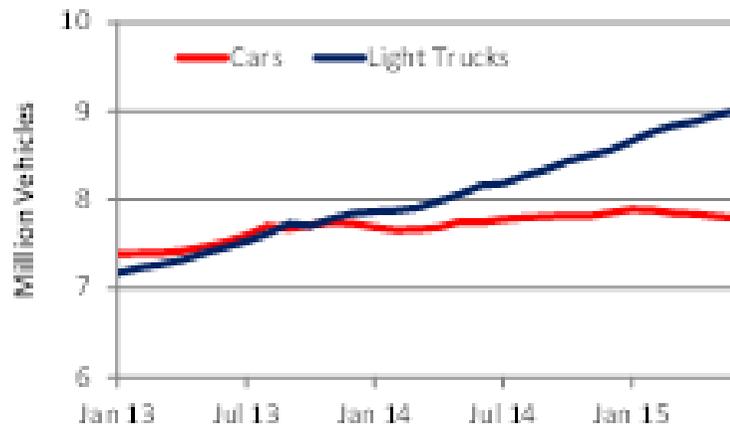
World: Hybrid & EV Sales - Rolling 12m Avg.



USA: Hybrid & EV Sales - Rolling 12m Avg.



Annualised US Light Vehicle Sales



- US consumers prefer trucks!
- Hybrid sales decline
- BEV sales sustained by heavy subsidies

Conclusions



- Efficiency has an important role to play, however, modelled savings are not representative of real efficiency savings
- Real world use is not accounted for - efficiency savings are vastly overstated
- The source of electricity must be accounted for to calculate real CO2 emission savings in transport
- Well designed vehicle efficiency standards have an important role to play. Standards promote gradual improvement through volatile oil price cycles.
- Consumer vehicle preference is critical – they cannot be forced or bribed to buy electric vehicles.
- Test whether market prices are really the most cost effective policies.