



ENERGY  
INDEPENDENCE  
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# *Future HD Vehicle Attributes*

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## Looking forward as much as 23 years (to 2035):

- Fuel cost, and it's volatility, may still be a driving issue
- True cost of goods movement may be increasing:
  - + Today, 40% of state GHG emissions from transport,
  - + 2030 projected\* – Diesel use at over 30% of gasoline - thus over 10% of State GHG emissions to be from diesel use.

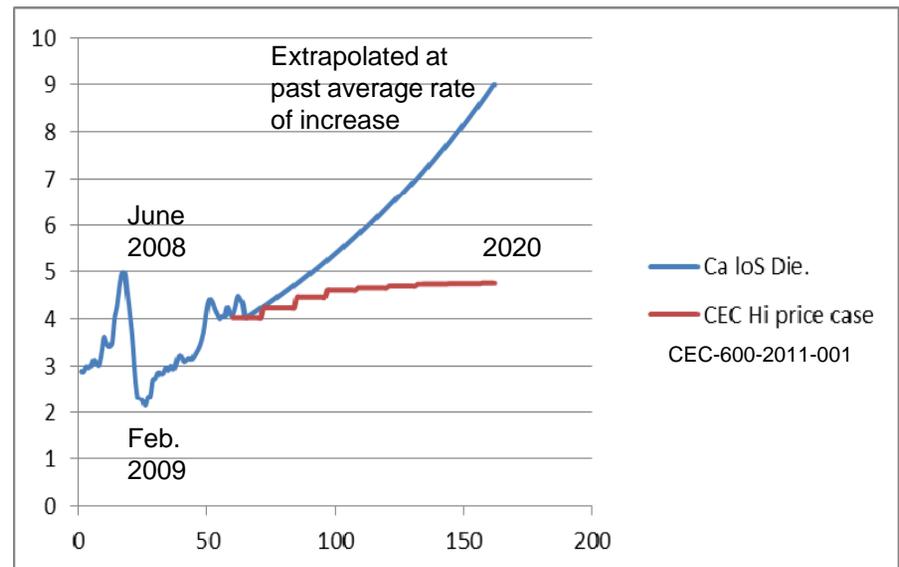
(\*2011 IEPR p.138)

## Fuel cost increases over the past decade have exceeded 10%/yr.

- IEA, DOE EIA, CEC all have made best case/worst case analyses
- inset shows past price and extrapolation from current CA diesel \$/g.
  - +Blue line BAU – extrapolating at 10%/yr (result of connecting minima of past)
  - +Red showing increases at the CEC high price case assuming diesel increases with crude
  - +Time period to 2007- 2020
- EIN Study focused on “Price Shock” damage to State economy.

[http://www.einow.org/images/stories/factsheets/upside-hedge-value\\_energy%20policyarticle.pdf](http://www.einow.org/images/stories/factsheets/upside-hedge-value_energy%20policyarticle.pdf)

Fuel price uncertainty hits its cost!  
Diverse fuel sources make a transport system not so vulnerable to fuel costs.



- Price shocks will happen – in the most unexpected ways.
- Rain in Mecca at 109°, while glacier sloughing in Greenland, record May, June temperatures in USA, fires, drought,
- Corn, soybean prices reach record prices in July as draught and demand combine in a perfect storm.

*Pending Cellulosic success, can we afford biofuels in a warming world?*



# Fuel Cell Buses in Ride and Drive – Essen, May 2010



# 2010 - 2012

## BC Transit serves Whistler Village with Hydrogen Buses

FCBs have:

- full size bus capability, freeway speeds, range in excess of 300 miles
- quiet and smooth operation (let the diesel pass and wait for the FCB)
- GHG levels of less than half those of conventional buses
- fuel domestically sourced, “not from the mid-east”



## London – 5000 buses going to electric drive, hydrogen buses in service



**Early results show efficiency improvements of triple to quadruple that of conventional buses!**

# To what extent can diesel be replaced?

(the projection of 10% GHG from diesel in 2030 demands a public plan and response!)

- Short haul is appropriately battery electric
  - +In city deliveries
  - +School buses
  - +Port trucks, yard hostlers
- Long haul:
  - +Fuel cell buses, made in CA
  - +Goods transport by cng, fuel cell trucks
- Incentive structure – there is public value in going ZEV!



*Meeting air quality standards and economic stability demand diversity in fuel use with appropriate rewards to those who operate ZEV vehicles! Manufacturers will invest only if there is a market for hundreds of vehicles.*