

<https://www.fueelfreedom.org/the-price-of-hybrid-and-electric-cars-is-plummeting-heres-why/>



# Automotive Fuels

*Team Booberry -*

Emily Aneshansley, Oliver Hesmondhalgh, Michael Moodispaw

# Topic Relevance

Our team chose this topic in the interest of learning more about the differences in electric, gas, and diesel powered cars. After research we altered our topic to discuss the benefits of diesel cars over gas and electric.



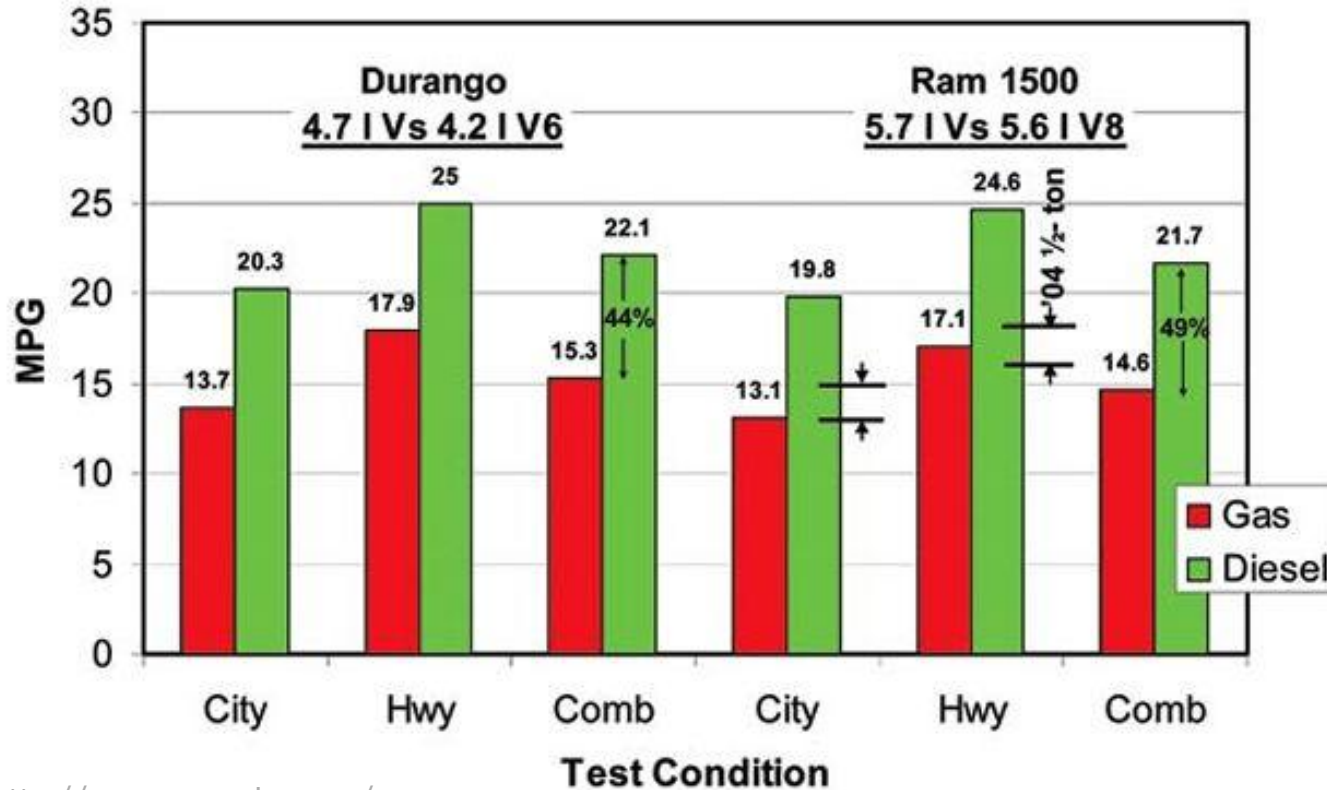
# Topic Description

- Often viewed as dirty and inefficient vehicles.
- Cleaner for the environment than other types of vehicles.
- Improved dramatically in the last decade.<sup>[5]</sup>
- New diesel cars reaching 46 mpg on the highway.<sup>[5]</sup>
- Notably cheaper than hybrids.<sup>[5]</sup>

	2015 MSRP	City mpg	Hwy mpg
Audi A3 (gas)	\$ 34,740	23	33
Audi A3 (diesel)	\$ 40,045	31	43
Volkswagen Jetta (G)	\$ 20,910	23	34
Volkswagen Jetta (D)	\$ 23,130	31	46
Chevrolet Cruz (G)	\$ 22,150	26	38
Chevrolet Cruze (D)	\$ 28,355	27	46

<http://www.fool.com/investing/general/2015/06/04/diesel-vs-gas-which-is-the-better-fuel-and-vehicle.aspx>

# Fuel Economy Results



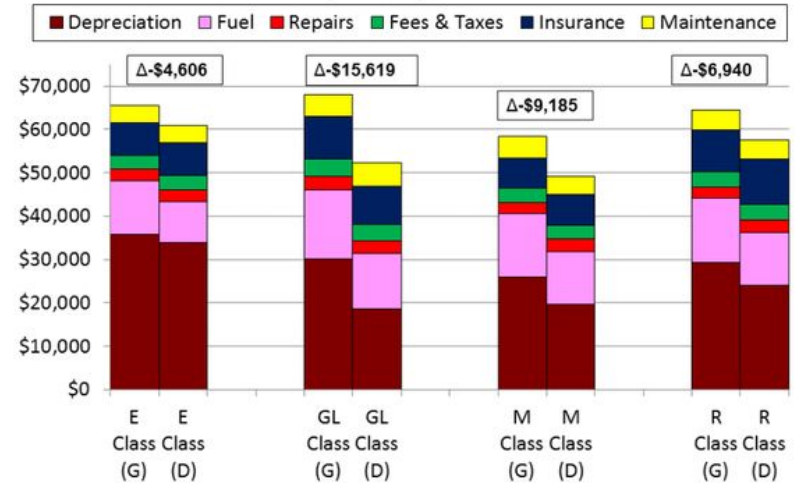
The diesel engine receives better fuel mileage

- City, highway and combined
- For both the V8 and V6
- Even though the diesel has a larger displacement

# Cost

- Annual savings depends on the amount of miles driven per year.<sup>[5]</sup>
- Higher initial price of diesel vehicles is offset by the annual savings in fuel expenses.<sup>[5]</sup>

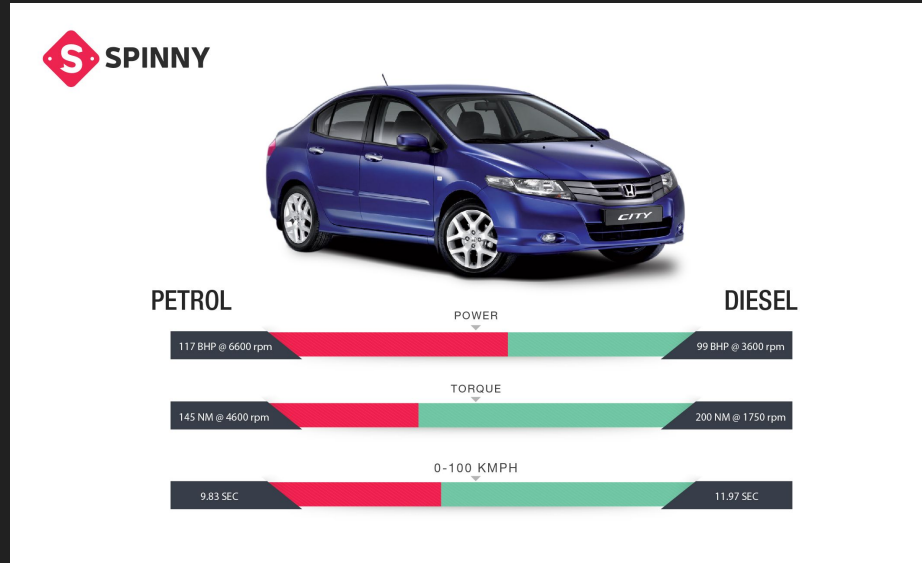
## TCO: Diesel vs. Gas 5 Years / 75,000 Miles



Annual Miles	15,000							
City %	55%		2015 MSRP	City mpg	Hwy mpg	Annual fuel cost	Annual savings	Years to breakeven
Highway %	45%							Miles to breakeven
		Audi A3 (gas)	\$ 34,740	23	33	\$1,712.73		
		Audi A3 (diesel)	\$ 40,045	31	43	\$1,186.81	\$ 525.91	10.1
Gas price	\$ 2.75	Volkswagen Jetta (G)	\$ 20,910	23	34	\$1,475.85		
Diesel Price	\$ 2.88	Volkswagen Jetta (D)	\$ 23,130	31	46	\$1,144.37	\$ 331.48	6.7
Premium Gas	\$ 3.14	Chevrolet Cruz (G)	\$ 22,150	26	38	\$1,313.69		
		Chevrolet Cruze (D)	\$ 28,355	27	46	\$1,215.19	\$ 98.50	63.0

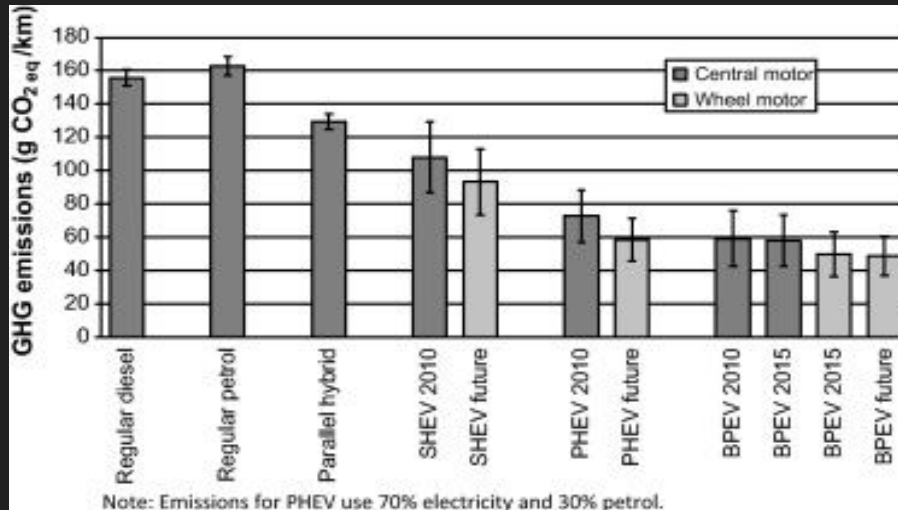
# Performance

- The compression ratio required:
  - Diesel engines: 22:1<sup>[1]</sup>
  - Petrol Engines: 8:1<sup>[1]</sup>
  - Diesel engines produce more torque, causing more acceleration off the line.<sup>[1]</sup>
  - Heavier diesel engines cause vehicles to be slower over time.<sup>[1]</sup>

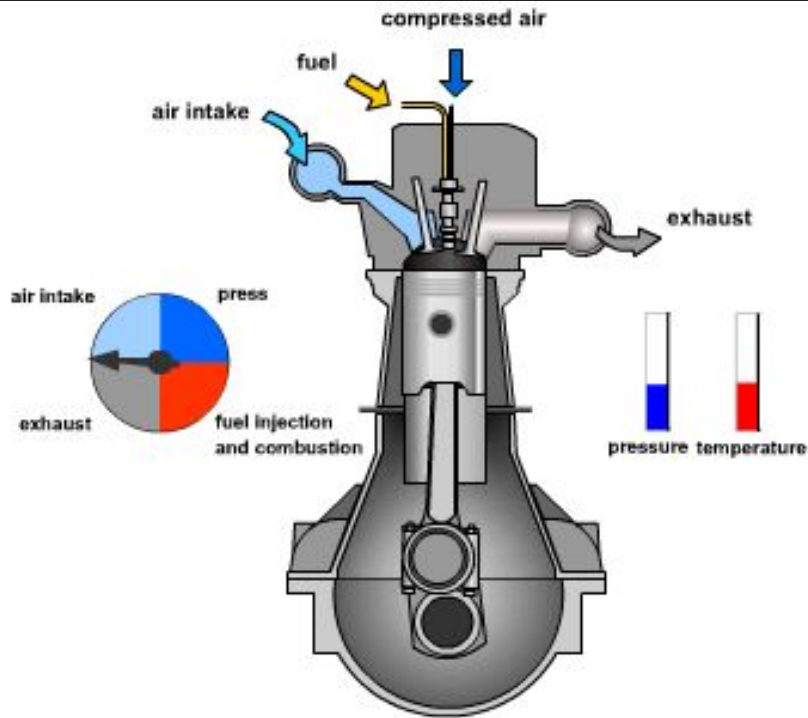


# Environmental Impact

- Lithium Battery Issues
  - Flammable and highly reactive<sup>[2]</sup>
  - Health Issues<sup>[2]</sup>
- Hybrids that depend on coal for their electricity are 17% to 27% *worse* than diesel or gas engines.<sup>[4]</sup>
- Initial production of the vehicle and the batteries together make up about 40% of the total carbon footprint <sup>[4]</sup>



# Emissions



Emits less hydrocarbons, and carbon monoxides and dioxides than gasoline.<sup>[6]</sup>

Direct injection controls the amount of fuel inserted into the cylinders and directs timing to reduce the amount of fuel needed.<sup>[6]</sup>

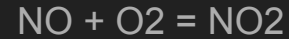




## Ultra-Low Emission Systems, Tier 4 Final

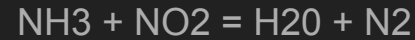


**DOC** - reduces Particulate Matter



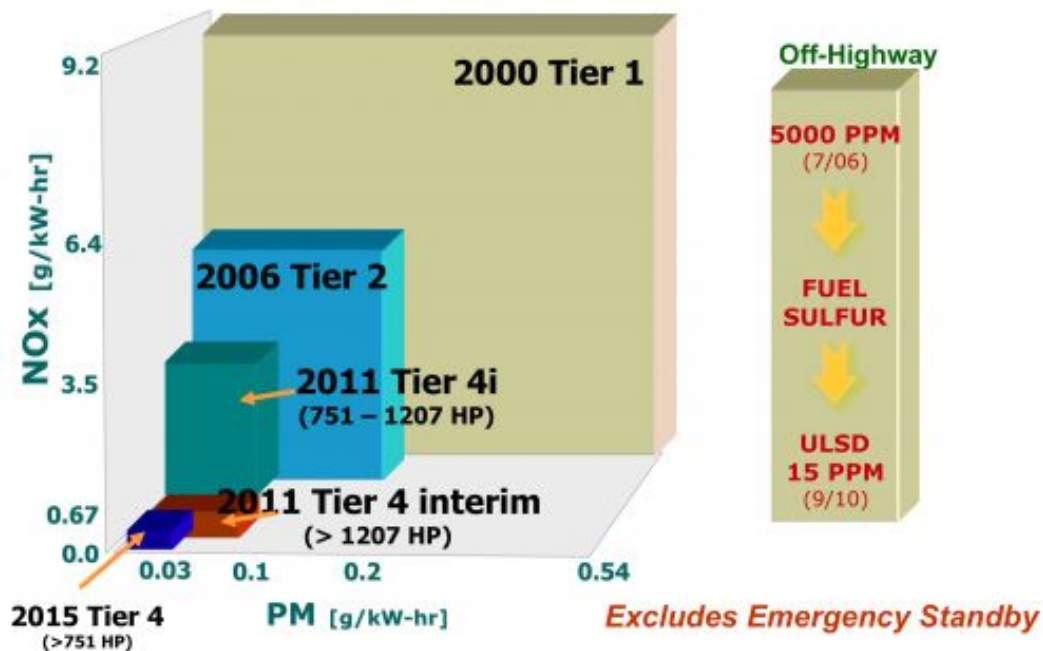
HC- (hydrocarbons, diesel) produce heat

**DEF**- injection of urea and water



**SCR** - reduces excess  $\text{NO}_2$  to near zero, enhances fuel economy <sup>[6]</sup>

# Evolution of EPA Off-Highway Emission Standards



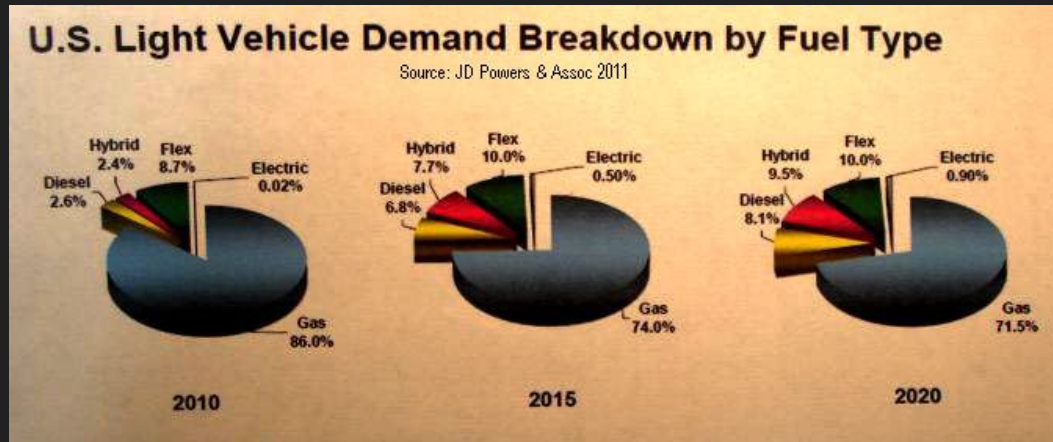
# History

- Diesel cars first used in 1933.<sup>[7]</sup>
- Research on diesel cars was done by companies to sell car.<sup>[7]</sup>
- Was found that it can be more efficient than gas powered cars.<sup>[7]</sup>
- Became popular after WWII for commercial use such as taxis, ambulances and delivery vehicles.<sup>[7]</sup>

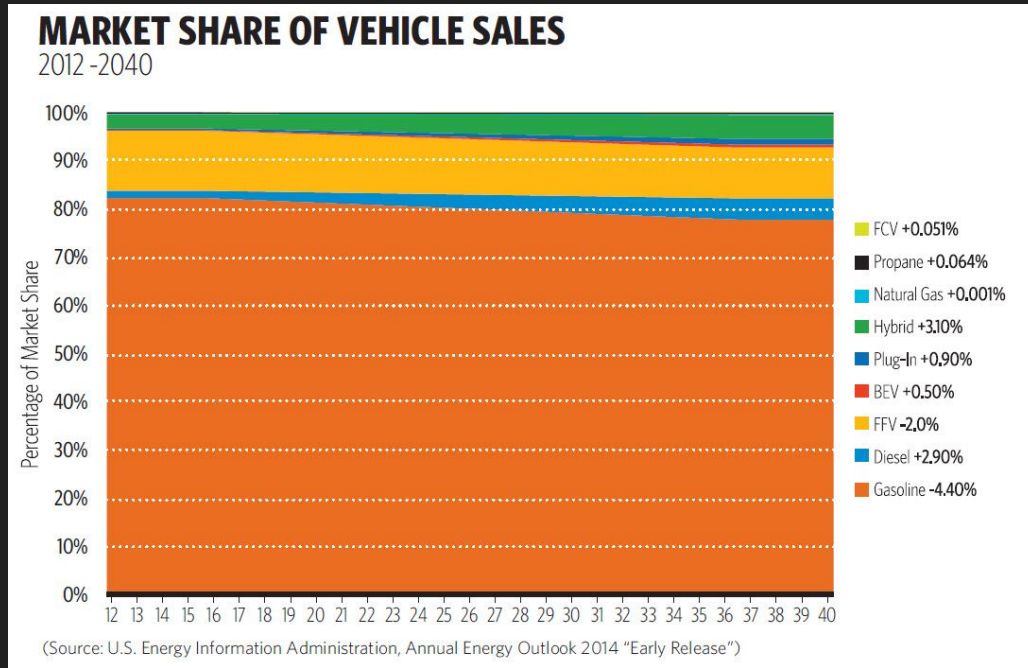


# History

- Became popular passenger cars in the early 2000's.<sup>[7]</sup>
- BMW, VW, Mercedes-Benz, Fiat hold the diesel car market.<sup>[7]</sup>
- In the early 2000's more companies like Honda, and Chrysler started testing out diesel engines.<sup>[7]</sup>
- Diesel cars still only make up a small percent because they are still viewed as dirty and can be more expensive.<sup>[7]</sup>



# Future Research



- Weight Problems.<sup>[8]</sup>
- Efficiency.
- Increase in popularity.

<http://fuelmarketernews.com/wp-content/uploads/2014/02/NACS2.jpg>

# Closing

- Electric cars do have a large footprint for both energy use and waste.
- Diesel has better fuel mileage than gas and electric cars on and off the highway.
- They produce less hydrocarbon emissions and have better technology for the future.
- Diesel is more cost efficient in the long run and better for the environment.
- Questions?

# Sources

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