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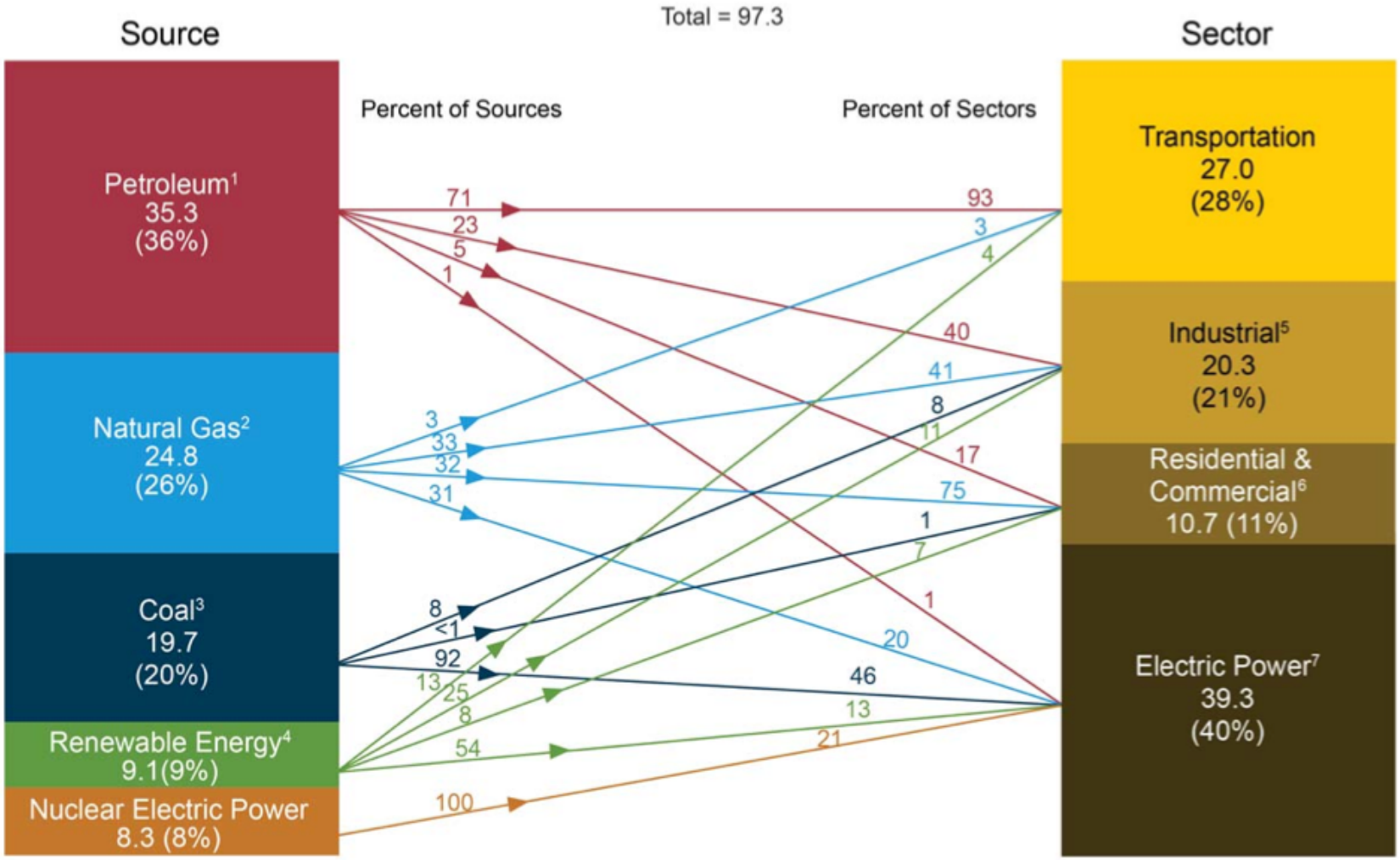
ENVS 119 - Energy & the Environment
06 - Petroleum Energy

Today

- Oil / petroleum = transportation fuel
- Used in energy, agriculture, plastic...
- Peak oil? End of oil?
- Petroleum environmental impacts
- Car emissions standards/smog
- VW "Clean Diesel"

How do we use Oil?

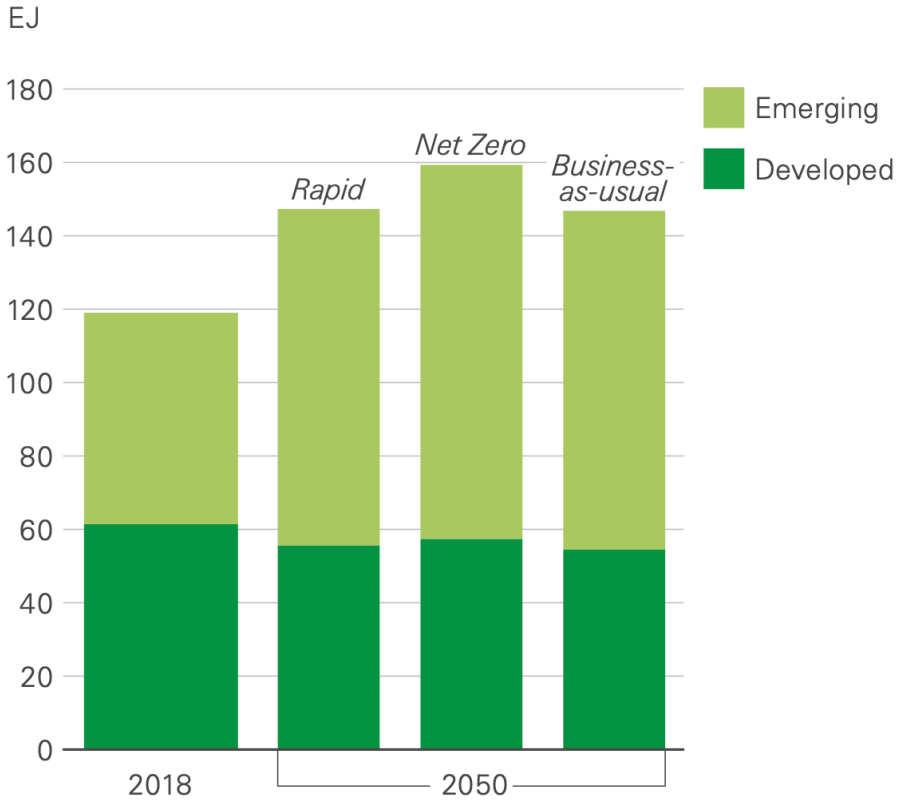
71% goes to transportation (cars, trucks, trains, ships and airplanes)…



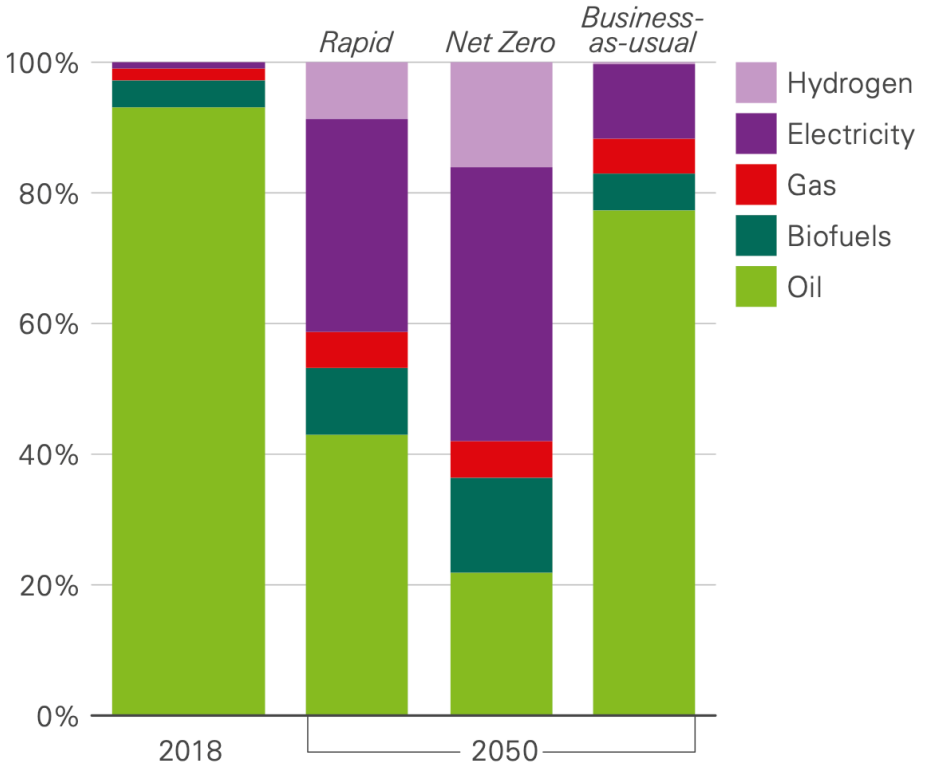
Petroleum Use - The End is Coming!

The growth of energy used in transportation slows, with oil peaking in mid-to-late 2020s

Primary energy demand in transport



Share of final energy consumption in transport by energy carrier

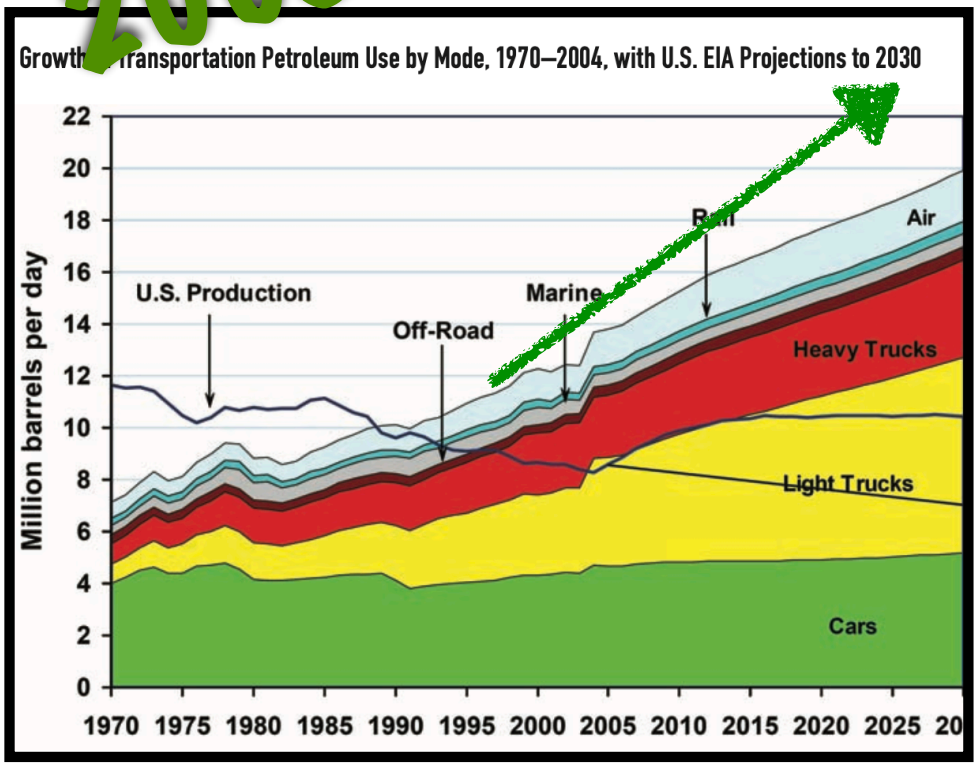


https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/energy-outlook/bp-energy-outlook-2020.pdf

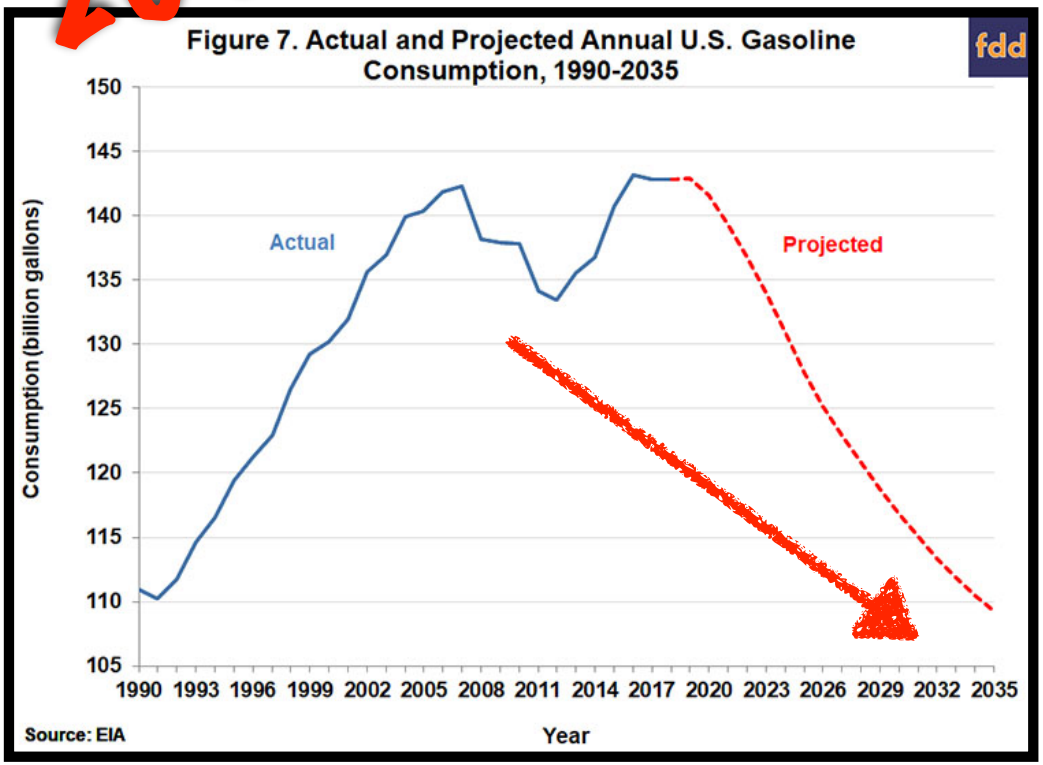
Projections are totally different now…

1. In 2008, EIA predicted **+80%** increase in US Petroleum use (2000-2030).
2. In 2018, EIA predicted **-40%** decreased in US Petroleum use (2000-2030)

2008

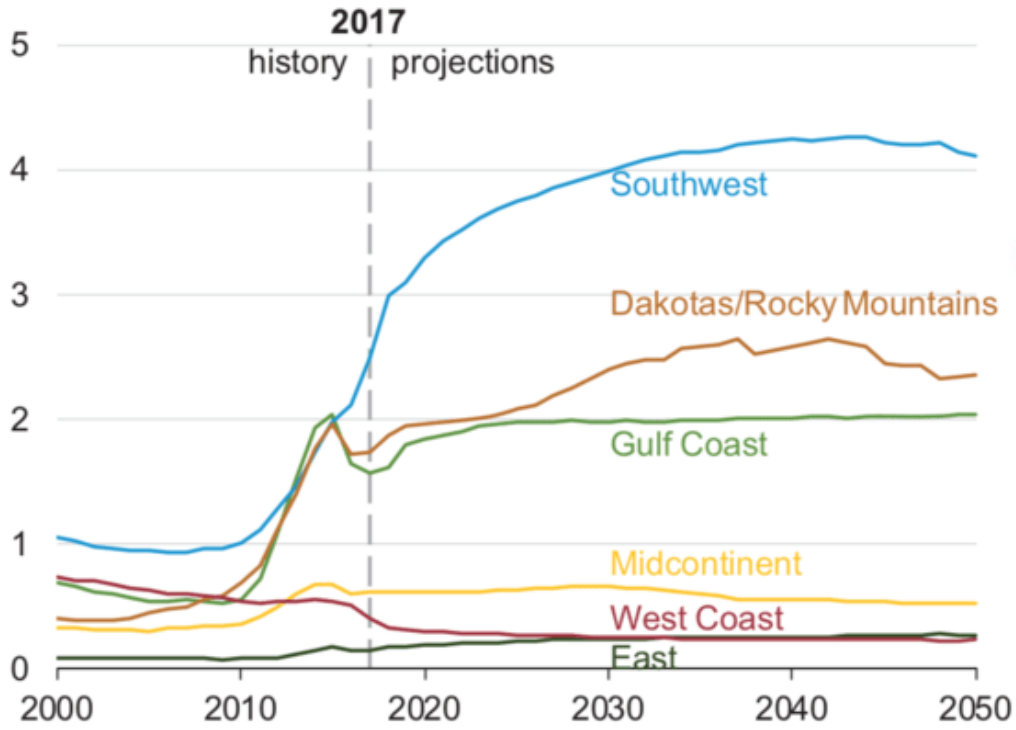


2019



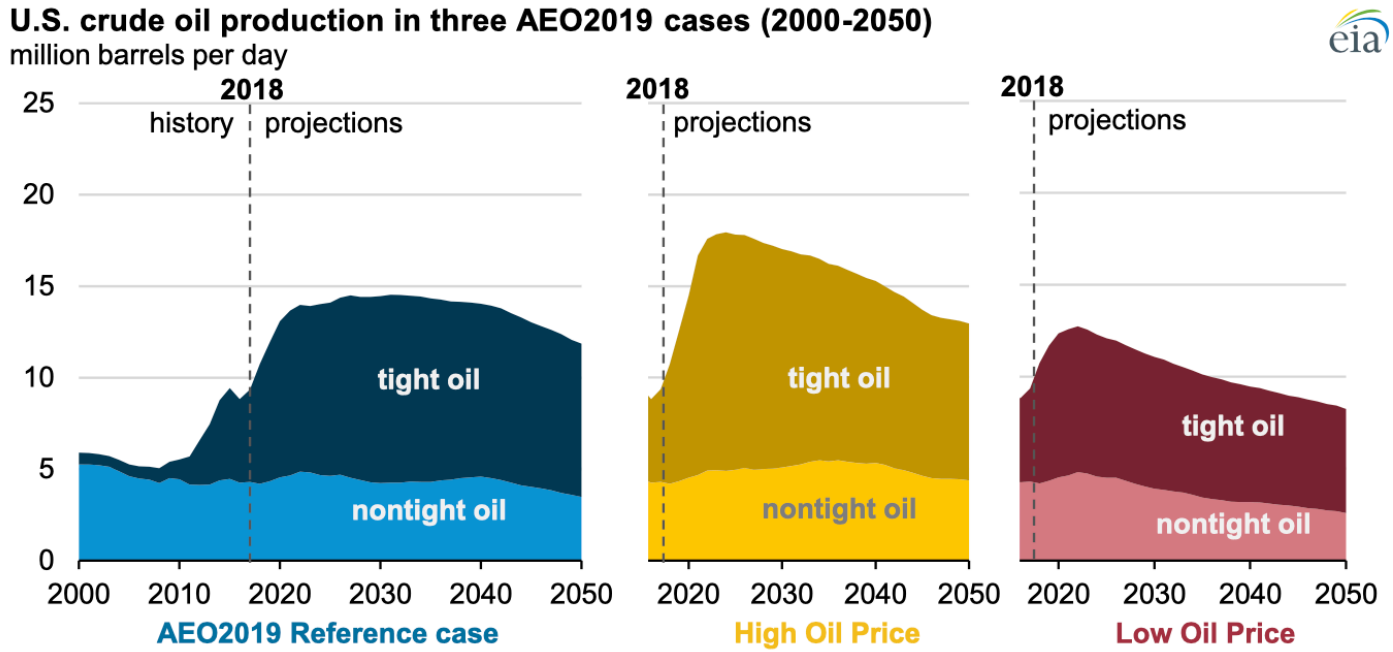
US Crude Oil production is booming.

While US Oil use is predicted to significantly decrease (better car efficiency, EV conversion…), US Oil production is increasing.
Oil prices will go down due to oversupply,
leaving the rest of World (OPEC and Russia) struggling.



US Oil Success depends on global price.

Oil markets have never been more volatile and uncertain

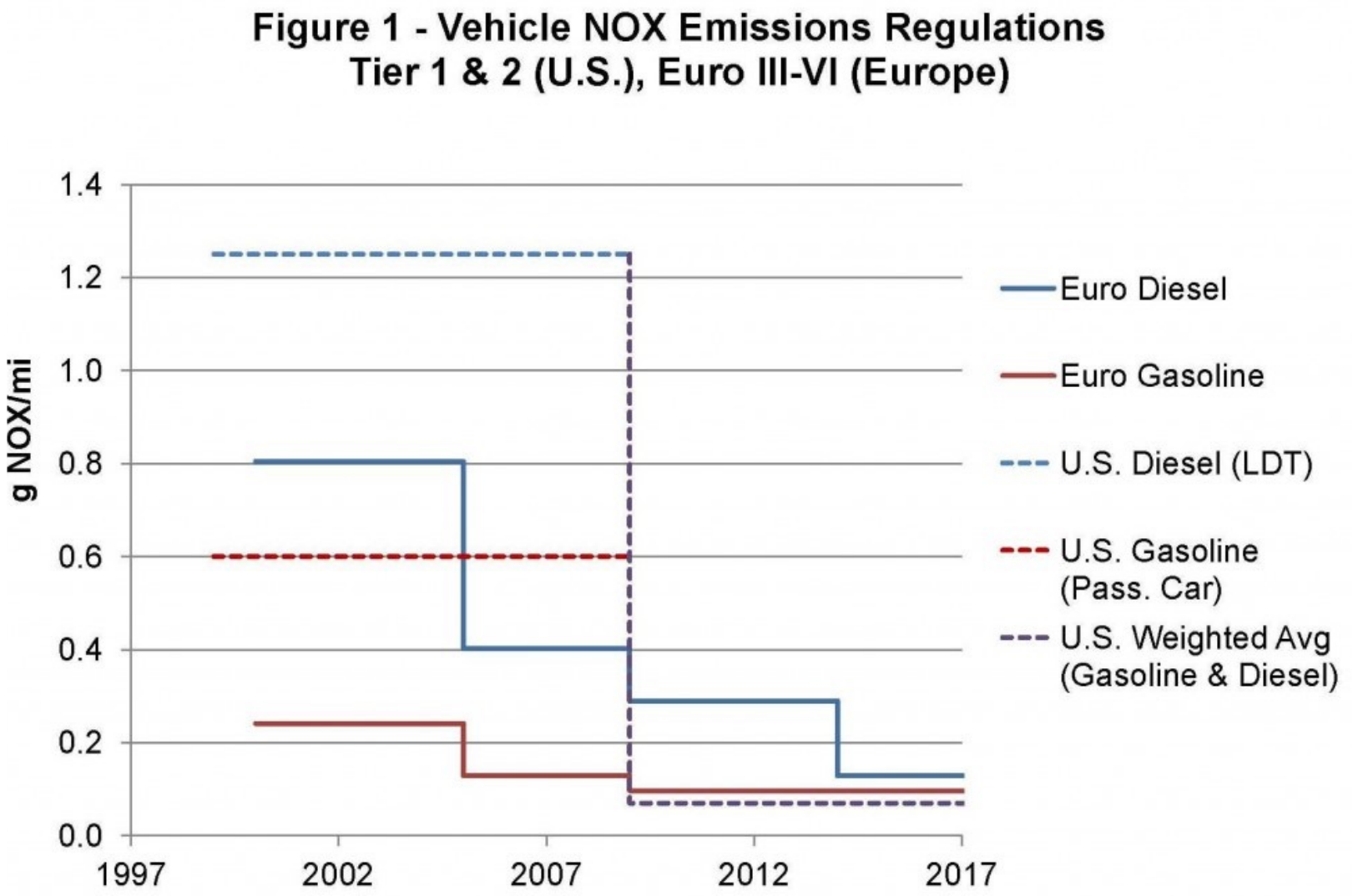


Source: U.S. Energy Information Administration, *Annual Energy Outlook 2019*

End of Petroleum will…

1. Improve air quality.
   Less local air pollution Nox/Sox, PM, Ozone in cities saves lives.
2. Stop soil pollution from leaks.
   Pipelines, tankers, drilling sites…
3. Lower Carbon Emissions.
   Rapidly improving pressure of global climate change.
4. Create non-carbon transportation solutions. Drones/carts deliveries, “Uber” autopilot fleet of EV for personal transportation needs…
5. Ends new prospection in sensitive areas (Coastal offshore, and Alaska Wildlife Refuge)

Example: CA Emissions standards on cars



To manage L.A. Air Quality

Emissions standards
2016 EPA v. VW Clean Diesel case.

- 500,000 Clean Diesel cars
- NOx x40 time standard
- $10B backback
- $2.7B fine
- $225M fine in CA

https://www.caranddriver.com/news/a15339250/everything-you-need-to-know-about-the-vw-diesel-emissions-scandal/

Case study: Lawn mower

- Pre- 2000 gas powered garden tools not regulated
- No_x = up to 11 cars
- Voc = 350 car miles

- Fix = Catalytic exhaust converter $30/unit (only!)

Demonstration of a Catalytic Converter Using a Lawn Mower Engine - Journal of Chemical Education, v87 n2 p180-182 Feb 2010

Measurement of Regulated and unregulated Exhaust Emissions from a Lawn Mover with and without an Oxidizing Catalyst: A comparison of Two Different Fuels
Environ. Sci Technology 2001, 35, 2166-2170

ENVS/ENGR 119 - Lecture 06

Q/A

End