

Energy: Transportation Fuels and Sources

Rapporteur Report:

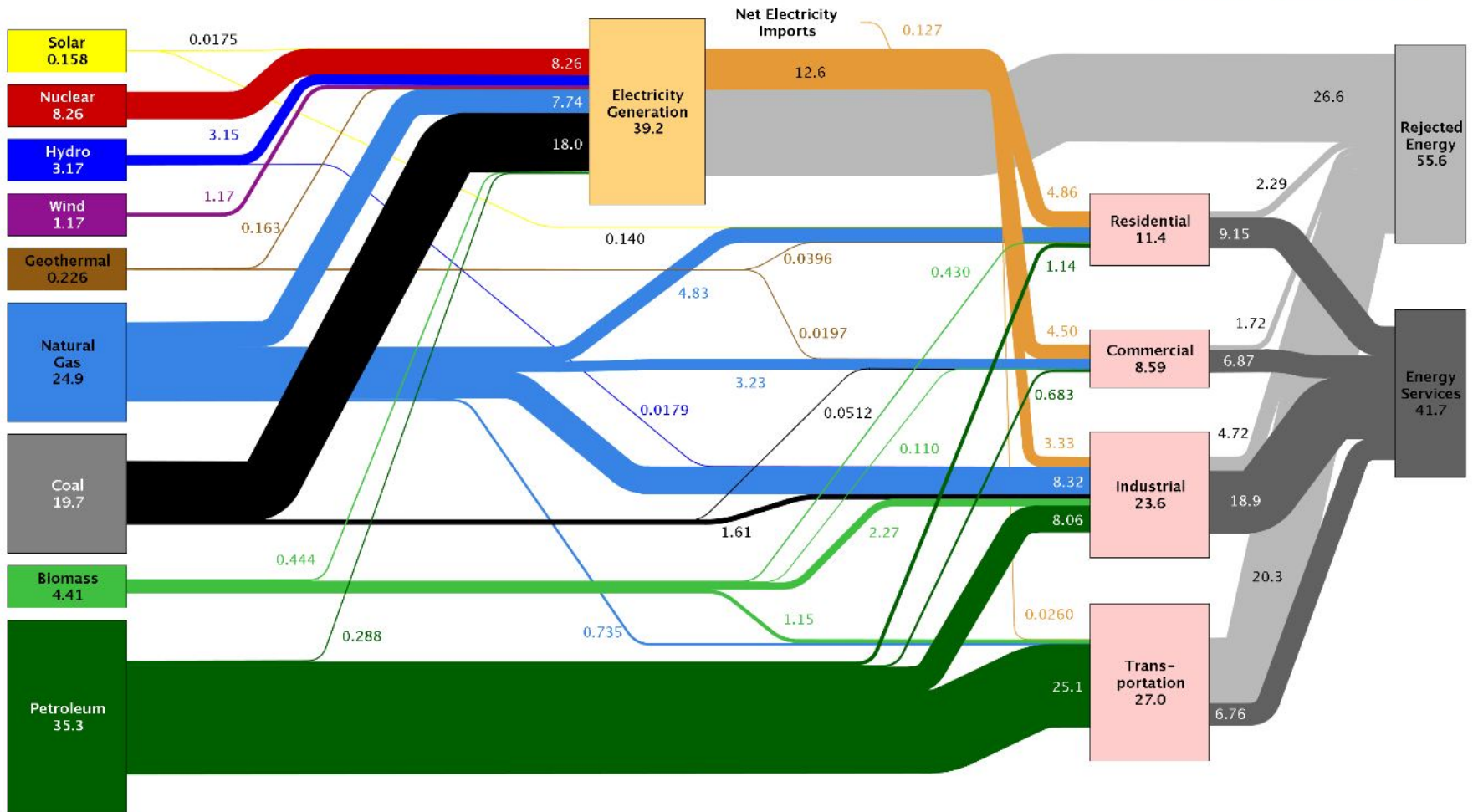
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Wide Range of Views on a 'Wicked Problem'

- Agreement: Innovative, multi-modal era with need to change transportation fuels and infrastructure.
- Agreement: Conventional air emissions still a major issue.
- Different views: Greenhouse Gas Emissions, Resiliency, Energy Independence

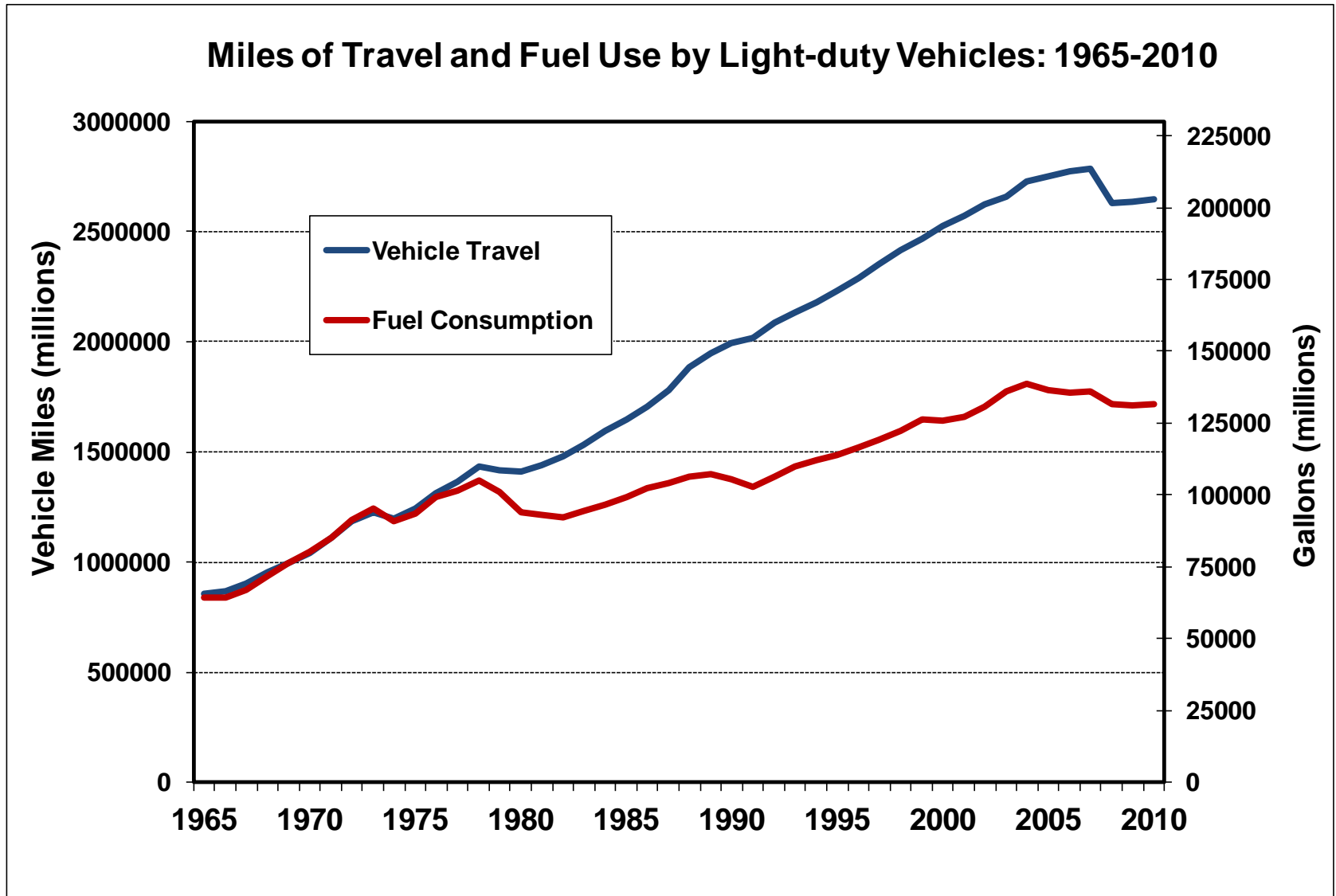
Estimated U.S. Energy Use in 2011: ~97.3 Quads



Source: LLNL 2012. Data is based on DOE/EIA-0384(2011), October, 2012. If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports flows for non-thermal resources (i.e., hydro, wind and solar) in BTU-equivalent values by assuming a typical fossil fuel plant "heat rate." The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 80% for the residential, commercial and industrial sectors, and as 25% for the transportation sector. Totals may not equal sum of components due to independent rounding. LLNL-MI-410527

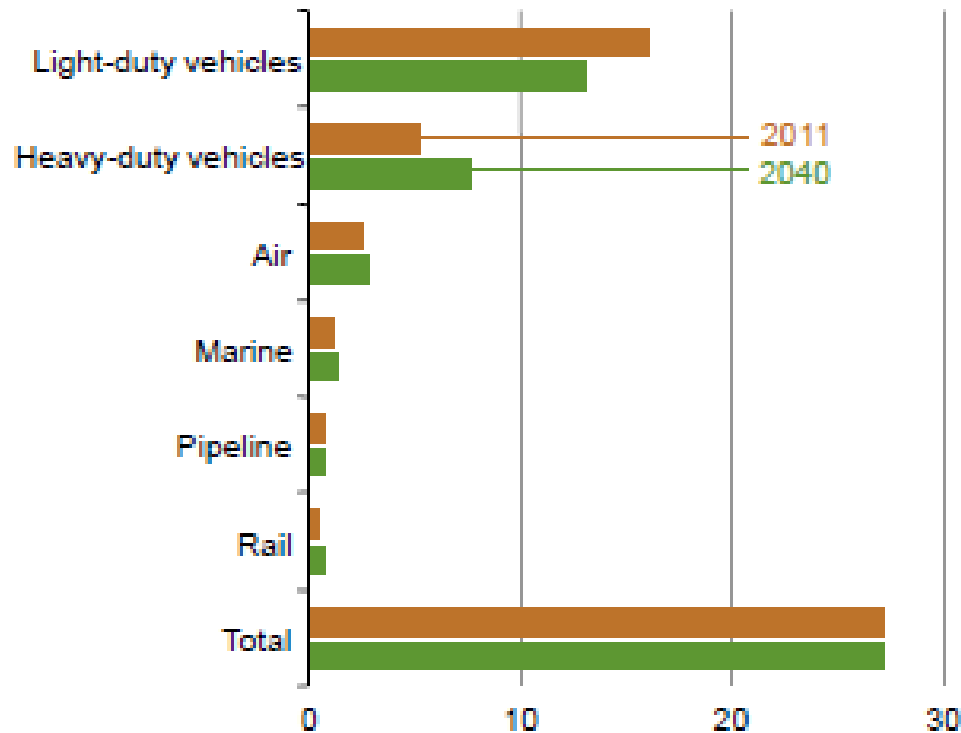
Transportation is large energy end use, reliant on petroleum, and with low energy efficiency.

Change Possible: LDV



EIA BAU Projects Transportation Energy Consumption Not Changing

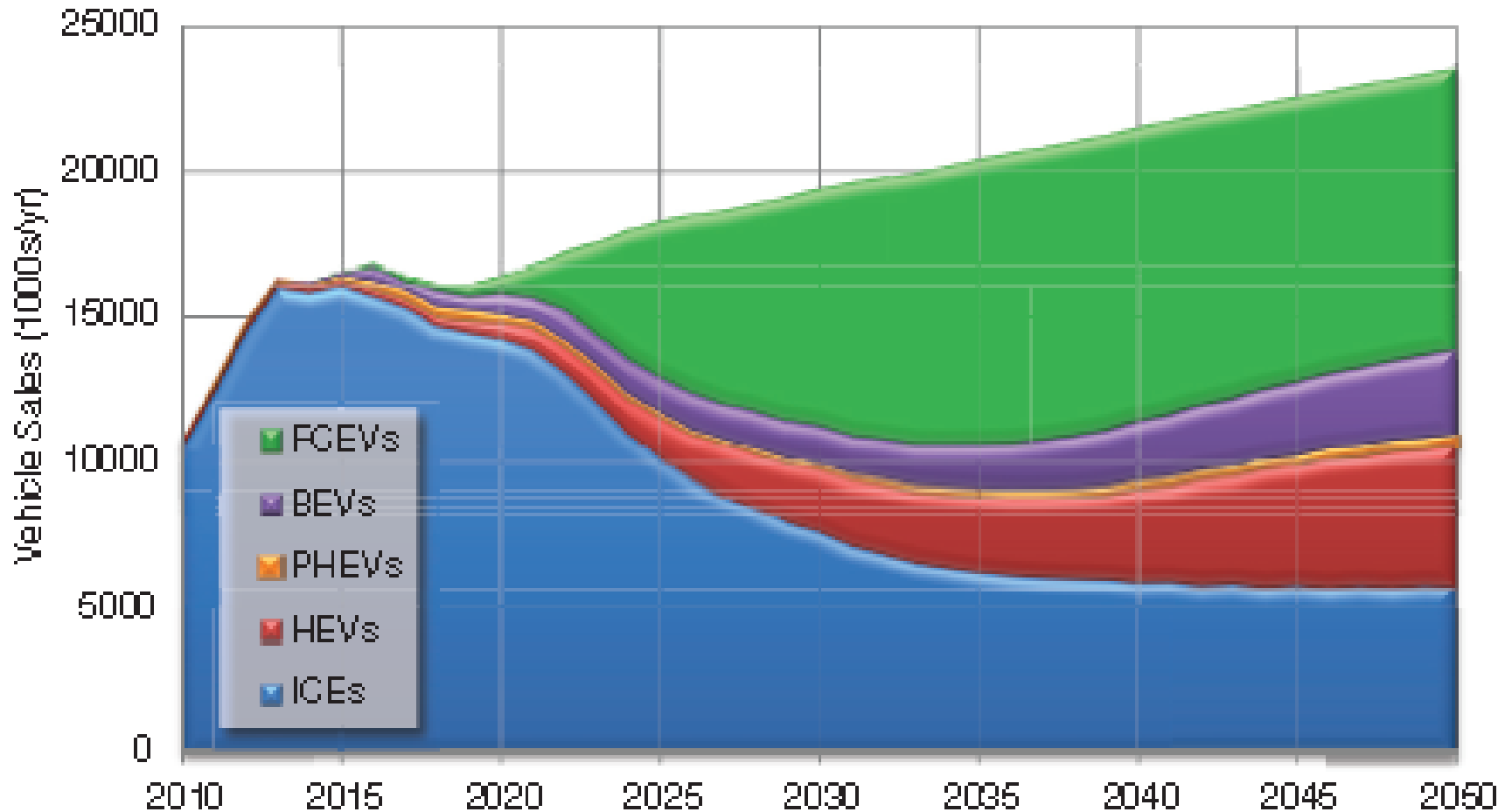
Figure 70. Delivered energy consumption for transportation by mode, 2011 and 2040 (quadrillion Btu)



Business as Usual Policy Option

- Increase in Light Duty Vehicle fuel efficiency (CAFÉ Standards) (and others)
- Continued use of ethanol (but little use of E85 by flex-fueled vehicles).
- Heavy Duty Vehicles move to Natural Gas.
- Early adopters move to HEV and PEV.
- Somewhat lower greenhouse gas and conventional air emissions.
- Somewhat lower petroleum imports.

LDV and H Low Emission Electrification Policy Option



C and H Natural Gas Policy Option

- Large increases in North American NG reserves.
- CNG combustion proven technology
- Lower current energy cost for NG versus oil.
- Environmental Management issues for Shale Gas Development.
- Marginal benefit for greenhouse gas emission reduction.

Biofuels

- Vehicle flex-fuel technology exists.
- Food competition, land conversion, nutrient use and water use issues
- Need new technology beyond corn and ethanol refinery: CO₂ + nutrients + water yields drop-in fuel

Non-Fuel Policy Options

- Land use and modal changes for efficiency.
- Congestion management strategies.
- Local manufacturing strategies.
- Autonomous vehicles improving driving cycles?
- Tele-conferencing
- Etc.

Barriers to Change Everywhere

- Simultaneous Infrastructure and vehicle changes needed.
- Range anxiety and charging/swapping time for BEV.
- Need subsidies to overcome current economics and inertia.
- International co-operation.
- Pervasive uncertainty: market response, etc.
- Need time to accomplish changes.
- No consensus on goals.

Some TRB Implications

- New stakeholders: fueling stations, electric utilities, etc.
- Can involve multiple issues (land use, bicycling, alternative fuels, road roughness, etc.)
- Petroleum tax increasingly inequitable and with smaller base. Need consensus for change – energy tax?
- Increasing diversity of vehicle fleets.
- Climate change as widespread driver.