

Evolving Fluid Needs for the e-ICE

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Performance you can rely on.

The rise of e-ICE (electrified-Internal Combustion Engine)



1. Why e-ICEs Matter

1.1 -  The Case for Action

1.2 -  Bridging the gap to zero emissions via e-ICEs

2. Why e-ICEs need tailored lubricants



Why e-ICEs Matter

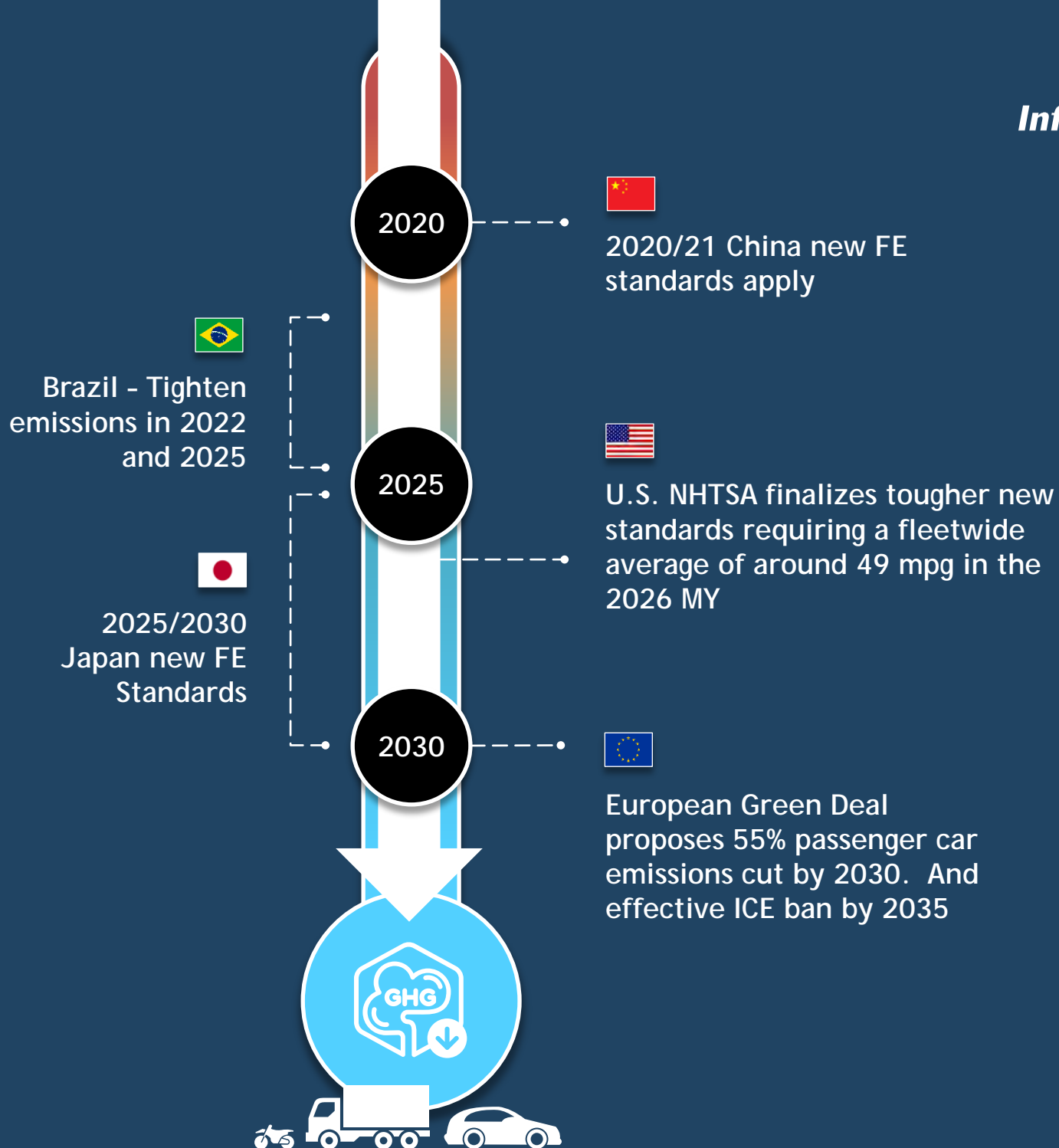
Shift to sustainable mobility:

The Case for Action

Global actions to cut pollution and in particular GHG and particulates from transportation

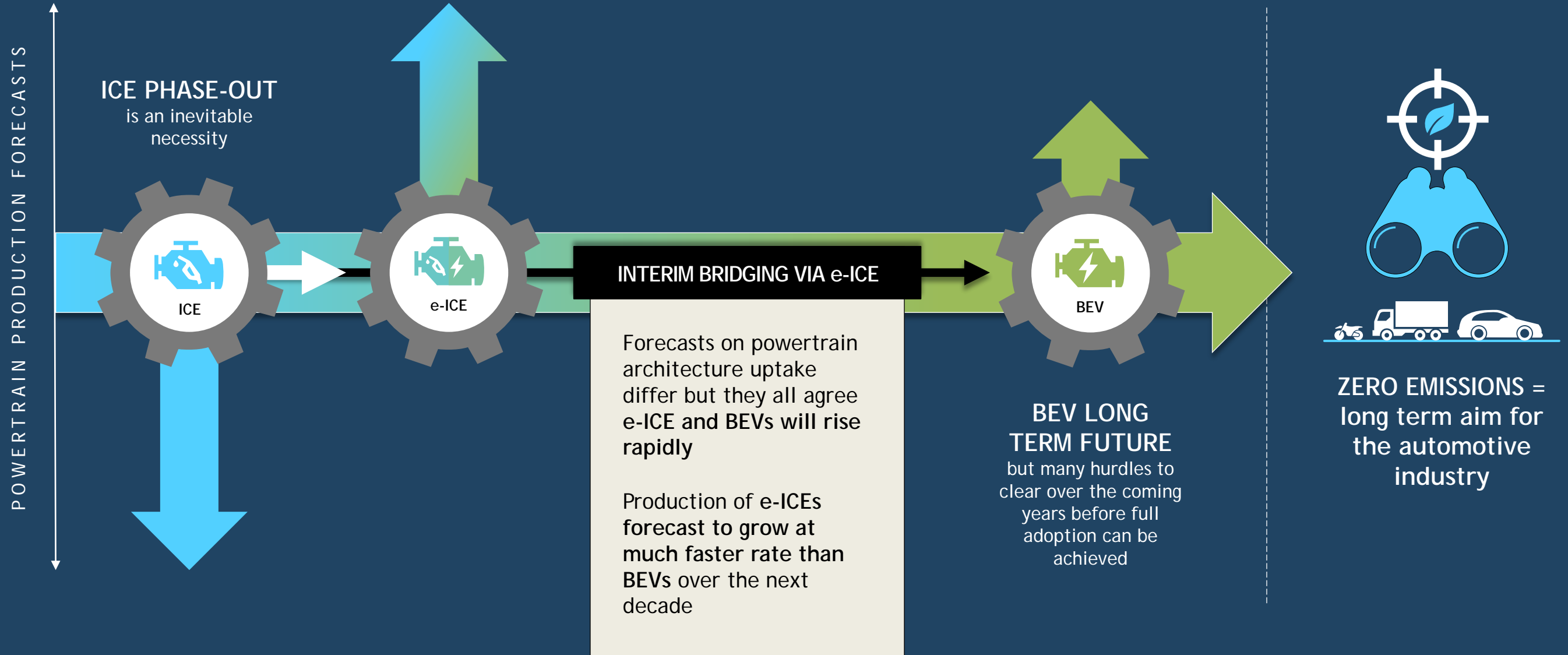


Timeline of key emissions standards and requirements global developments

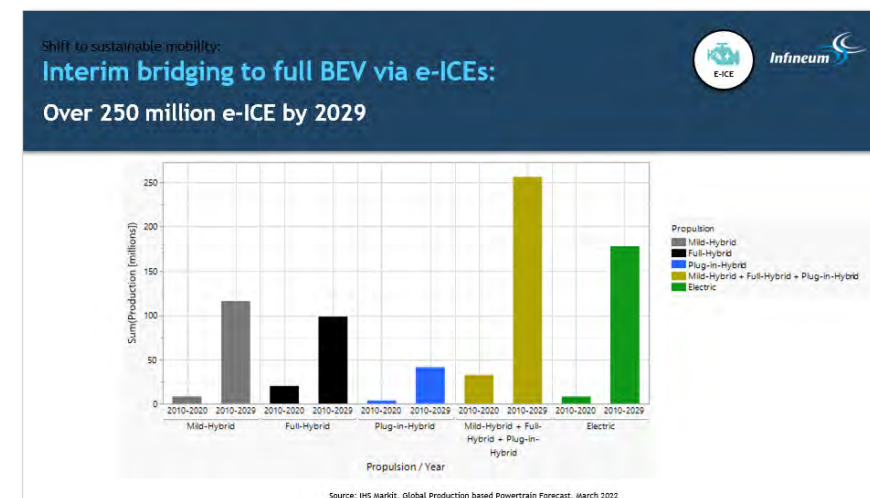
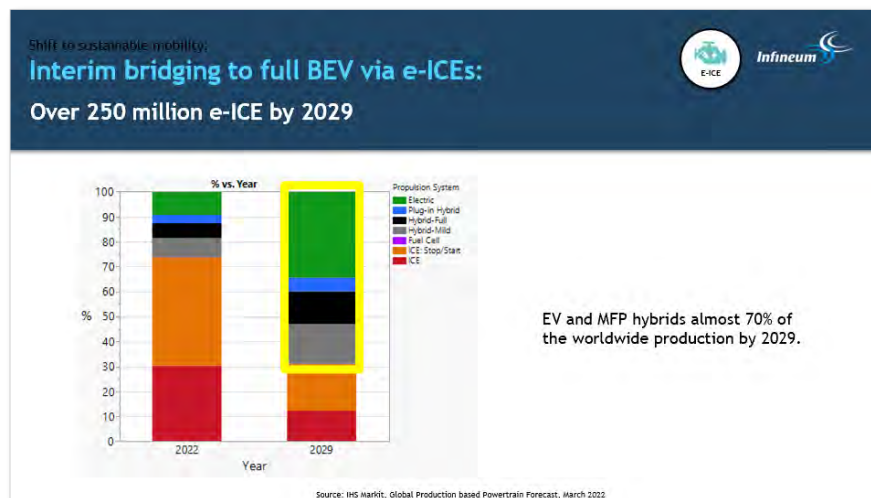
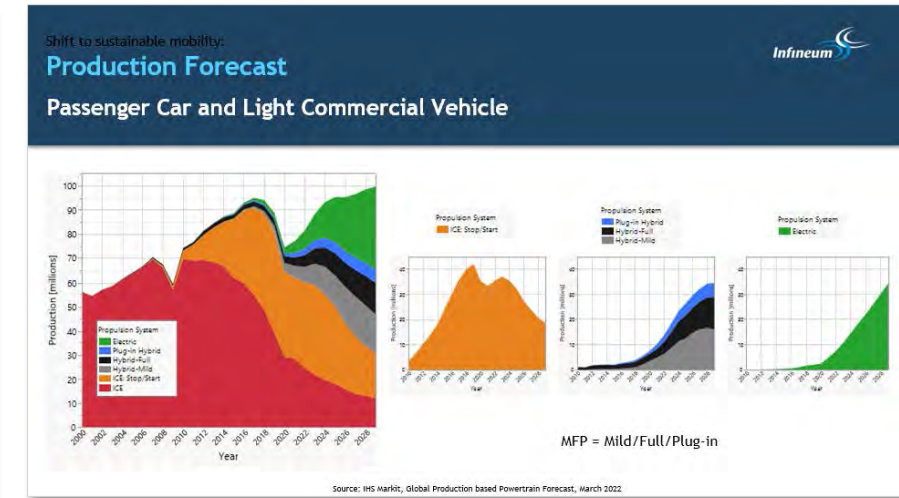
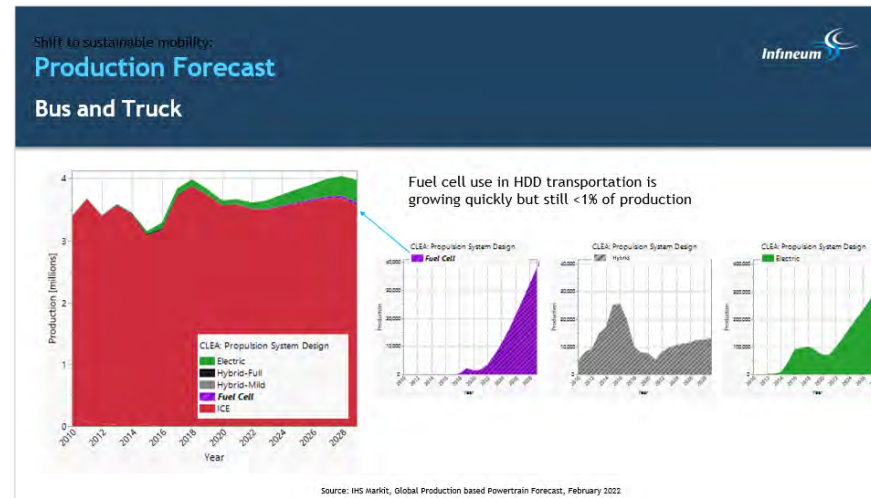
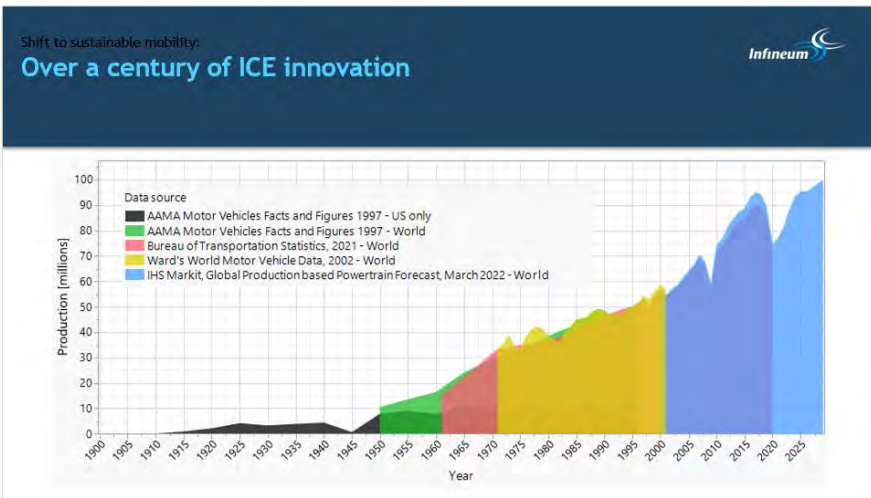


Shift to sustainable mobility:

Bridging the gap to reach zero emission goals

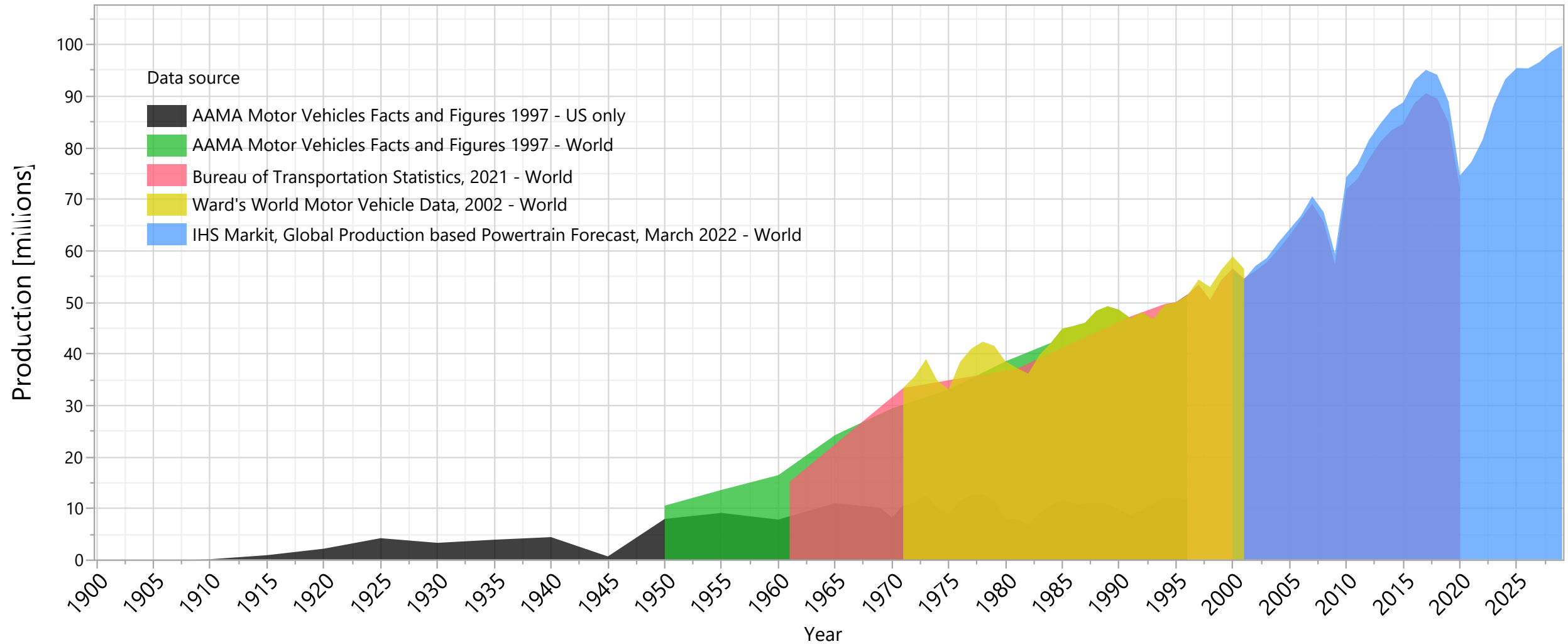


Shift to sustainable mobility: Interim bridging to full BEV via e-ICEs: Key global data sets



Shift to sustainable mobility:

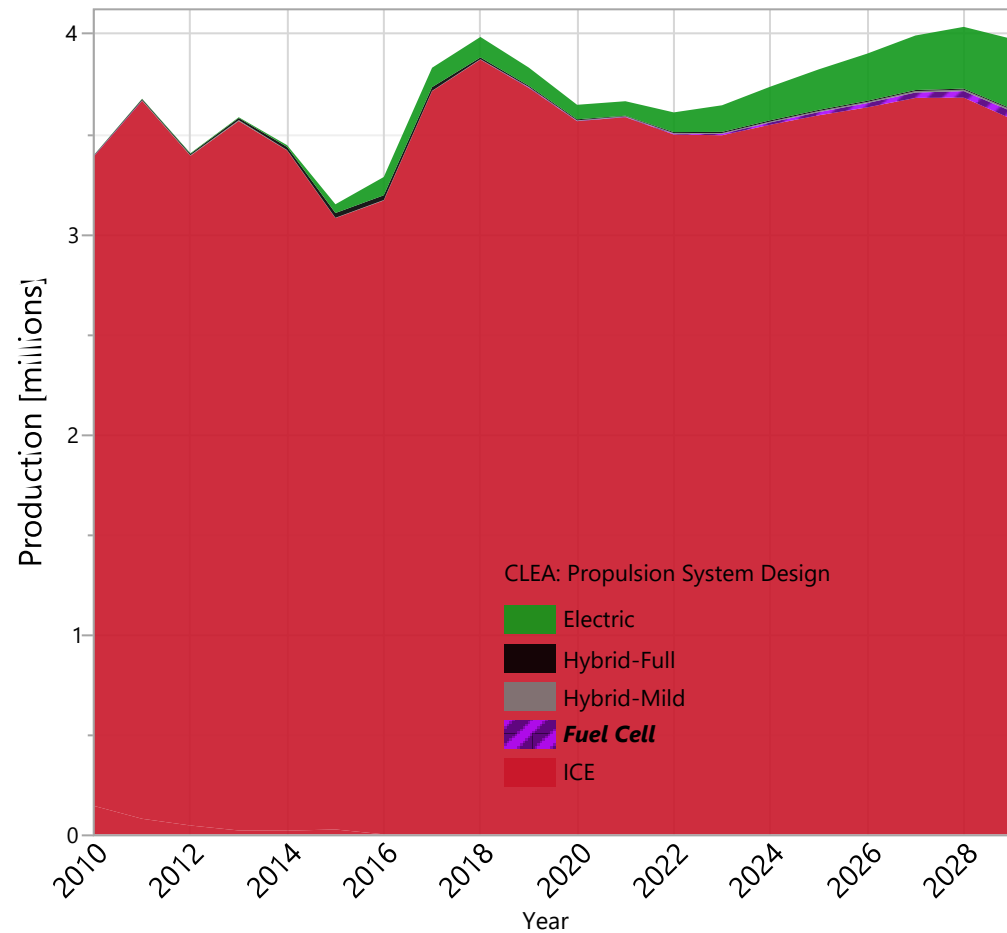
Over a century of ICE innovation



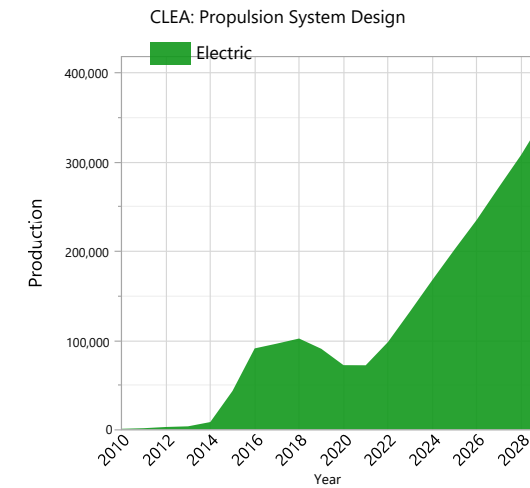
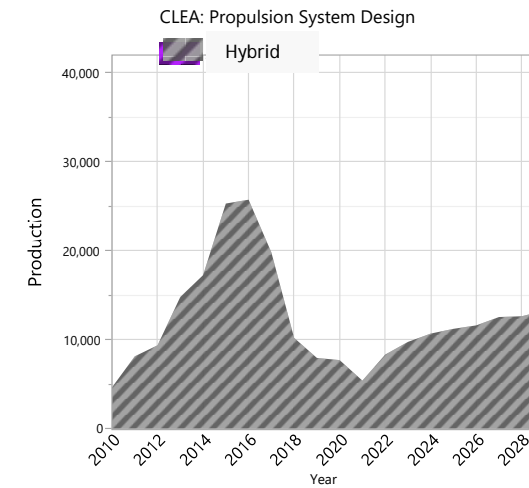
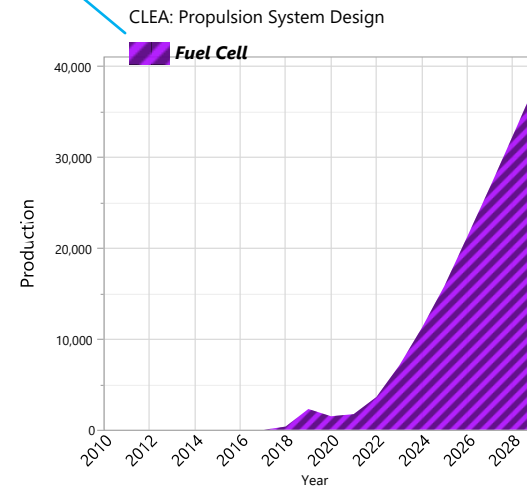
Shift to sustainable mobility:

Production Forecast

Bus and Truck



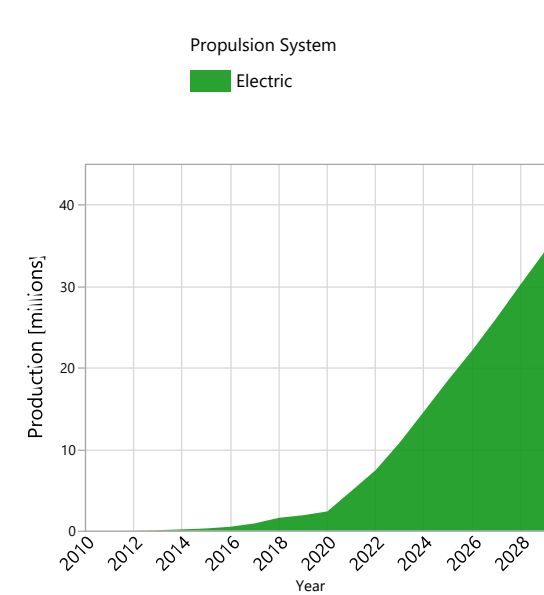
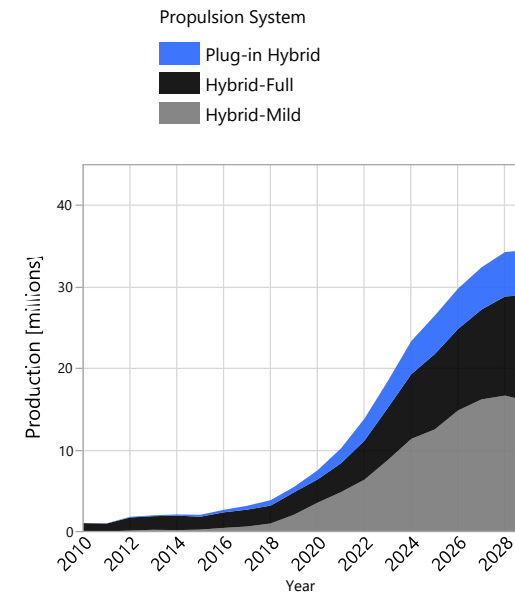
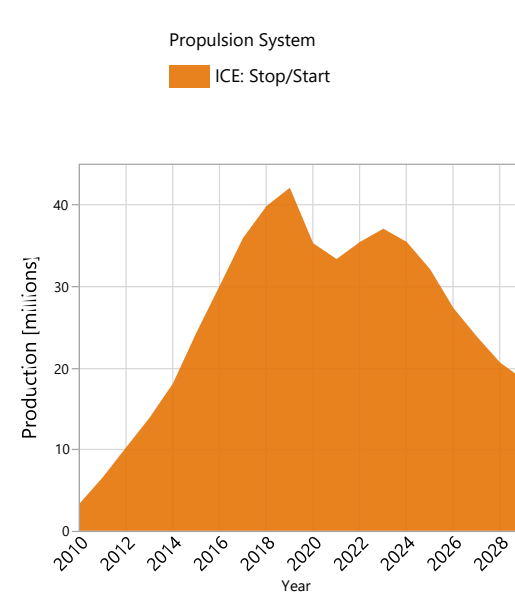
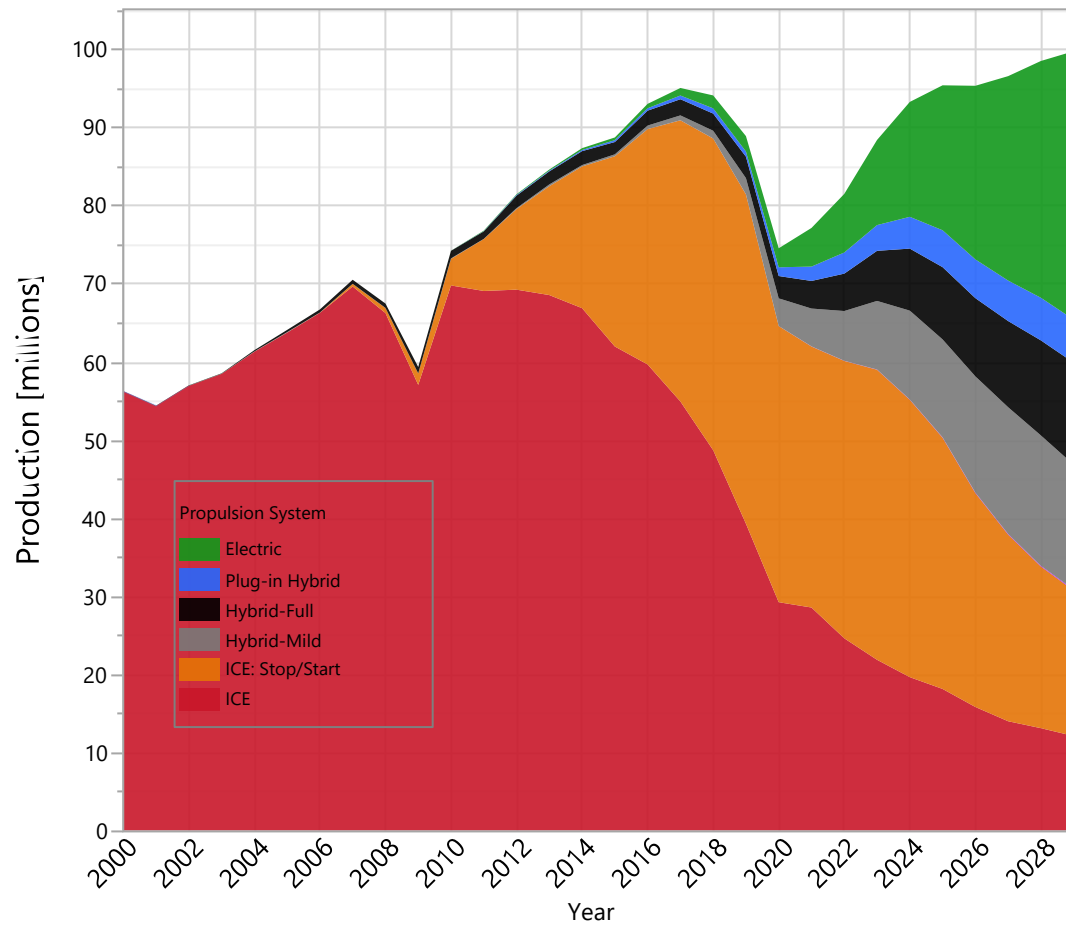
Fuel cell use in HDD transportation is growing quickly but still <1% of production



Shift to sustainable mobility:

Production Forecast

Passenger Car and Light Commercial Vehicle

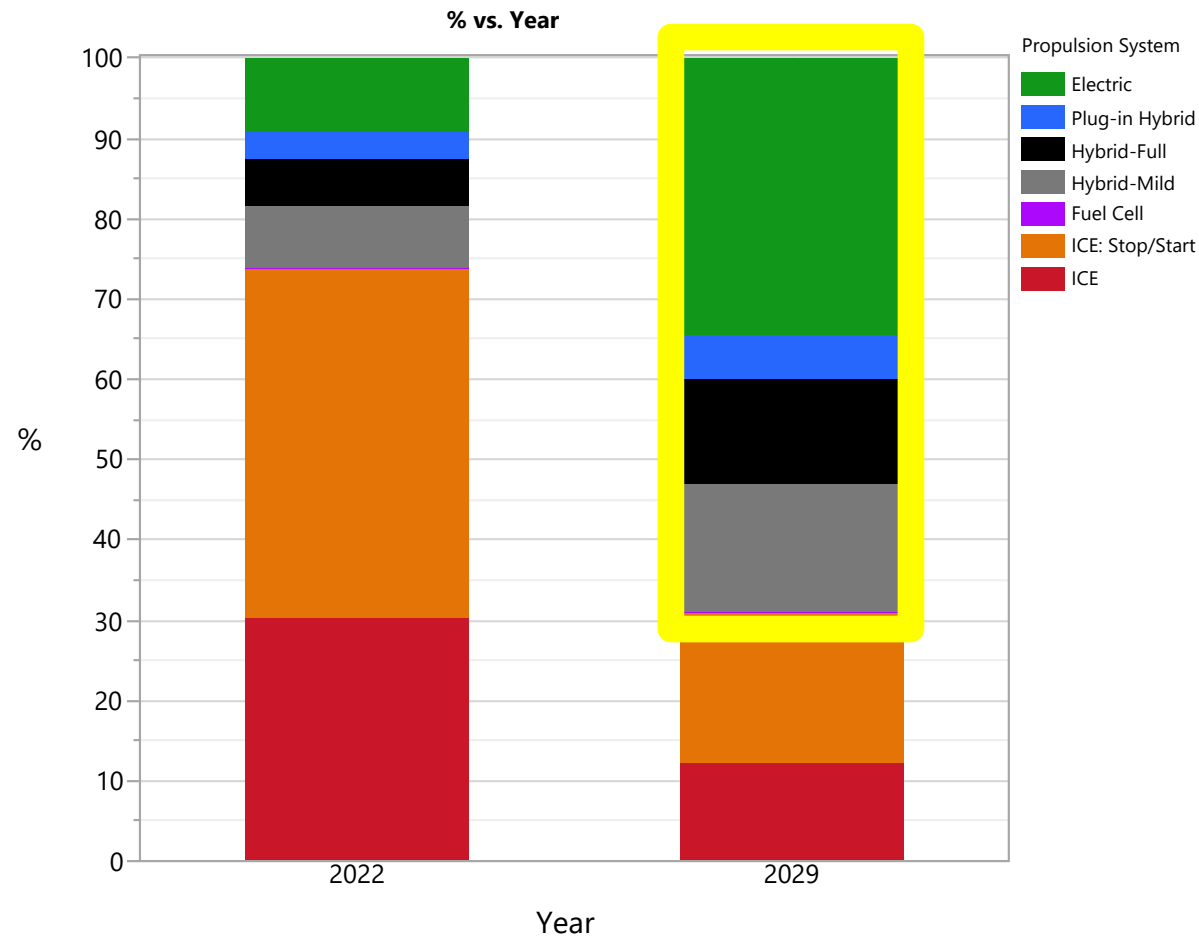


MFP = Mild/Full/Plug-in

Shift to sustainable mobility:

Interim bridging to full BEV via e-ICEs:

Over 250 million e-ICE by 2029

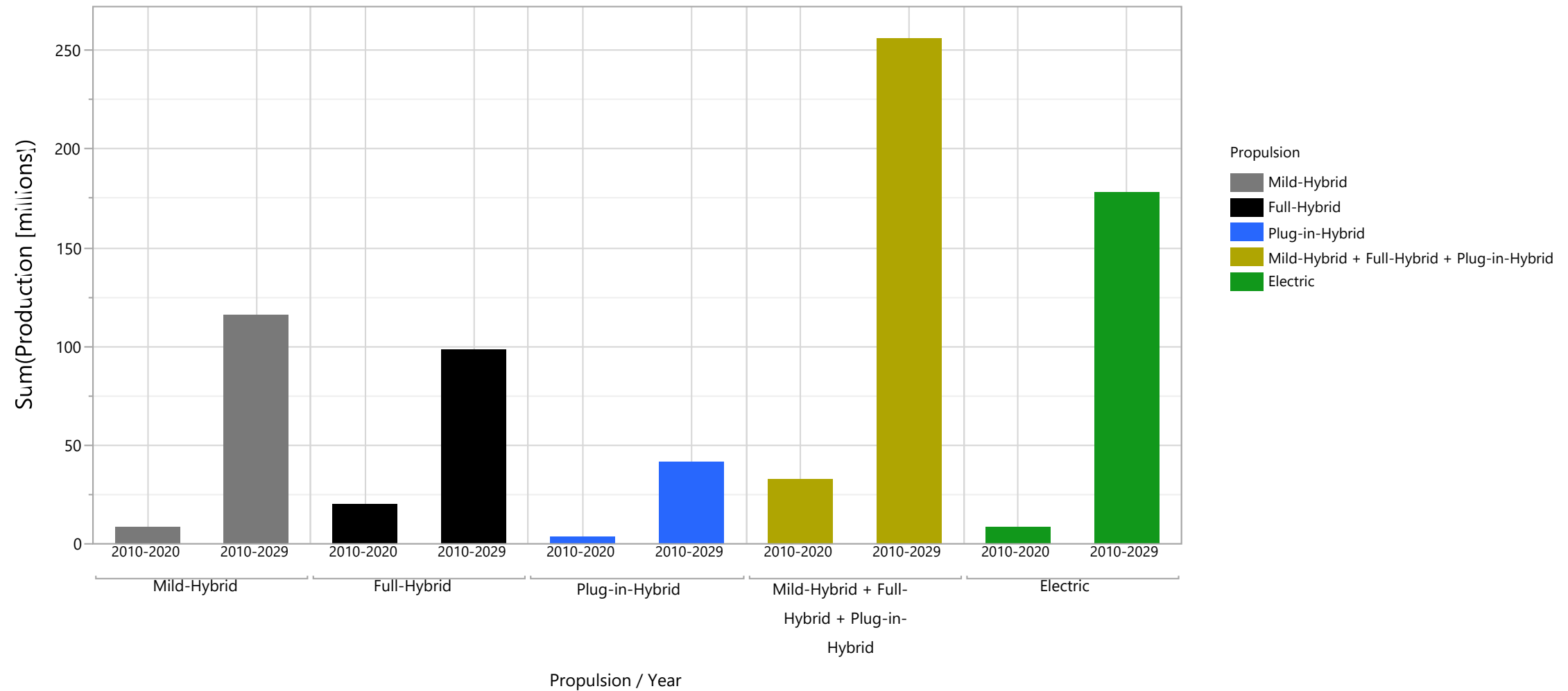


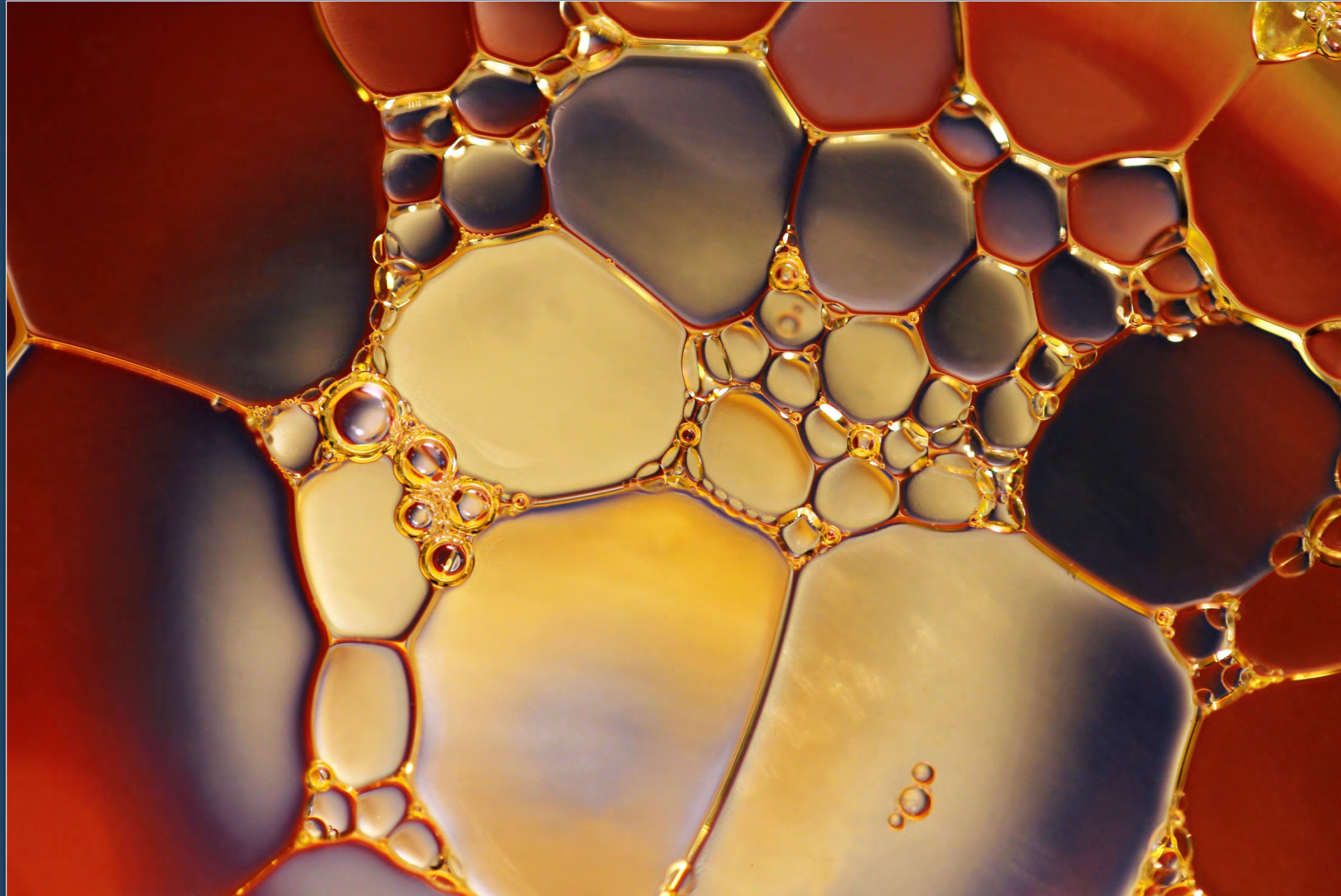
EV and MFP hybrids almost 70% of the worldwide production by 2029.

Shift to sustainable mobility:

Interim bridging to full BEV via e-ICEs:

Over 250 million e-ICE by 2029





Why e-ICEs
need
tailored
lubricants

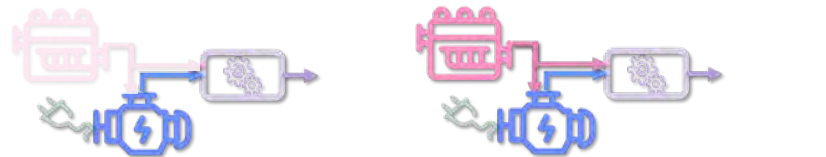
Why e-ICEs need tailored lubricants::

Hybrid Duty Cycles

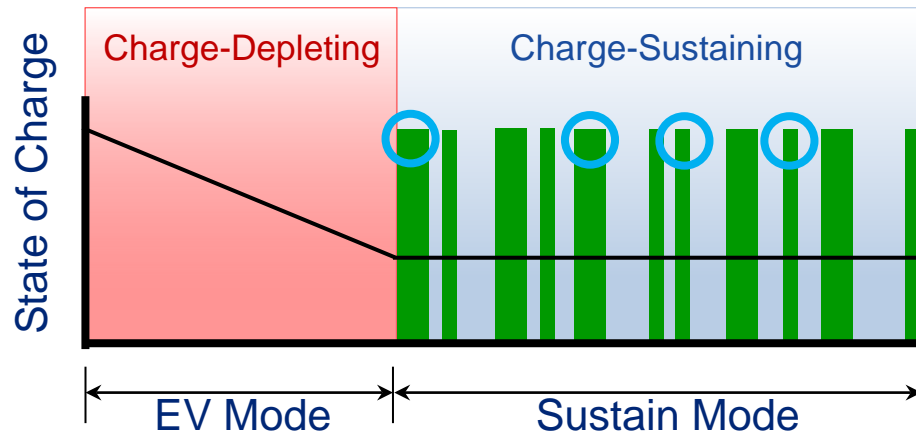
Charge Depleting & Sustaining Modes



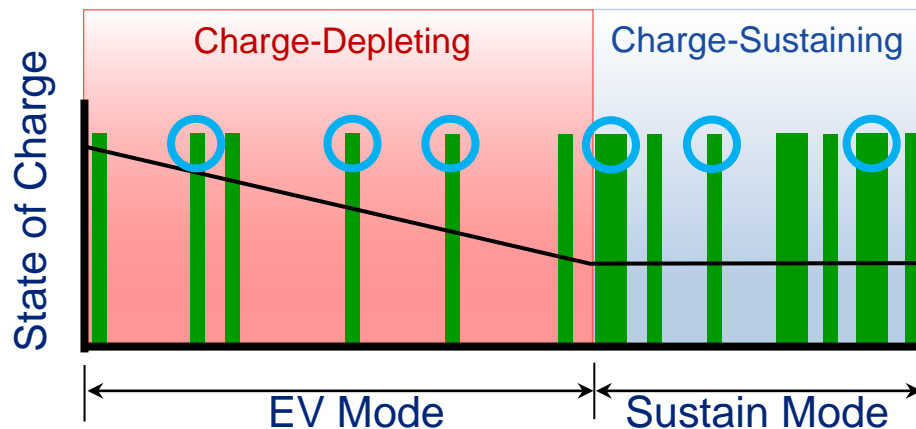
 = engine on



All Electric
(Charge Depleting)



Blended type



- Engine is on for short periods of time
- High Power-Cold Starts (HPCS)
- Different to constant city Stop/Start
- Oil temperature remains low for long periods of time in cold climates

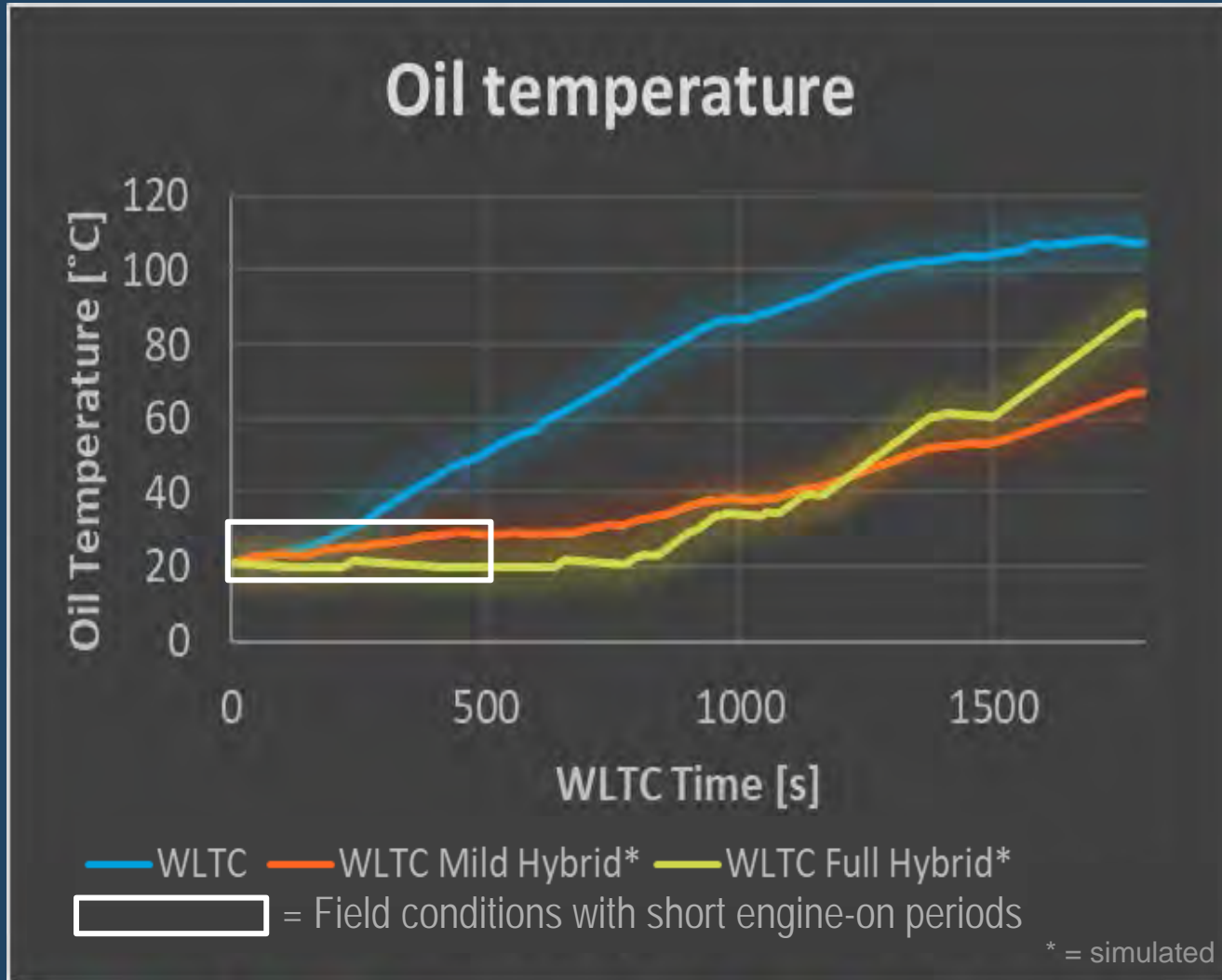
- 1) Water and Fuel Dilution builds-up generating Corrosion, Rust, Emulsion
- 2) Potential for catastrophic parts failure
- 3) High emissions spikes, including small particles < 23 nm

Why e-ICEs need tailored lubricants:

Impact of Water and Fuel Contamination



Water and Fuel Dilution builds-up generating Corrosion, Rust, Emulsion



Photos from SwRI

Why e-ICEs need tailored lubricants:

Impact of Lubricant Contamination and HPCSSs



Potential for catastrophic parts failure



Why e-ICEs need tailored lubricants:

HPCS Generate Unexpectedly High Particulates



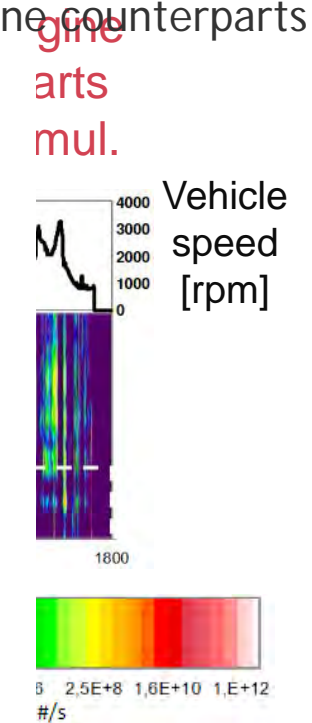
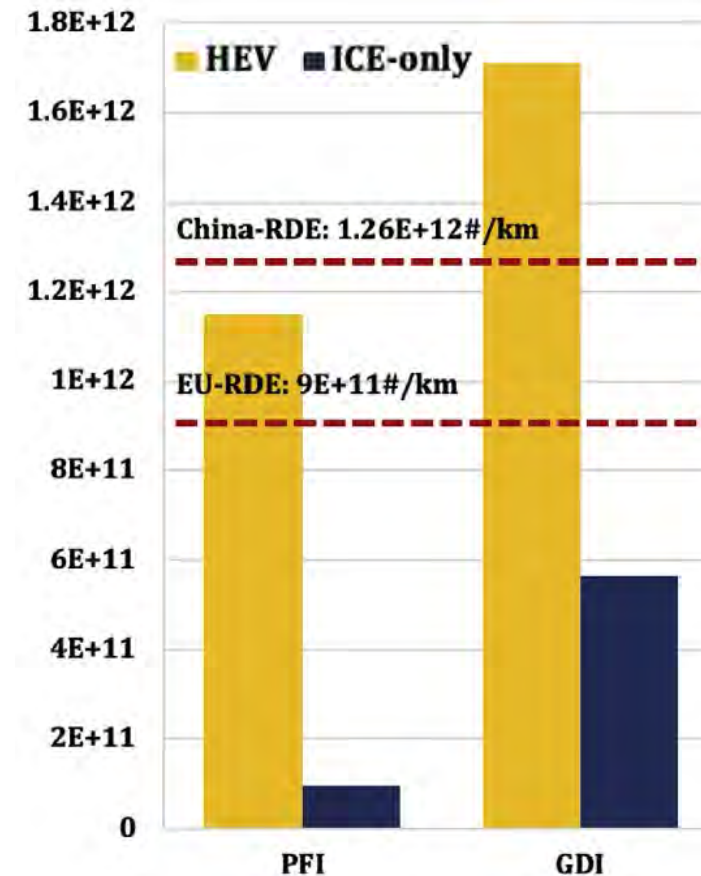
High emissions spikes, with increasing focus on sub 23 nm particles

- Cold start is always the most challenging part of emissions control
- HPCS in cold WLTC generate lots of particulates during 1st 2 phases
 - PFI Hybrid - no GPF
 - GDI without GPF higher emissions
- HPCSs also show particulate spikes in Real Driving Emissions (RDE) tests
- Rising interest in the small particulates with HPCSs

Real Driving PN emissions from hybrid vehicles and their gasoline counterparts

Real Driving PN emissions from hybrid vehicles and their gasoline counterparts

Distance-based PN emissions [# / km]



Summary:

Future Directions



- Hybrid duty cycles present new, emerging challenges to the lubricant
 - Today's hybrids rely on specifications developed for ICE-only duty cycles
 - New test methods needed for hybrid duty cycles
 - New application targets may be needed
- New e-ICE solutions frame future lubrication requirements
 - ICE innovations will continue and be connected to hybrid powertrains
 - Hybrid duty cycles must be addressed by the lubricant
 - Effects of contamination, wear, and emissions highlighted here

For more information: please visit <https://www.infineuminsight.com/en-gb/articles/passenger-cars/a-new-generation-of-lubricants-for-hybrids/>

Performance you can rely on.



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