

Electric vehicles are coming. But how will they be received?

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Agenda

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- 01** Global Efforts to Limit Climate Change
- 02** EV Sales Estimates Aggressive
- 03** Automakers are responding
- 04** EV adoption is complicated
- 05** Uneven global rollout
- 06** Thoughts on the Internal Combustion Engine
- 07** The Future of Engine Oil Lubricants

01 Global efforts to limit climate change

Recommendations from 27th COP in 2022

Implementation is expensive and complicated

Limit global
temperature rise to

1.5°C

Strengthen actions
globally

**Cut GHG &
Adapt**

Boost support to
developing countries
for

**Finance,
technology
capacity**

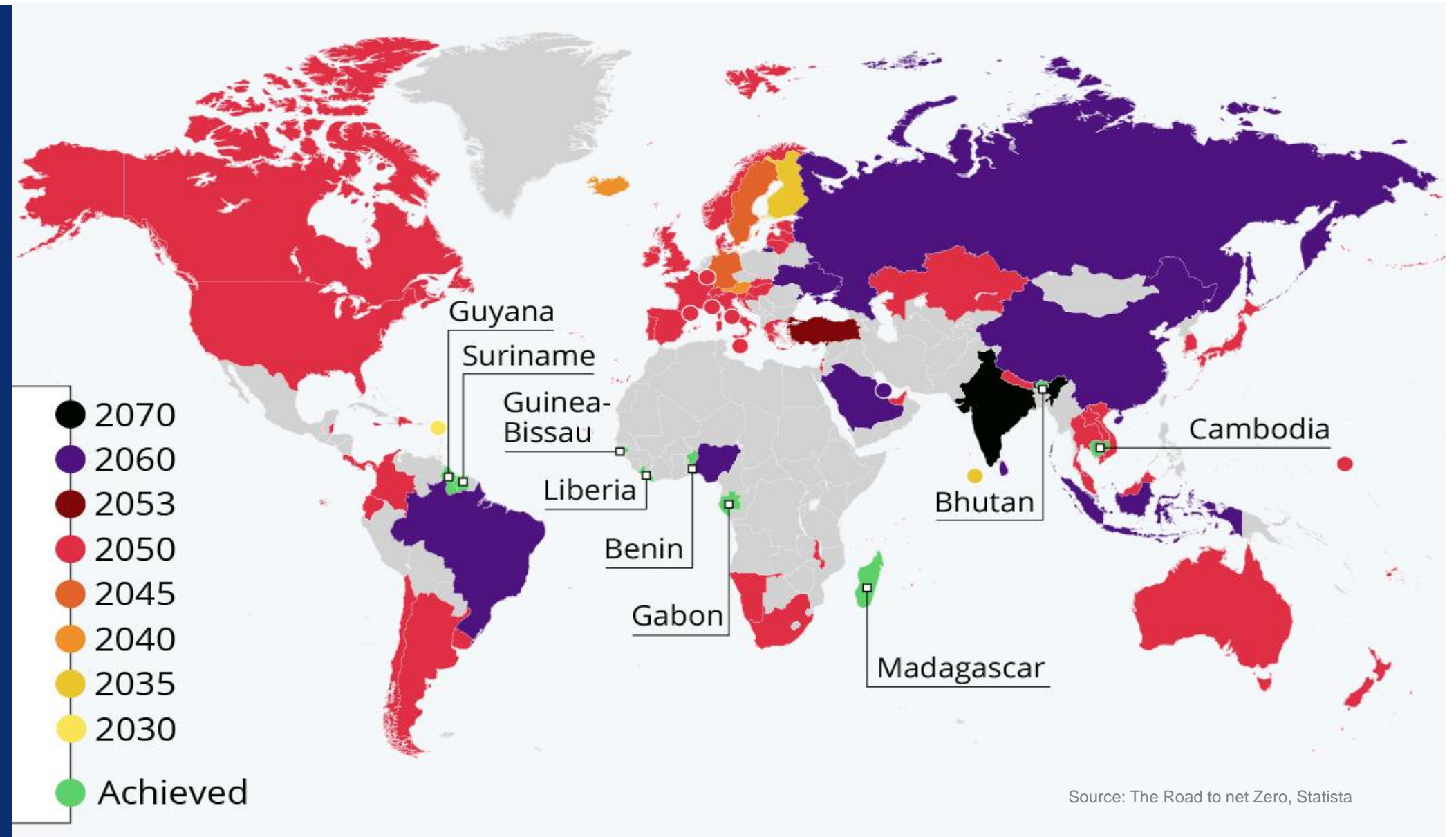
To vulnerable
countries hit hard by
climate disasters

**Provide loss
and damage
funding**

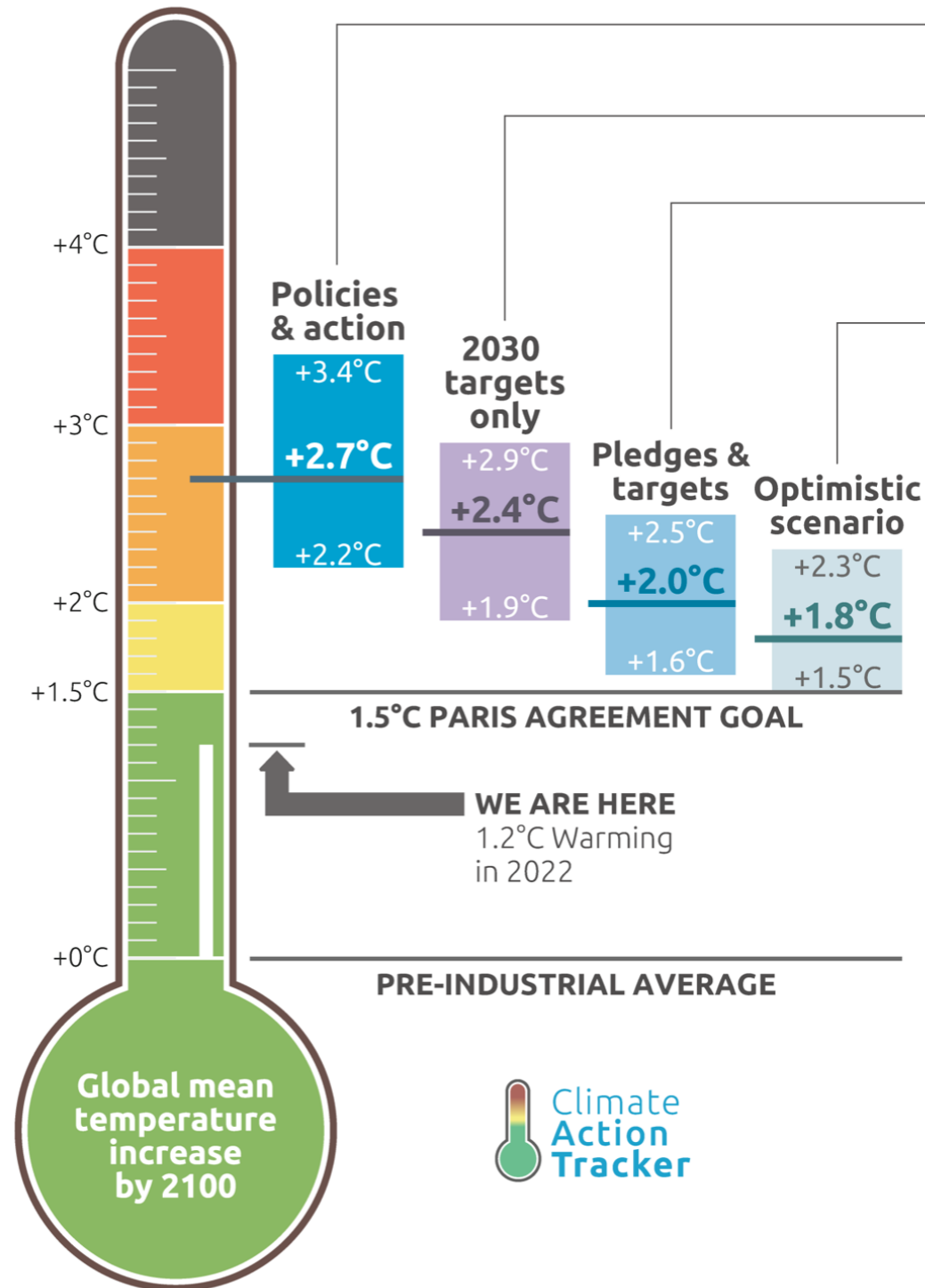
27th Conference of the Parties to the United Nations Framework Convention on Climate Change

Global Aspirations

Countries with laws, policy documents or timed pledges for carbon neutrality by target year



Estimations of Global Mean Temperature 2100



Policies & action

Real world action based on current policies †

2030 targets only

Based on 2030 NDC targets* †

Pledges & targets

Based on 2030 NDC targets* and submitted and binding long-term targets

Optimistic scenario

Best case scenario and assumes full implementation of all **announced** targets including net zero targets, LTSs and NDCs*

† Temperatures continue to rise after 2100

* If 2030 NDC targets are weaker than projected emissions levels under policies & action, we use levels from policy & action

CAT warming projections Global temperature increase by 2100

November 2022 Update

Our Energy transition strategy

Advance a lower carbon future

Lower carbon intensity of our operations

Target

35% carbon reduction in Upstream by 2028

Maintain

1st quartile performance in oil and gas GHG intensity

Focus

on methane, flaring and energy management

Aim

2050 net zero aspiration* for upstream
Scope 1 & 2 emissions

Grow lower carbon businesses



Renewable fuels
& products



Hydrogen**



Carbon capture,
utilization & storage



Offsets & emerging lower
carbon opportunities

Chevron expects to triple our lower carbon capital versus prior guidance to over \$10 billion between now and 2028:
\$2B in carbon reduction projects and \$8B in low carbon investments

* Upstream emission intensity Scope 1 and 2 in kgCO₂e/BOE. Achieving the Upstream 2050 net zero aspiration will require continued partnership and progress in technology, policy, regulations, and offset markets.

**Chevron's approach to hydrogen envisions the use of green, blue, and gray hydrogen. See Climate Change Resilience Report page 51 to learn more.

Change is possible

A personal experience

1965

Maclean's magazine called Lake Erie "an odorous, slime-covered graveyard" that "may have already passed the point of no return."

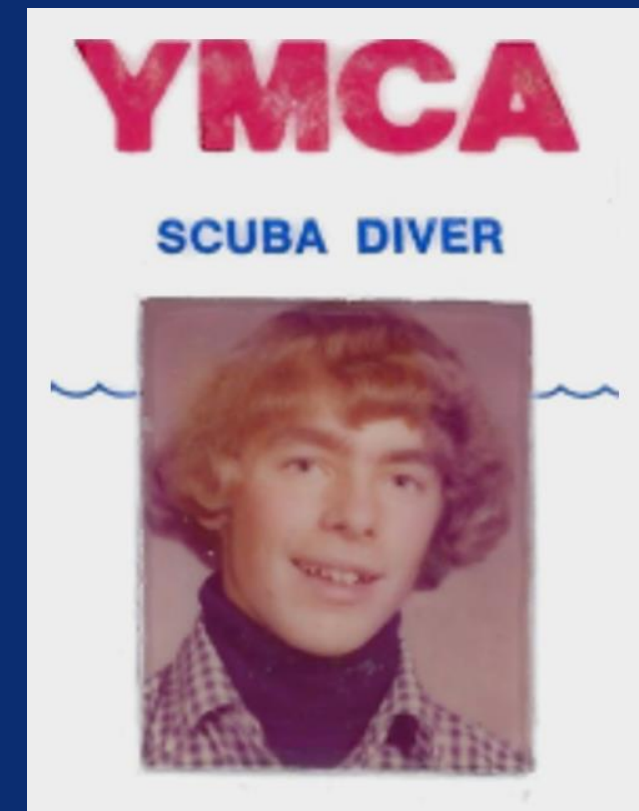


1972

Canada & US signed the Great Lakes Water Quality Agreement
Major improvements

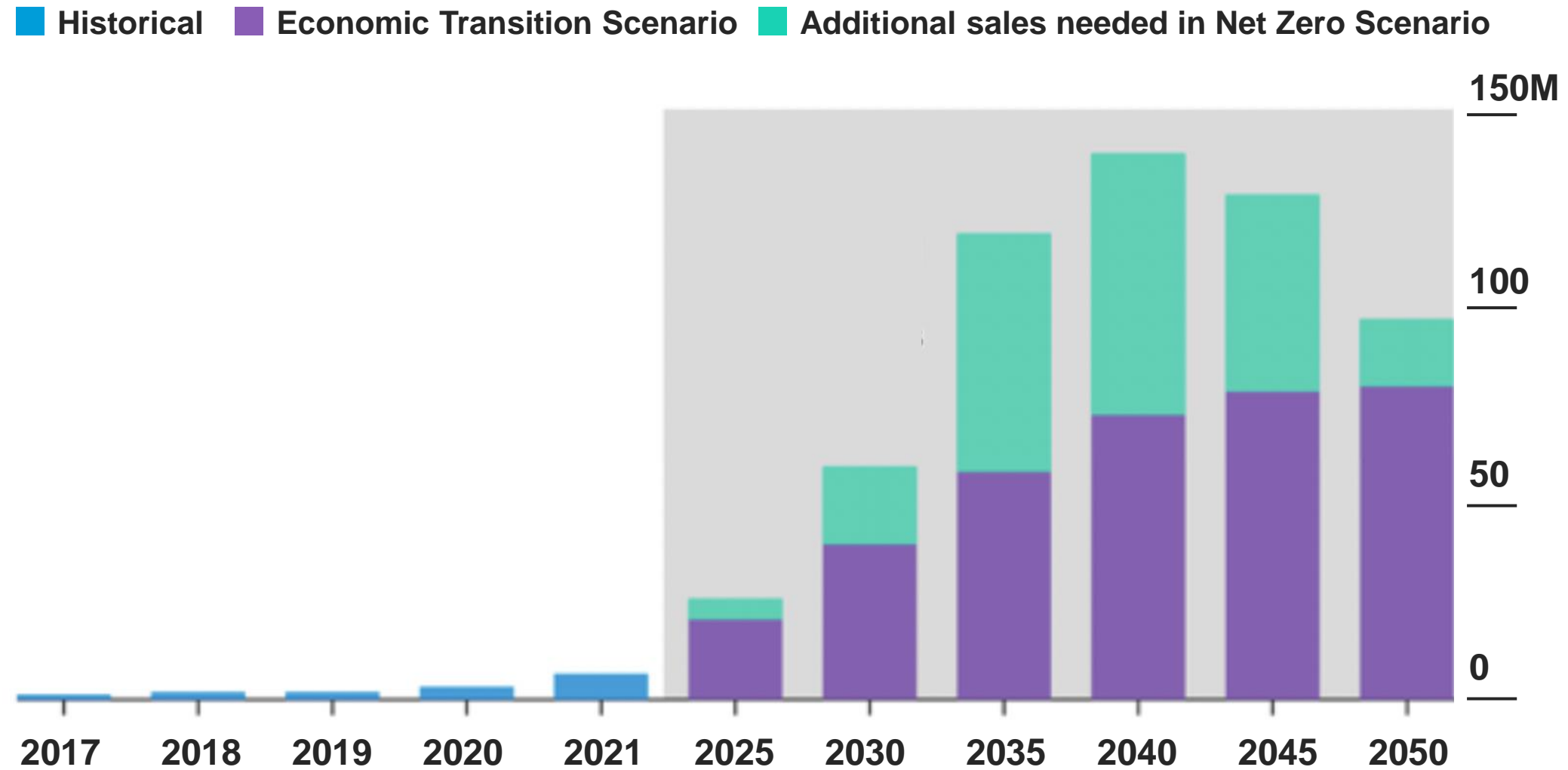


1977



02 Electric vehicle sales estimates are aggressive

Significant ramp up in passenger EV sales needed to meet zero tailpipe emissions

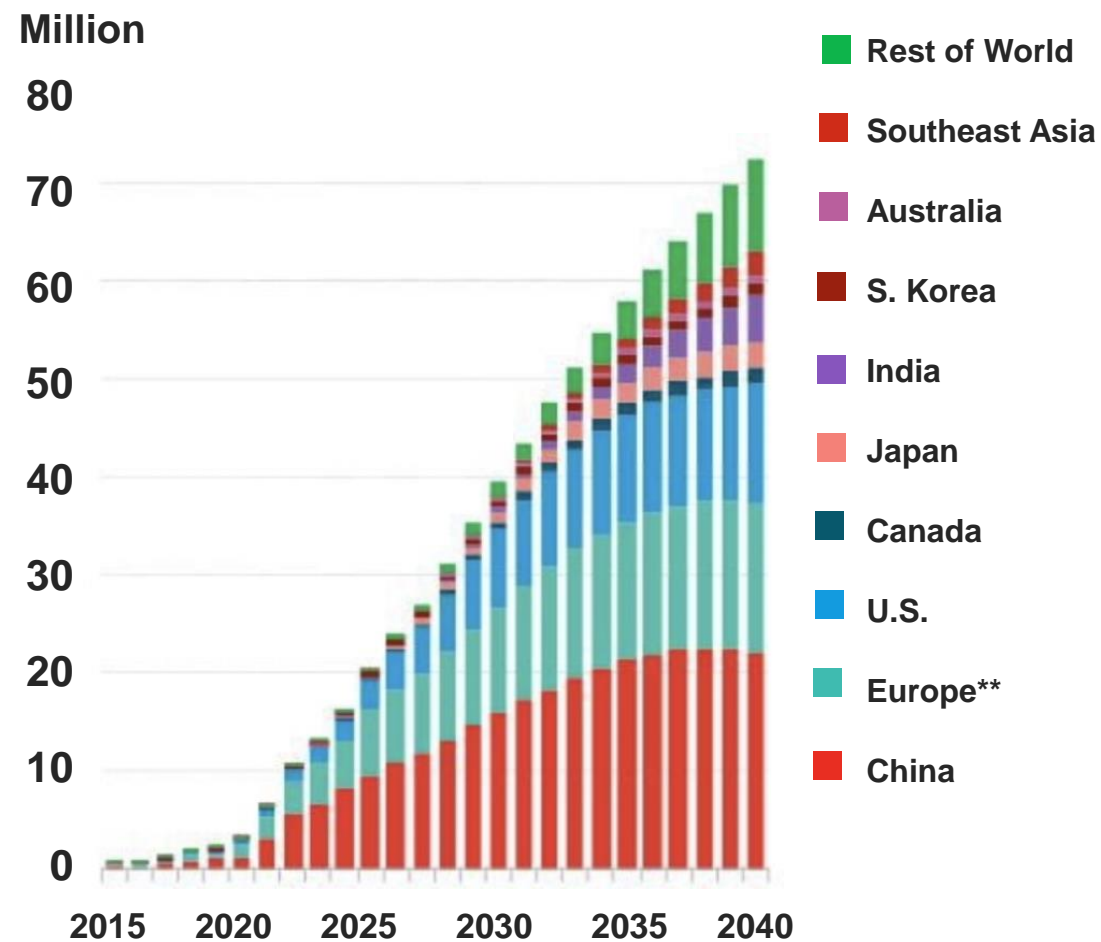


Source: BloombergNEF

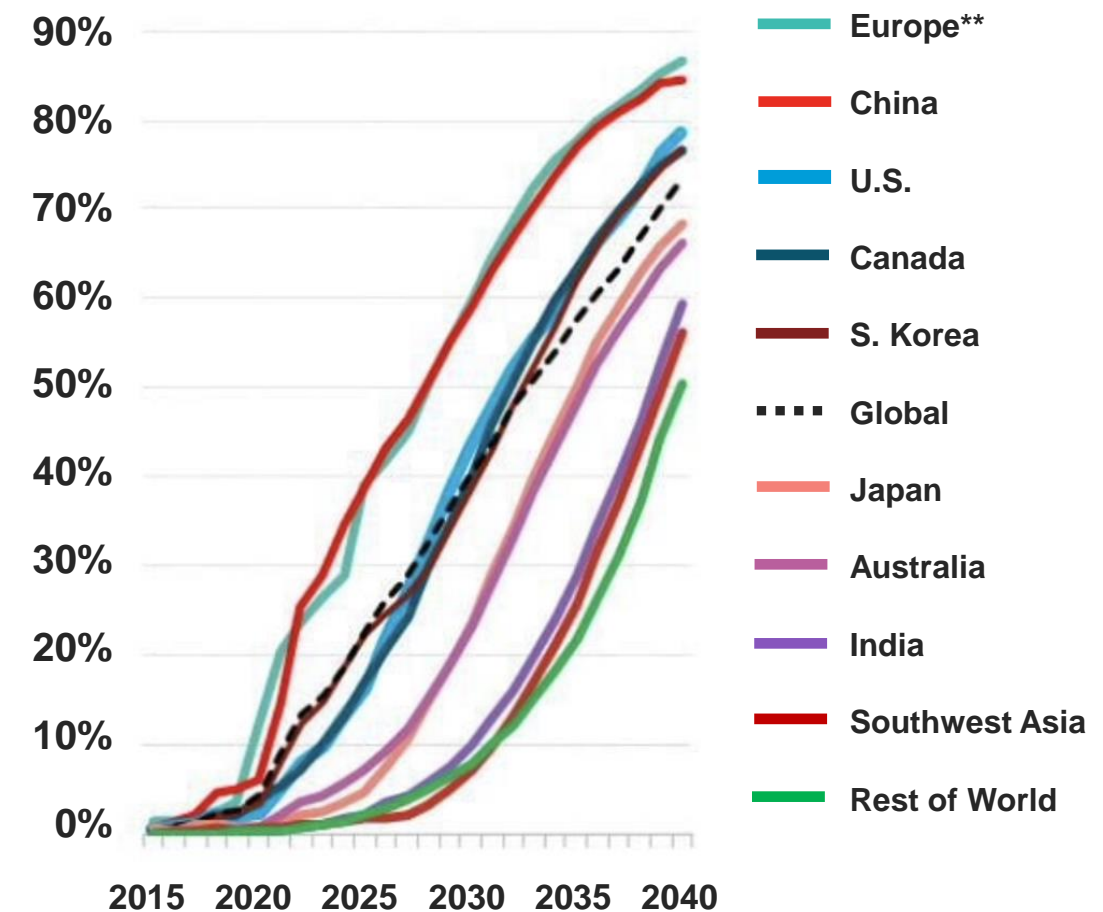


Forecast New EV sales 50%-90% of all 2040 Light Vehicle sales

Global long-term passenger EV* sales by market- Economic Transition



Global long-term EV* share of new passenger vehicle sales by market - Economic Transition



*EV includes BEVs and PHEVs

**Europe includes the EU, UK and EFTA countries

Source: BloombergNEF



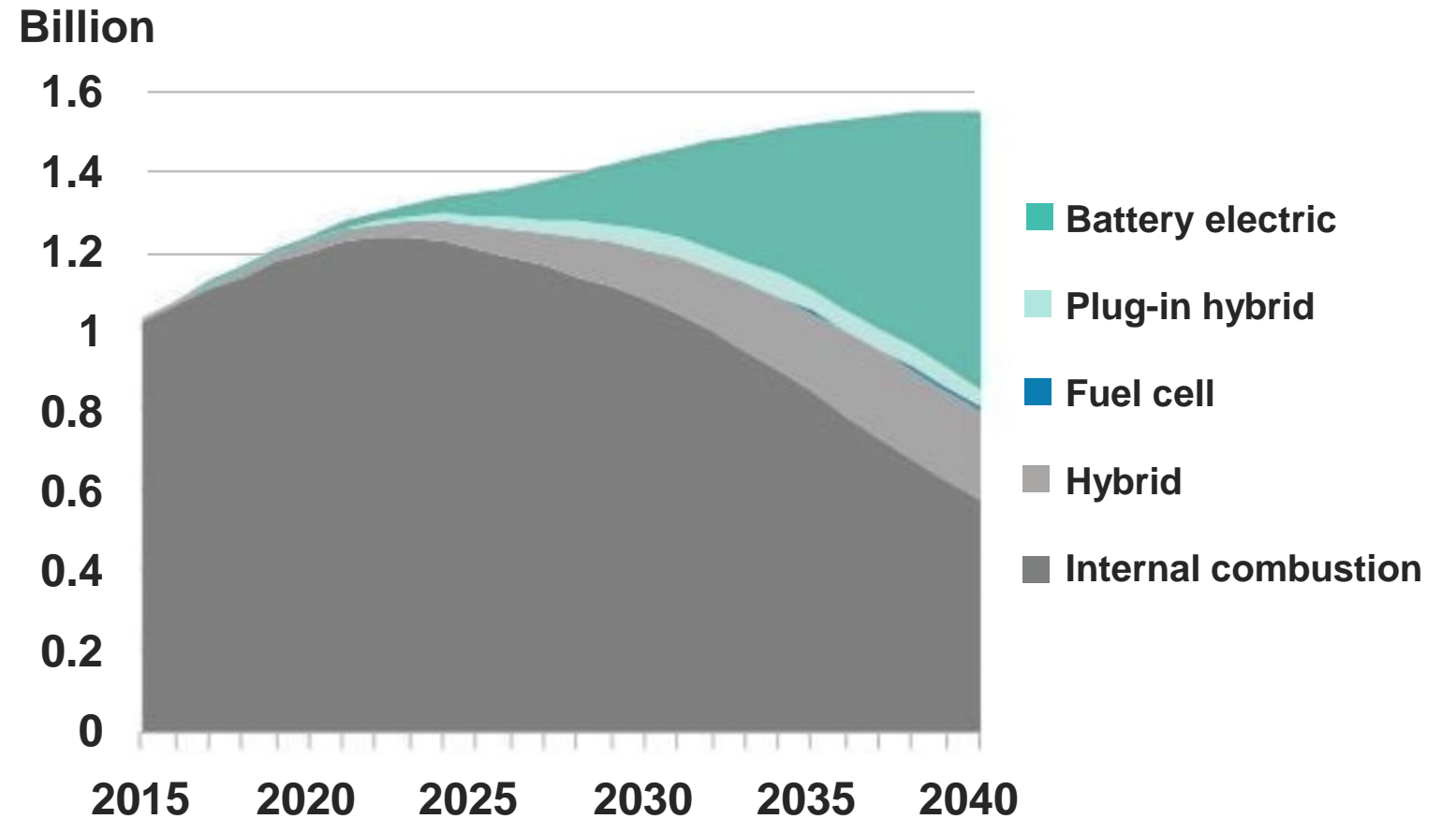
New sales don't account for the existing, largely ICE, car park

2040

>50%
Of vehicles require OEM
approved engine oils

nearly 1 billion
vehicles









Global passenger vehicle fleet by drivetrain –
Economic transition scenario



Source: BloombergNEF

03 Automakers are responding

2021-2022 OEM announcements on EV plans

EV target	2025/6	2030	2040
	100% New models		
	30 models 1 million BEV NA		Carbon neutrality
	33%	50%	
	20%		
		100%	
		70% EU 50% China & US	100% ZEVs
		50%	
		3.5 Million 30 BEV model	

Source: Electric Vehicles – Analysis - IEA

Auto Manufacturers are redeploying assets

Investments

EV engineers, plants & partnerships

\$1.2 trillion
through 2030

By 37 of the
world's top automakers

Reuter's

Battery partnerships

Key component of EVs

Supply reliability critical

Layoffs & buyouts

“Automakers’ Shift to Electric Vehicles Puts Union Jobs on line”

Bloomberg Law 5/27/21

“...the cost of electrification cannot be passed on to the customer”

Stellantis Chief Operating Officer
Mark Stewart

04 Reality for EV adoption is complicated

2023 Ram Superbowl Commercial



Technical challenges

Consumer concerns

- Range anxiety
- Recharge time
- Charger availability
- Disaster reliability
- Purchase price

Resource issues

- Mining
- Friend-shoring supply lines

Grid decarbonization

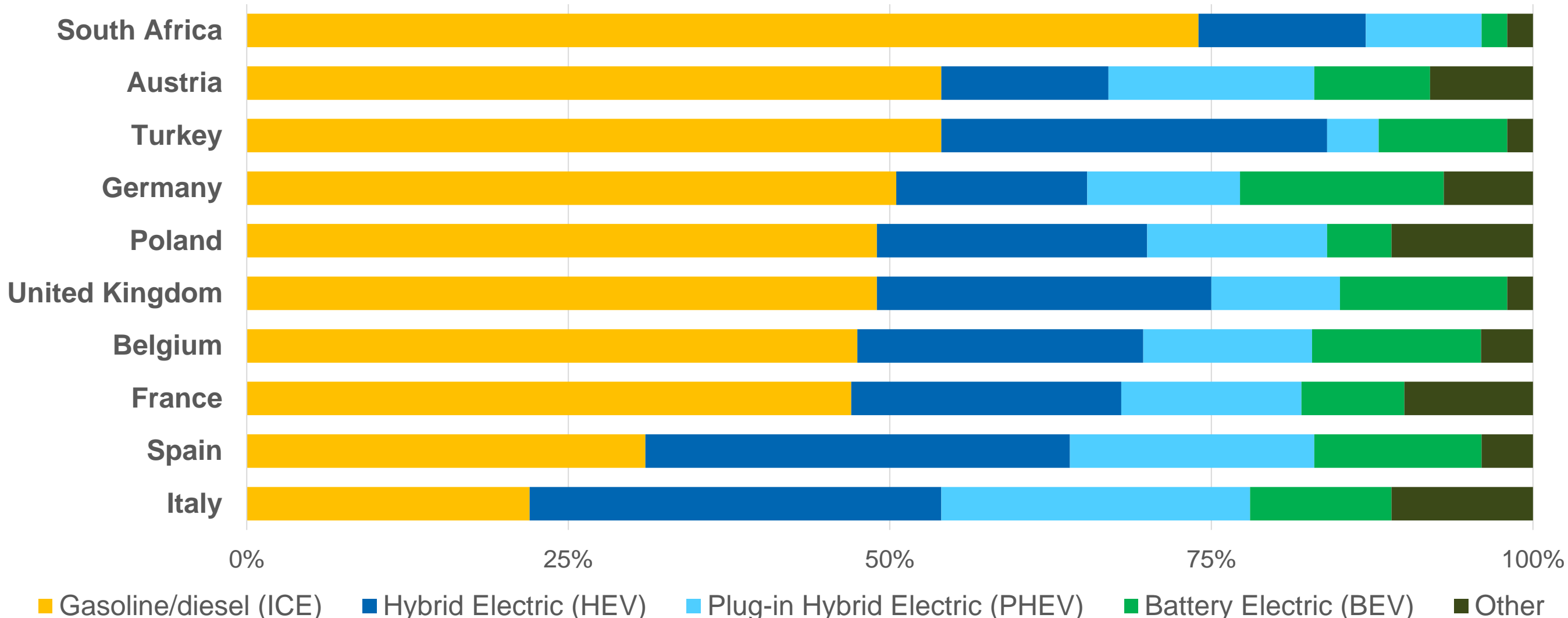
- Permitting delays
- Reliability concerns

Every new idea looks the best on the first day I see it. — Rich Robbins, VP Lubrizol



In most countries, ICEs dominate demand Hybrid technology is more popular than BEVs

Engine preference in next vehicle



Progress on Charging ... but ...?

According to the SMMT
(Society of Motor Manufacturers)
UK would require
300,000 - 720,000
charging points by 2030.

Meeting 300,00

> 100

new chargers added daily

current rate is

~23 each day.

EV charging infrastructure

(units)

China

1,400,000

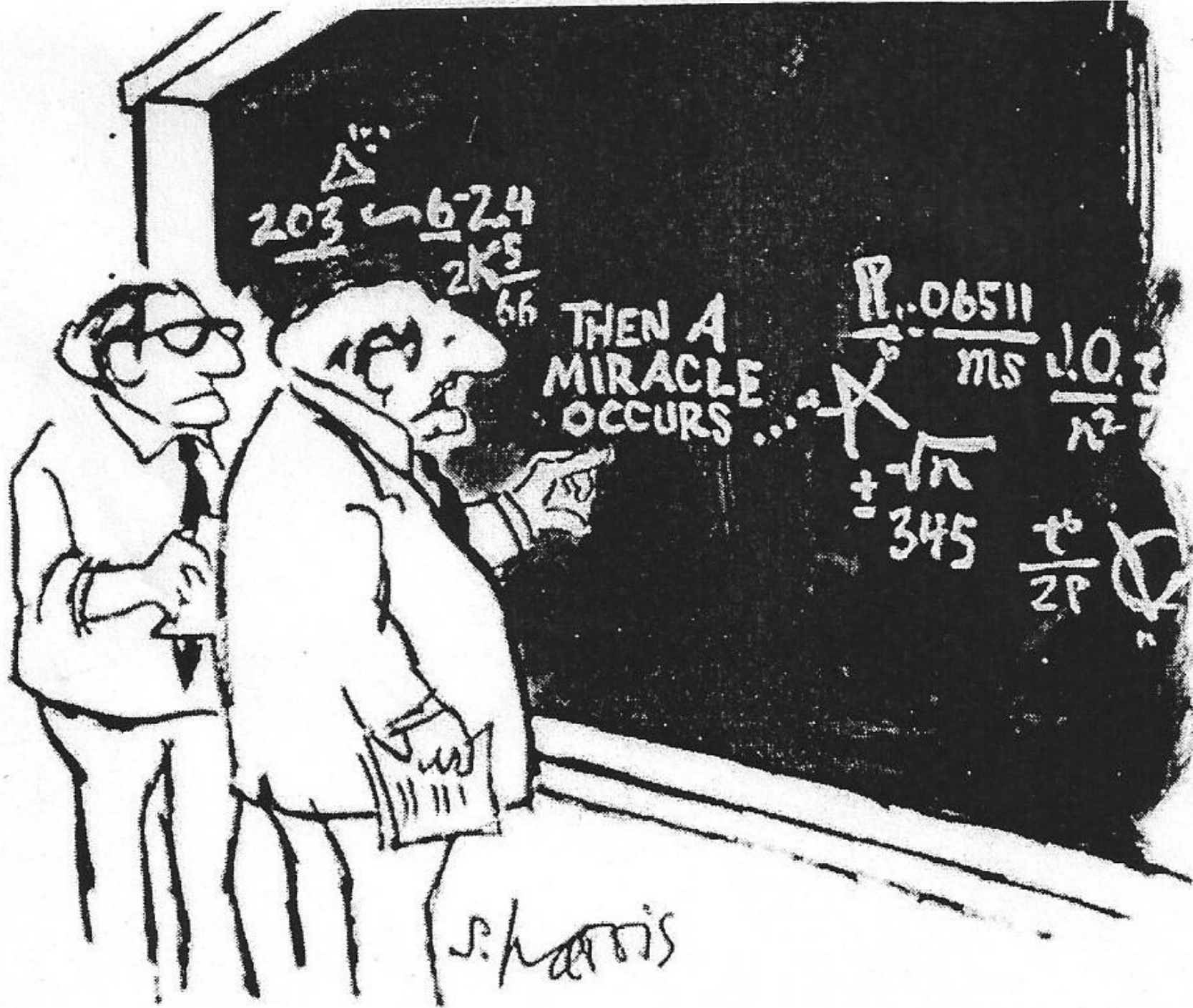
Europe

400,000

US

140,000

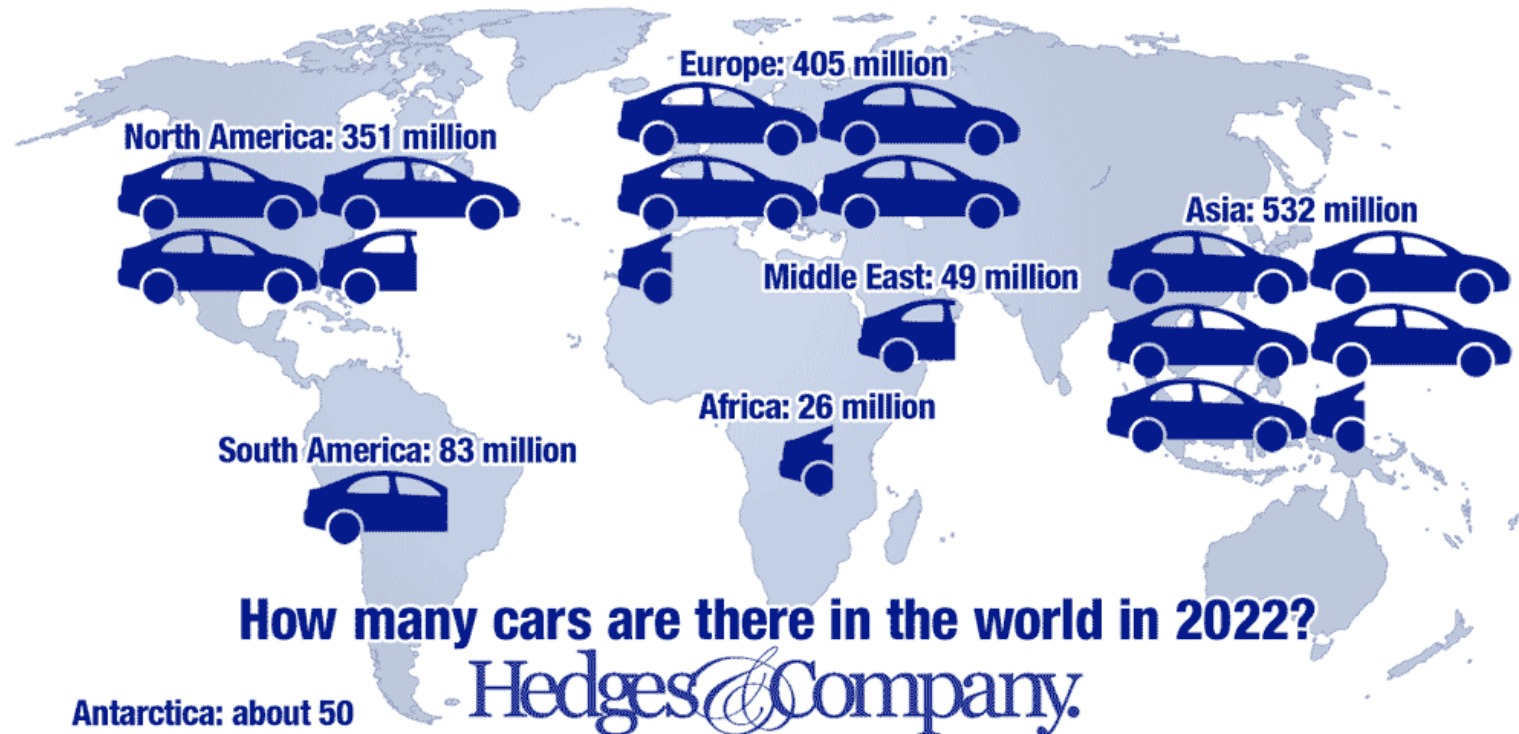
Source: S&P Global Commodity Insights



"I think you should be more explicit here in step two."

05 Uneven global rollout

Global light vehicle transportation is very unevenly distributed



- North America: 710** vehicles per thousand people
- Europe: 520** vehicles per thousand people
- South America: 220** vehicles per thousand people
- Middle East: 180** vehicles per thousand people
- Asia/Pacific: 140** vehicles per thousand people
- Africa: 50** vehicles per thousand people
- Antarctica: 50** vehicles per thousand people

How will this change by 2050?

OECD vs Non-OECD political climate challenges



OECD
(16.68% of global population)

- Cut greenhouse gas emissions
- Maintain reliable services
- Maintain living standards

Non-OECD

- Don't grow greenhouse gas emissions
- Create reliable services
- Dramatically raise living standards
- Reliable electricity
- Transportation
- Food security

Politicians Facing Unhappy Voters Have Waivered

**French Yellow-vest
protest started over fuel taxes**

**President Biden tapped the
Strategic Petroleum Reserve for
8 months prior to 2022 elections**

**Germany refused EU efforts to
ban all ICE by 2035 → e-fuel
waiver**

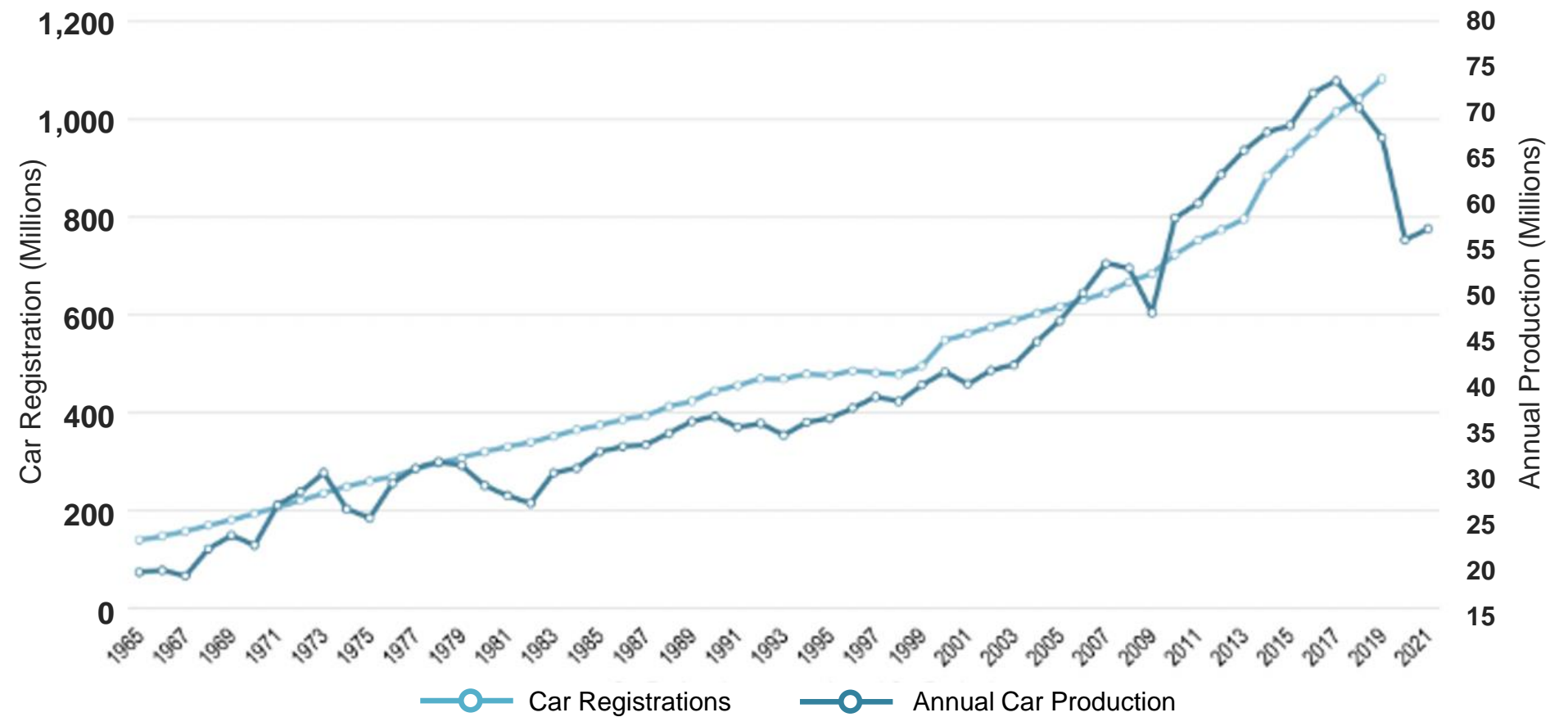


06 Has the ICE been prematurely buried?

There are more than a billion automobiles in the world

All but a tiny fraction have Internal Combustion Engines

World Automobile Production & Fleet 1965-2021



Every vehicle
needs qualified engine oils meeting OEM specifications

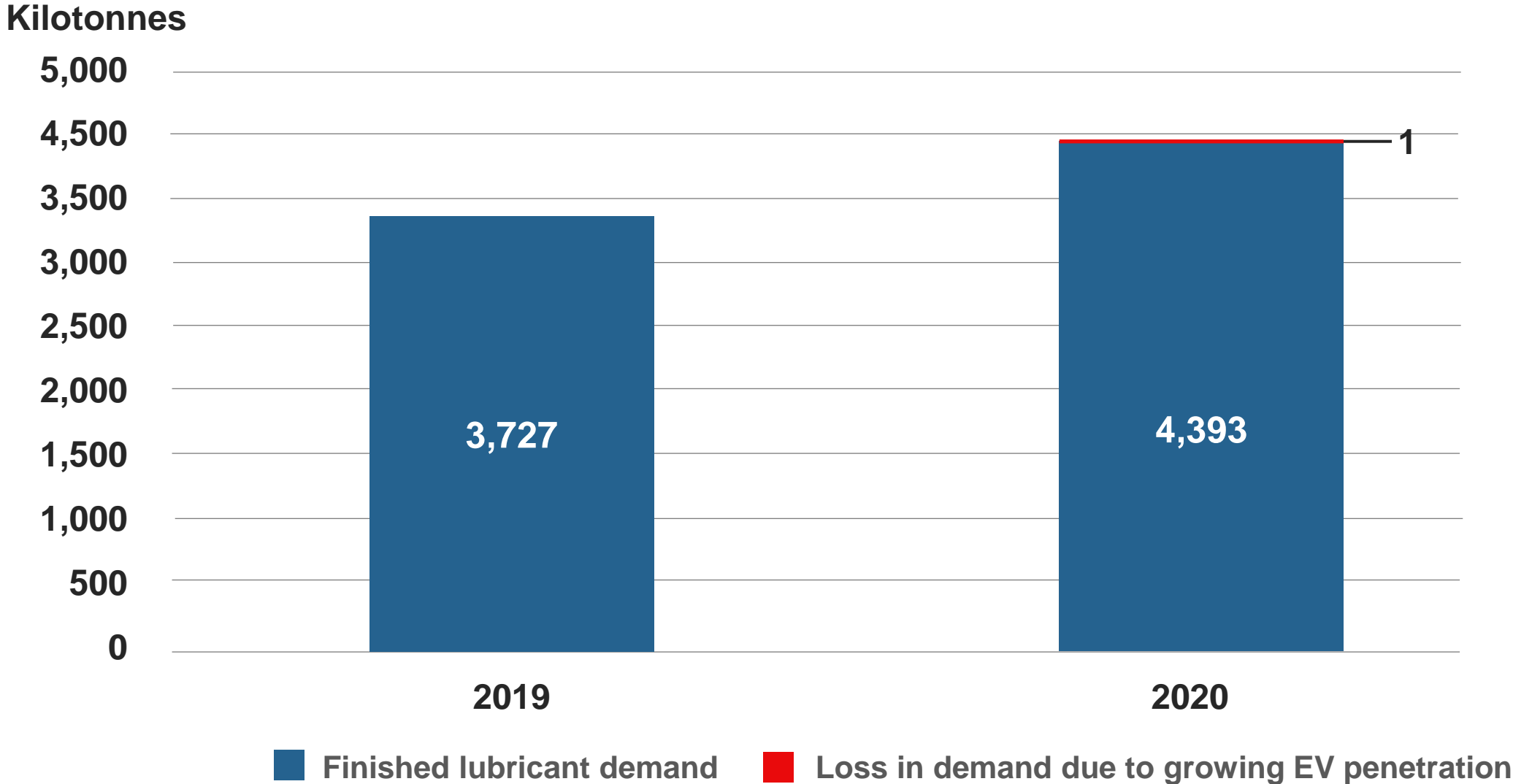
Almost all of those require Group II or Group III Base Oils

Source: World Automobile Production and Fleet, 1965-2021
The Geography of Transport Systems (transportgeography.org)

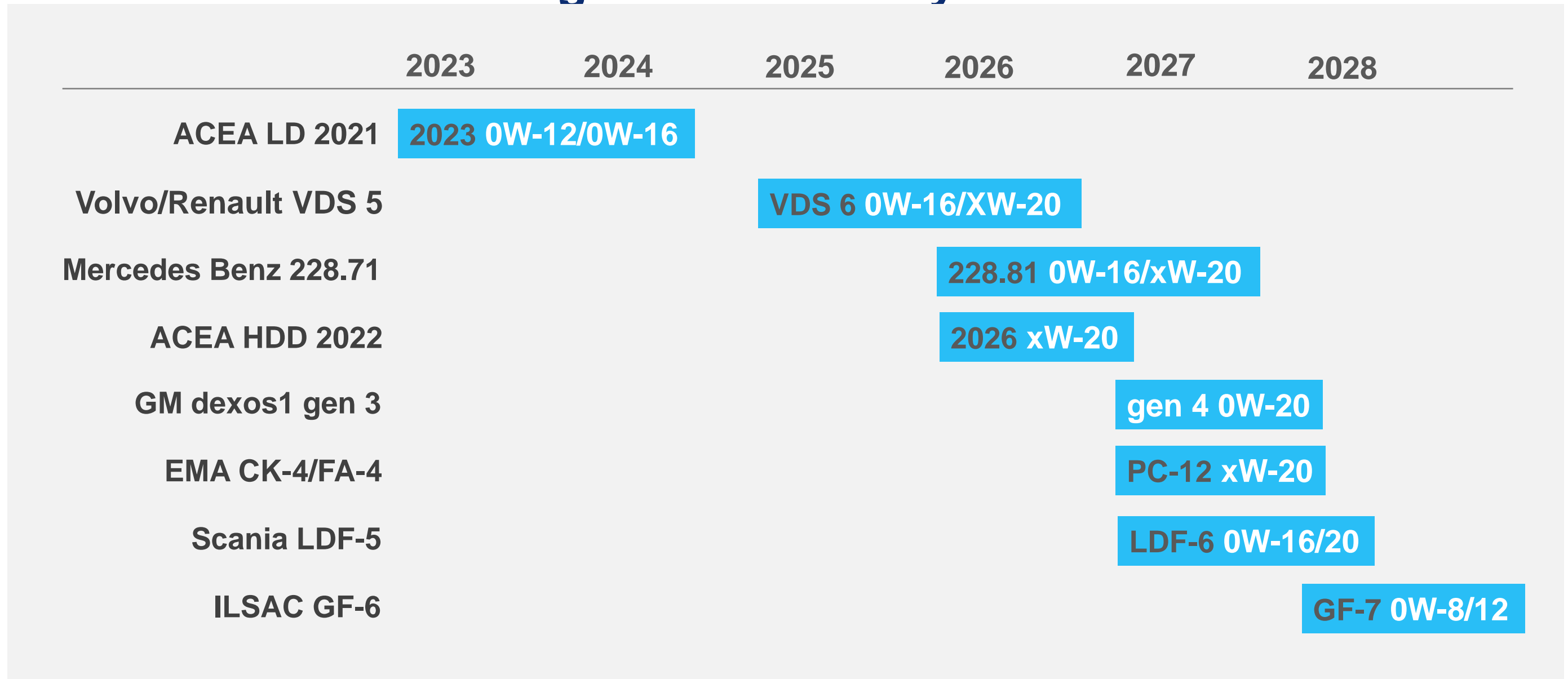


In South America Kline projects negligible impact from EVs

Impact on finished-lubricant demand in South America due to growing electric vehicle penetration, 2019 to 2029



New engine oil development is continuing & moving to low viscosity lubricants



07 Automobile & HDD engine oils will be around for decades

Chevron Group II & III base oils

Broader portfolio = reduced complexity

Meet tightening specifications and sustainability aspirations by:

Optimizing formulations across product lines

Capitalizing on large and growing qualifications

Optimizing blending for increasingly stringent specifications

Base oil path to reduced carbon with NEXBASE 4+



















Chevron base oils can be used in

>98%

of all lubricant applications

Global availability enables global formulations

Chevron Global Slate

	Richmond	Yeosu	Pascagoula	Porvoo	Sitra
Group II/II+	NEXBASE® 3030				
	100R				
	150R				
	220R				
	600R				
NEXBASE® Group III	NEXBASE® 3020				
	NEXBASE® 3043	 NEW			
	NEXBASE® 3050				
	NEXBASE® 3060				
	NEXBASE® 3080				

Summary

Limiting climate change is important

Chevron is pledged to reach Net Zero Emissions for Phase 1 & 2 by 2050

OEMs taking action

- New models
- Huge investments
- Major workforce changes
- Enormous risk

Consumer acceptance and political commitment are unclear

Global EV adoption

Will move at different rates between countries and within countries

Internal Combustion Engines will be moving us for decades

Chevron's combined Group II & III base oil slates with broad approvals & reliable supply support >98% of blending needs