From Model T to Tesla: A Fireside Chat on Automotive Innovation

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Carl Benz

Early Internal Combustion Engine (ICE) vehicle:
Benz Patent Motor Car

1886

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Early Electric Vehicle (EV):
Flocken Elektrowagen

1888

Andreas Flocken
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Major Events in Automotive History

1900

40% of American automobiles powered by steam, 38% by electricity, and 22% by gasoline

1920s

Internal Combustion Engine (ICE) propulsion with lead acid starter batteries dominates the automotive market

1997

Toyota releases the Prius, the first mass produced hybrid vehicle

2008

Tesla launches the Roadster, the first production EV sports car

2024

EVs and hybrids make up >20% of new cars sold in the US

Key early EV Innovations

Curved magnets replaced straight magnets to boost energy generation capability

Mass producible lead acid battery design decreased cost and increased power

Electricity became readily available in cities to power lighting and factories

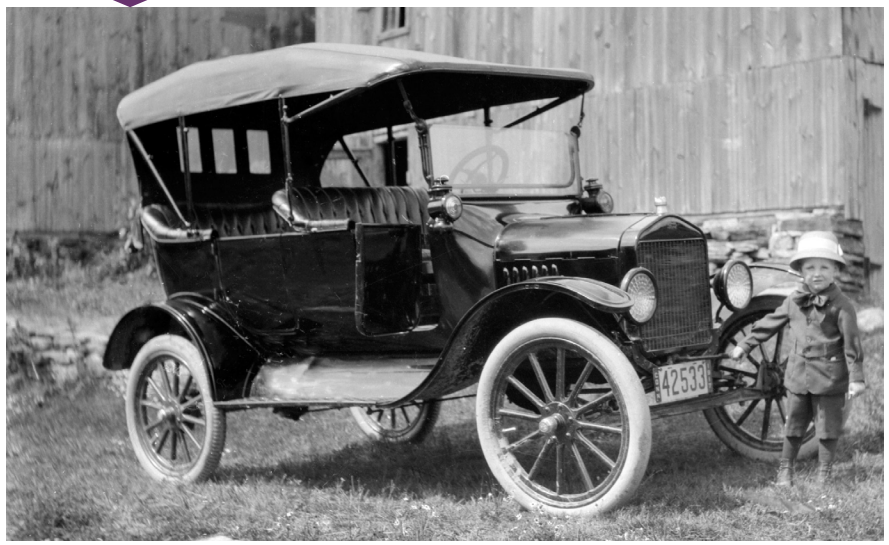
Key early ICE Innovations

Electric starter + lead acid battery made starting engines relatively safe

Ford assembly line decreased vehicle cost

Gasoline became widely available via the discovery of crude oil in Texas and a national network of gas stations

Baker Motor Vehicle Company EV



Ford Model T

Lead Acid

Lead acid batteries started cars for the next 70 years

Other markets drove new battery chemistry development, setting the stage for modern EVs

First Generation Toyota Prius

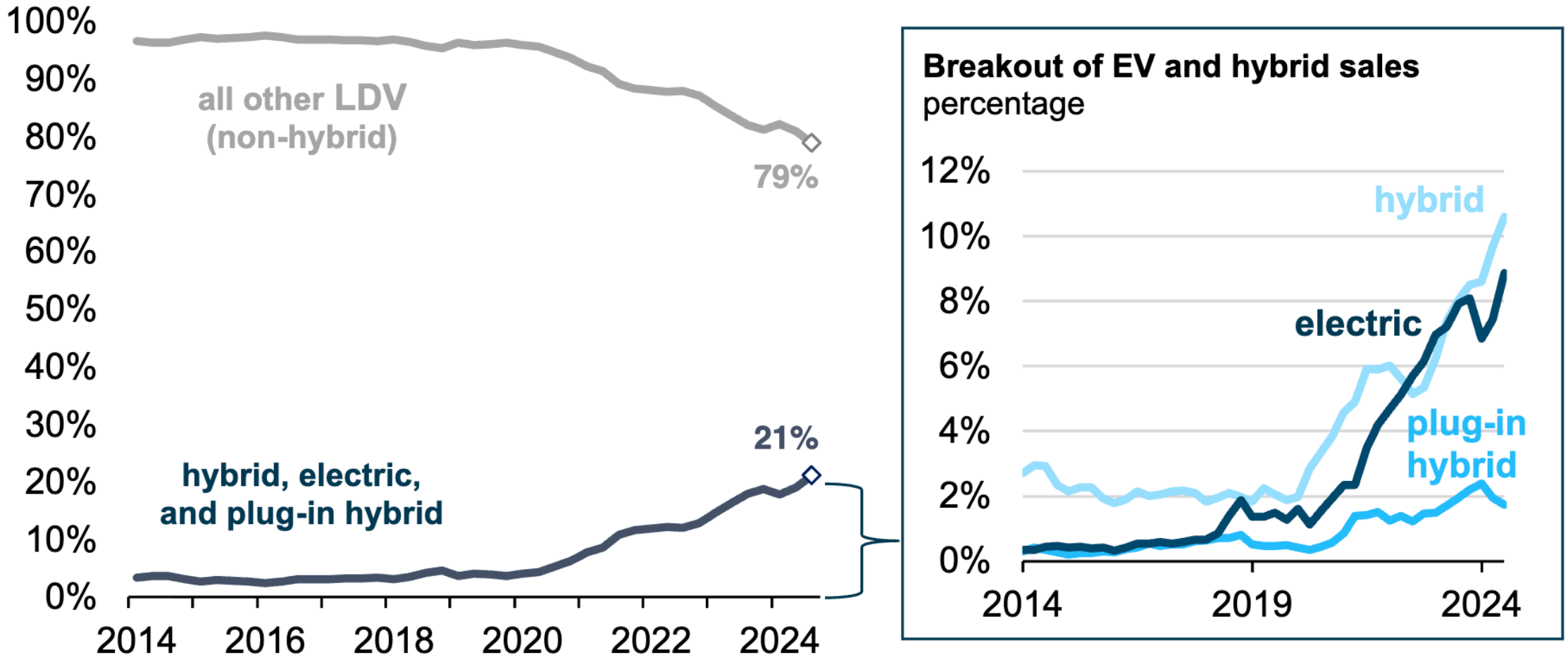
First Generation Honda Insight

Nickel Metal Hydride

Lithium Ion

Quarterly U.S. light-duty vehicle (LDV) sales by powertrain (Jan 2014-Sept 2024)

percentage of sales



Data source: Wards Intelligence
Note: EV=electric vehicles, including both battery electric and plug-in hybrid electric vehicles

Yiwei Sehol E10X

JMEV EV3

Sodium Ion

Significant Battery Chemistries for Automotive Use

What they do vs what future EVs need

- Lead Acid
- Nickel Metal Hydride
- Lithium Ion
- Sodium Ion