The Global Automotive Outlook & the Disruptive Forces Shaping Automotive Manufacturing

Presented to:

ams
AUTOMOTIVE MANUFACTURING
Evolution
SUMMIT LIVE

December 7, 2021

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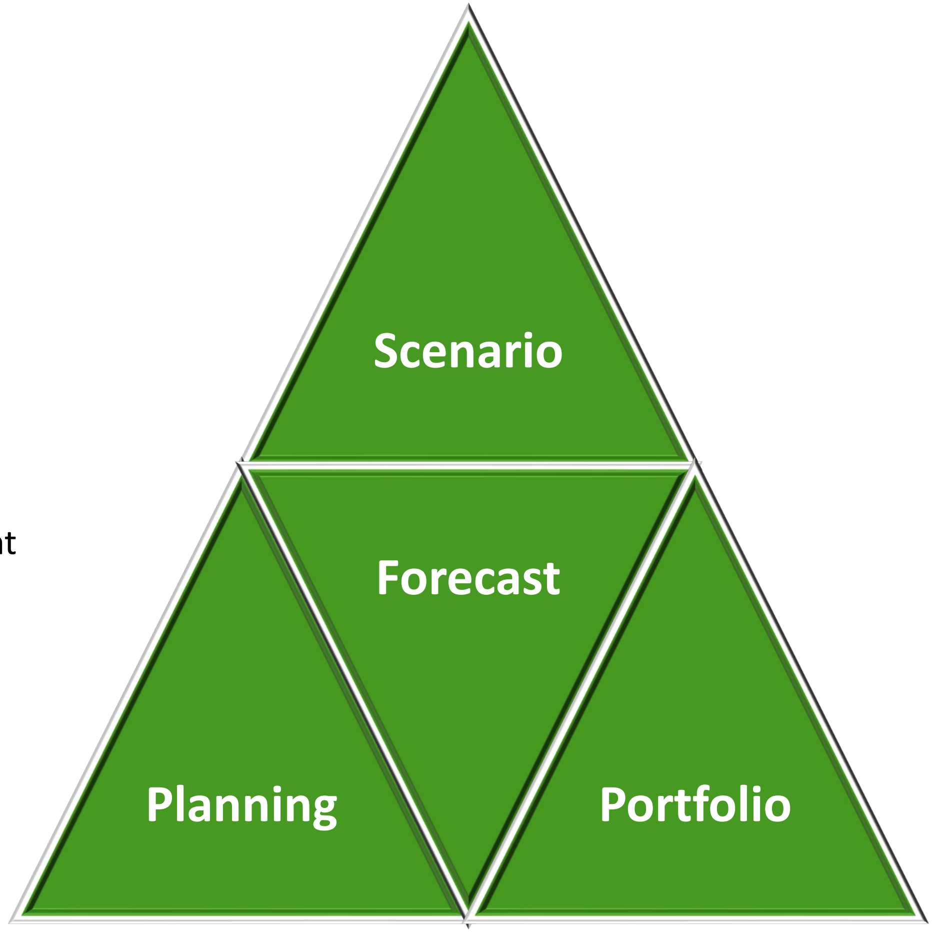
AutoForecastSolutions

AFS Services: Forecasting & Business Intelligence Solutions

AFS Forecast
- Global Production Detail
- Vehicle, Engine, Transmission, Motor, Drivetrain, & Electrification
- BEV, PHEV, HEV, FCEV, IC
- History + 8 Year Outlook
- Updated Weekly & Monthly
- Web-Based Reporting Suite
- AFS Market Alerts

AFS Planning
- Part Number, Pipeline/RFQ Management
- Real-Time Sales Forecasting
- Risk Assessment
- Opportunity Identification
- Budget vs. Current Analysis
- Capacity planning
- Secure, Web-based Interface
- Integrate with AFS Forecast & Scenario



Understand opportunities
Develop a value proposition
Identify areas of risk & growth.

AFS Scenario
- Outlook Adjustment
- Proactive Approach to Prepare for Market Shifts
- Forecast Performance Comparison
- Budget vs. Current Forecast Analysis
- Secure, Web-based Interface
- Integrate with AFS Forecast & Planning

AFS Portfolio
- Opportunity Identification
- Market Share Mapping
- Competitor Analysis
- Gap Analysis
- Secure, Web-Based Interface
- Integrate with AFS Forecast & Scenario

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Driving Data into Decisions.
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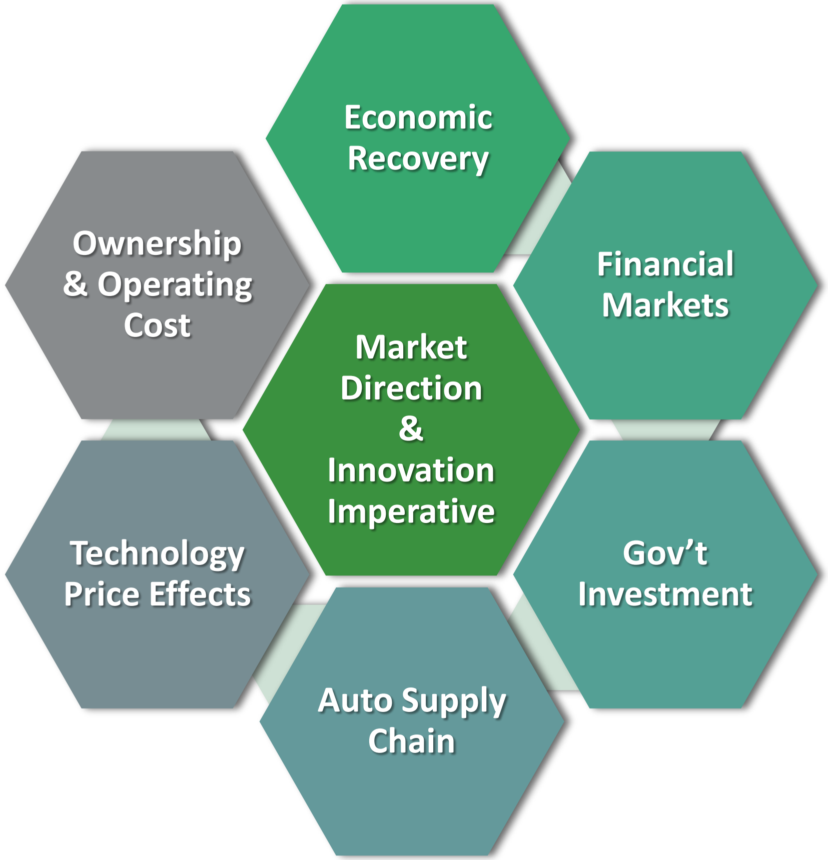
Competing in a Disruptive Global Market

Market Drivers, Enablers & Constraints

- Consumer preference vs. market direction
- Ability vs. necessity (The Demand Imperative)
- Shareholder value
- Supply chain importance to the VM strategy
- Program lifecycle & cadence adjustments
- Innovation in product and strategy

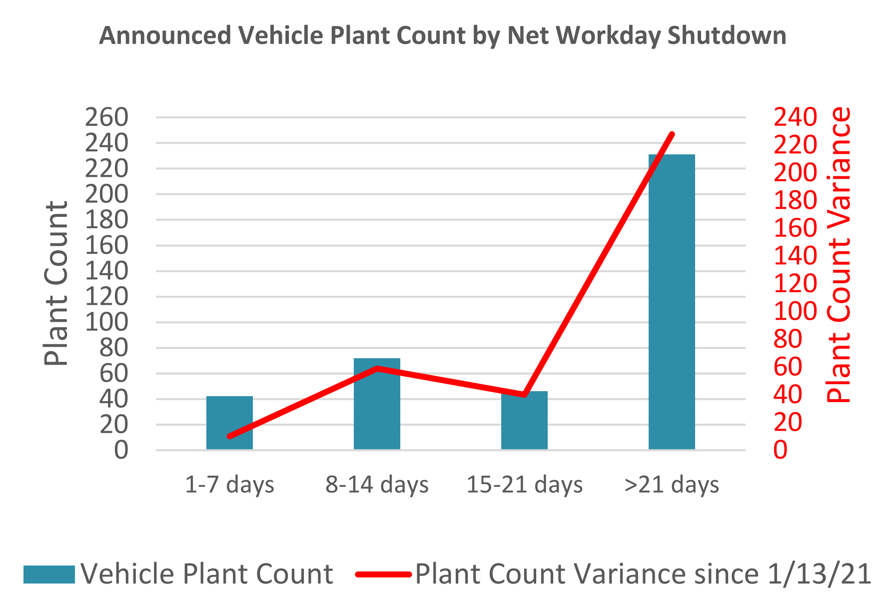


- Investment strategies
- Regulations & incentives
- Geo-political impact on globalization
- Trade rules & logistics
- Legacy vs. future players
- Increasing level of stakeholder impact

- Partnerships, collaboration, cooperation, & standardization
- The Balancing Act: Minimize risk and maximize opportunities
- Defend core operations and identify areas for growth

SEMICONDUCTOR IMPACT SUMMARY

Semiconductor Shortage Impact Analysis: Global Scenario



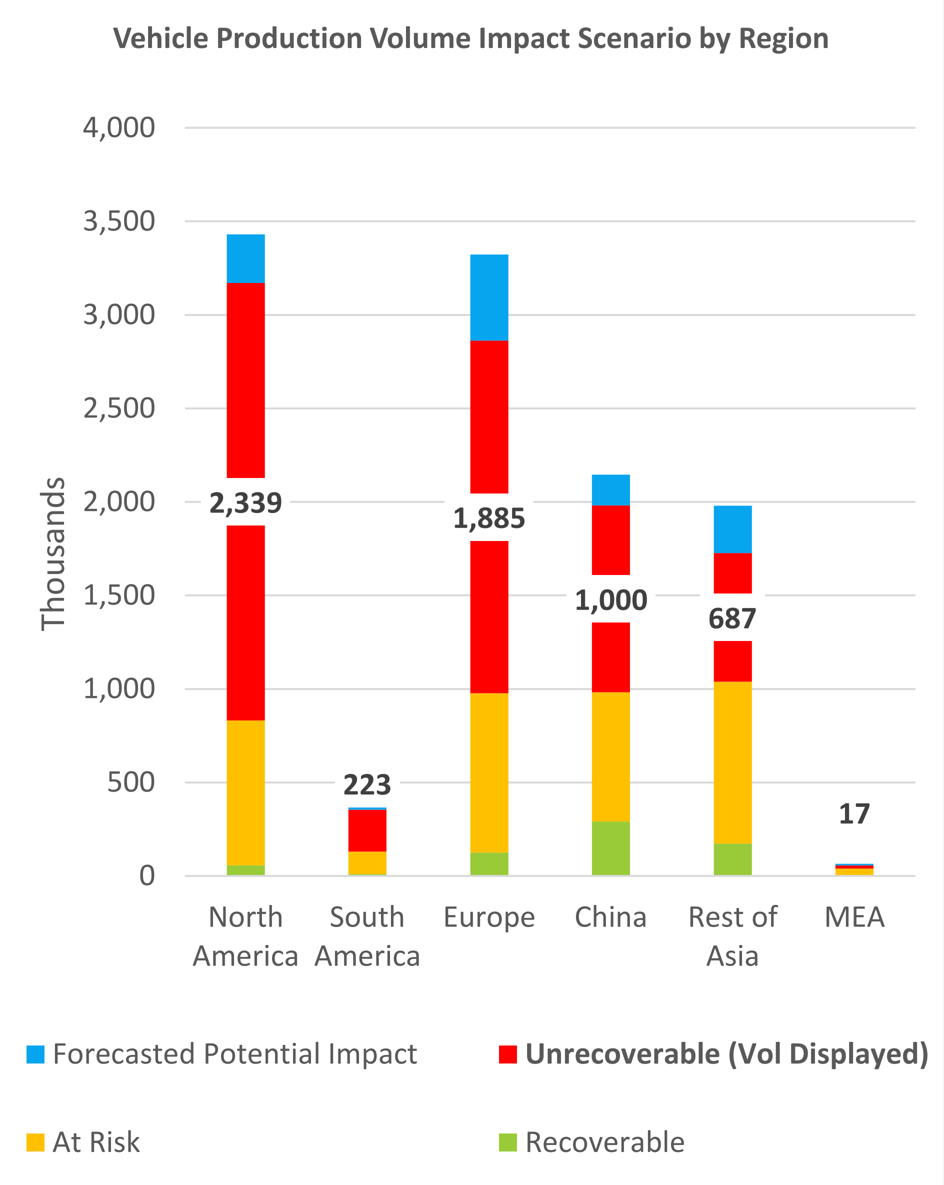
AFS tracks the total impact of production volumes due to the semiconductor shortage

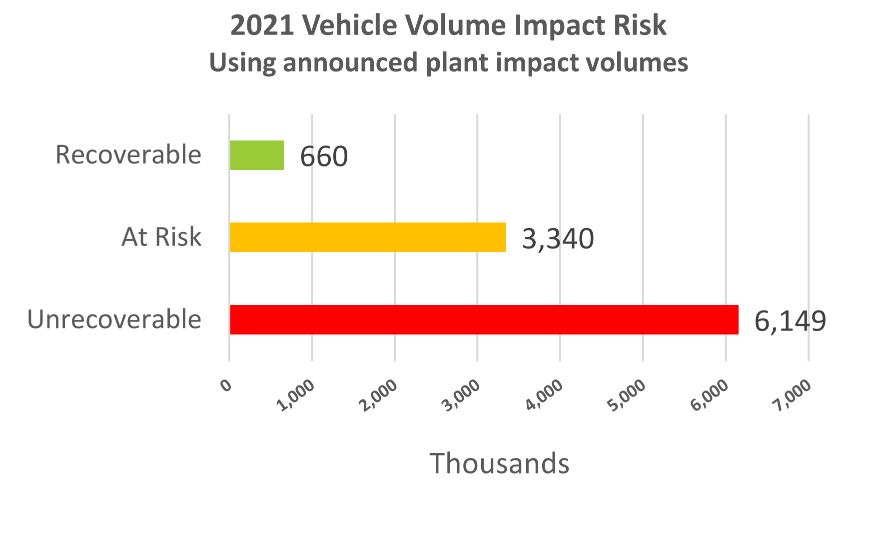
The total volume impact forecast combines:

Announced Plant Impact Analysis
Additional potential volume impact

Announced Plant Impact Analysis Volumes:
10.15M
Total 2021 Production Volume Impact Forecast:
11.33M
Vehicle Plants Impacted:
391

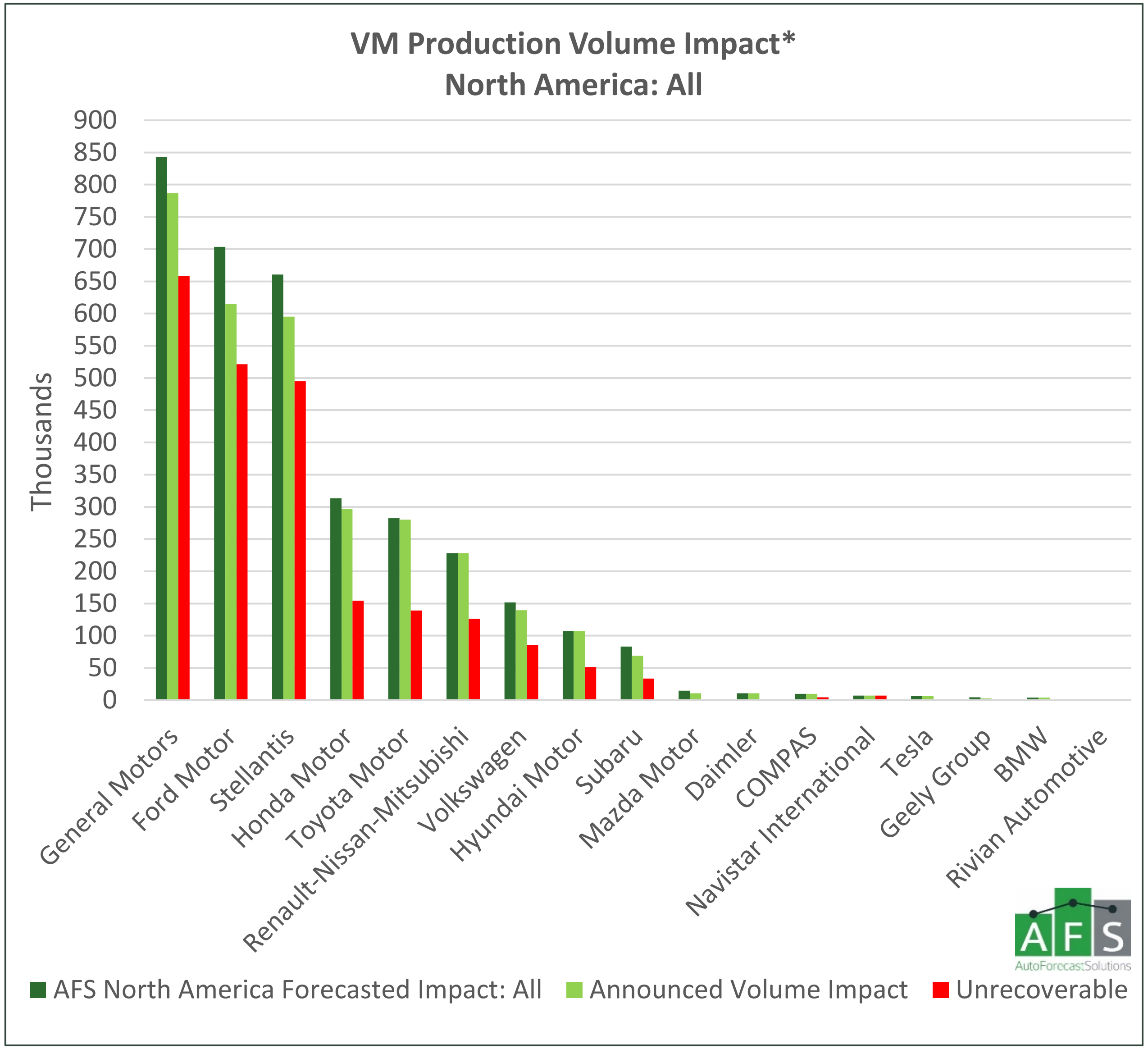
As of: November 30, 2021

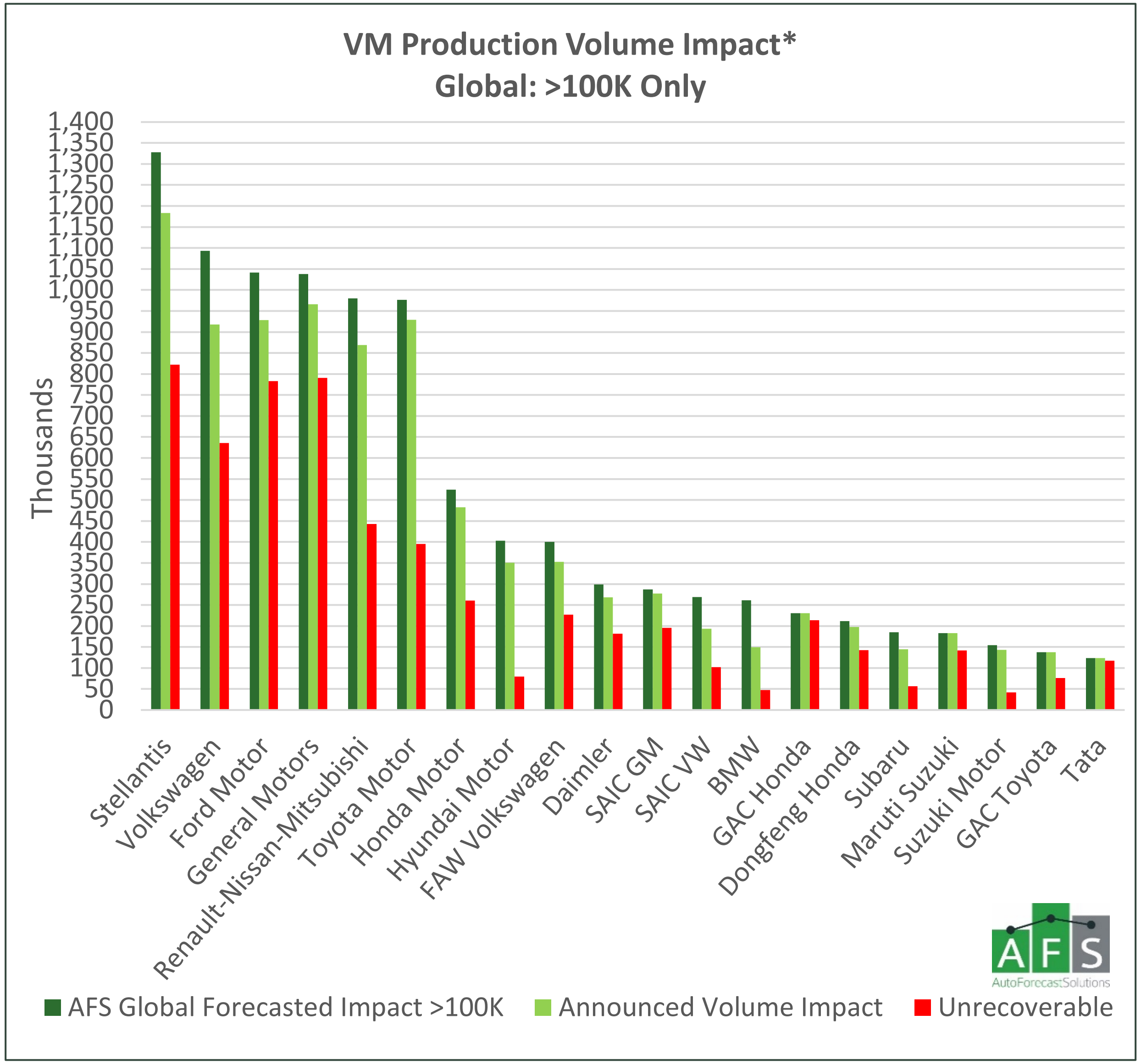




Source: AFS global forecast and services

Semiconductor Shortage Impact Analysis: VM





*Volumes provides in the AFS Market Alerts. Scale of each reports do not match.

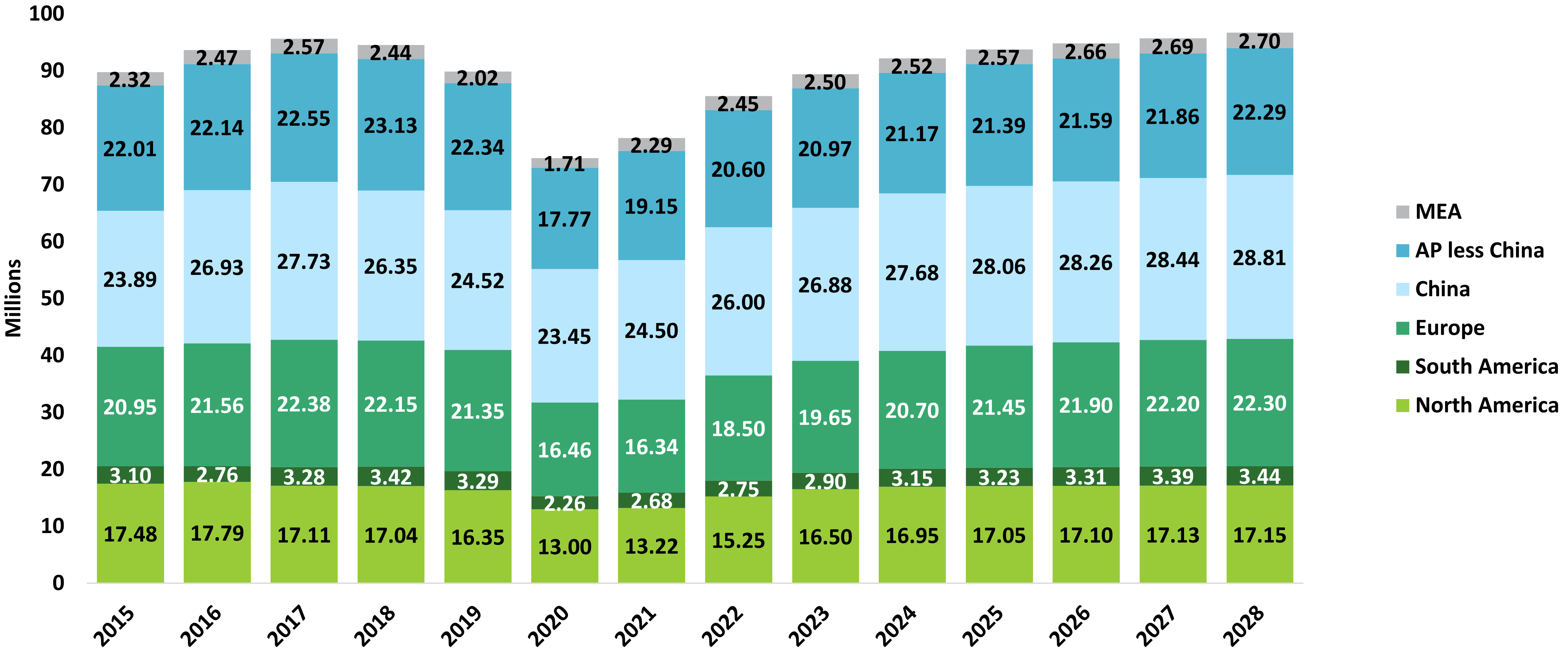
Updated: November 30, 2021

Source: AutoForecast Solutions

THE GLOBAL OUTLOOK

LONG TERM ANALYSIS

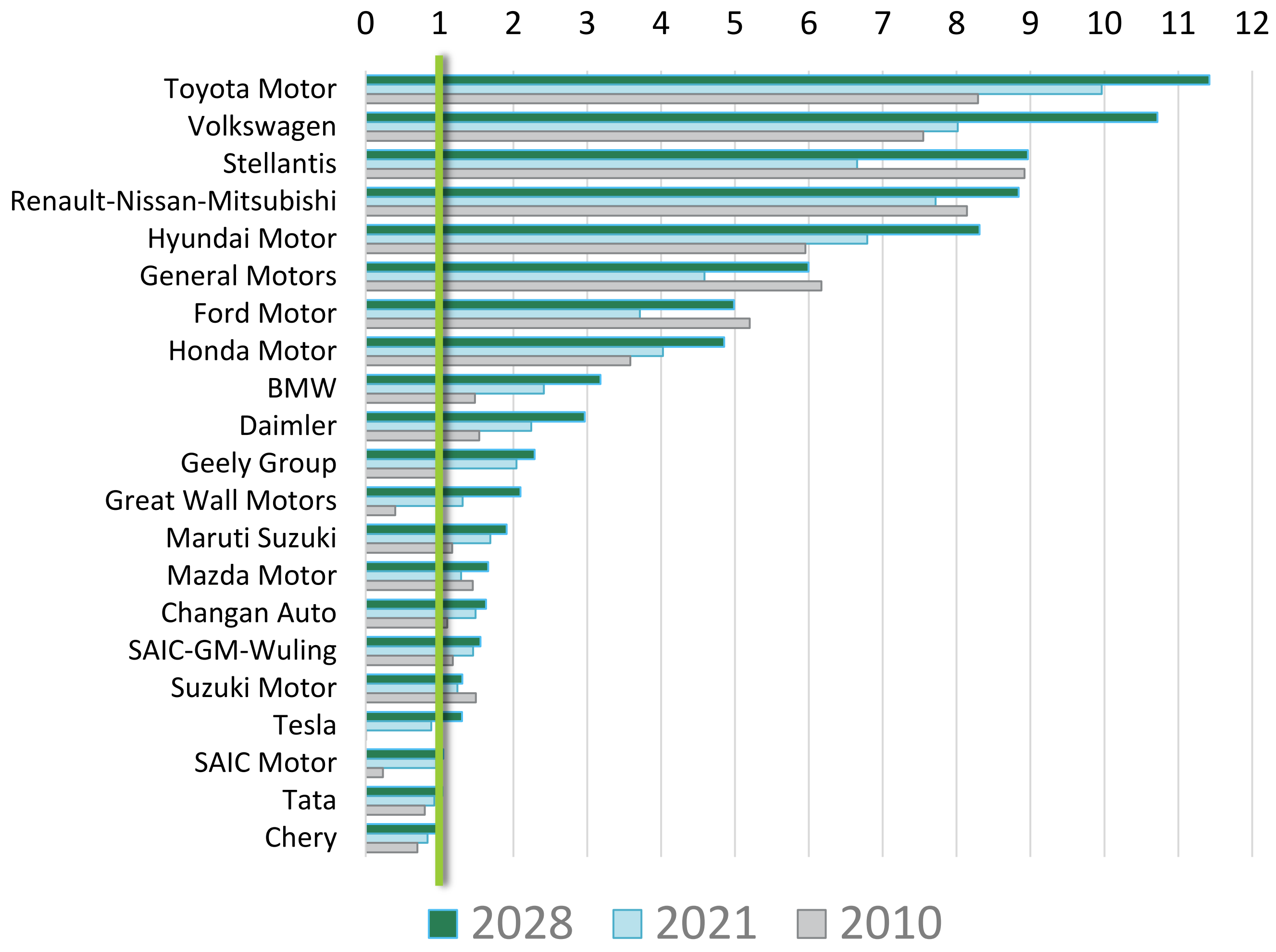
Global Light Vehicle Production Outlook (as of November 30, 2021 AFS Forecast release)



Source: AutoForecast Solutions

"1 Million Unit Club" Brand Owner Analysis (2028)

MILLION UNITS OF GLOBAL PRODUCTION RANKING BASED ON 2028 POSITION



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Brand Owners in 2028 to produce OVER 1 Million units/year

90%

% of Global Production

Top 10 Brand Owners

73% of total market

Inductees Since 2010
Chery
Geely Group (with Volvo)
Great Wall Automobile
SAIC Motor
Tata
Tesla

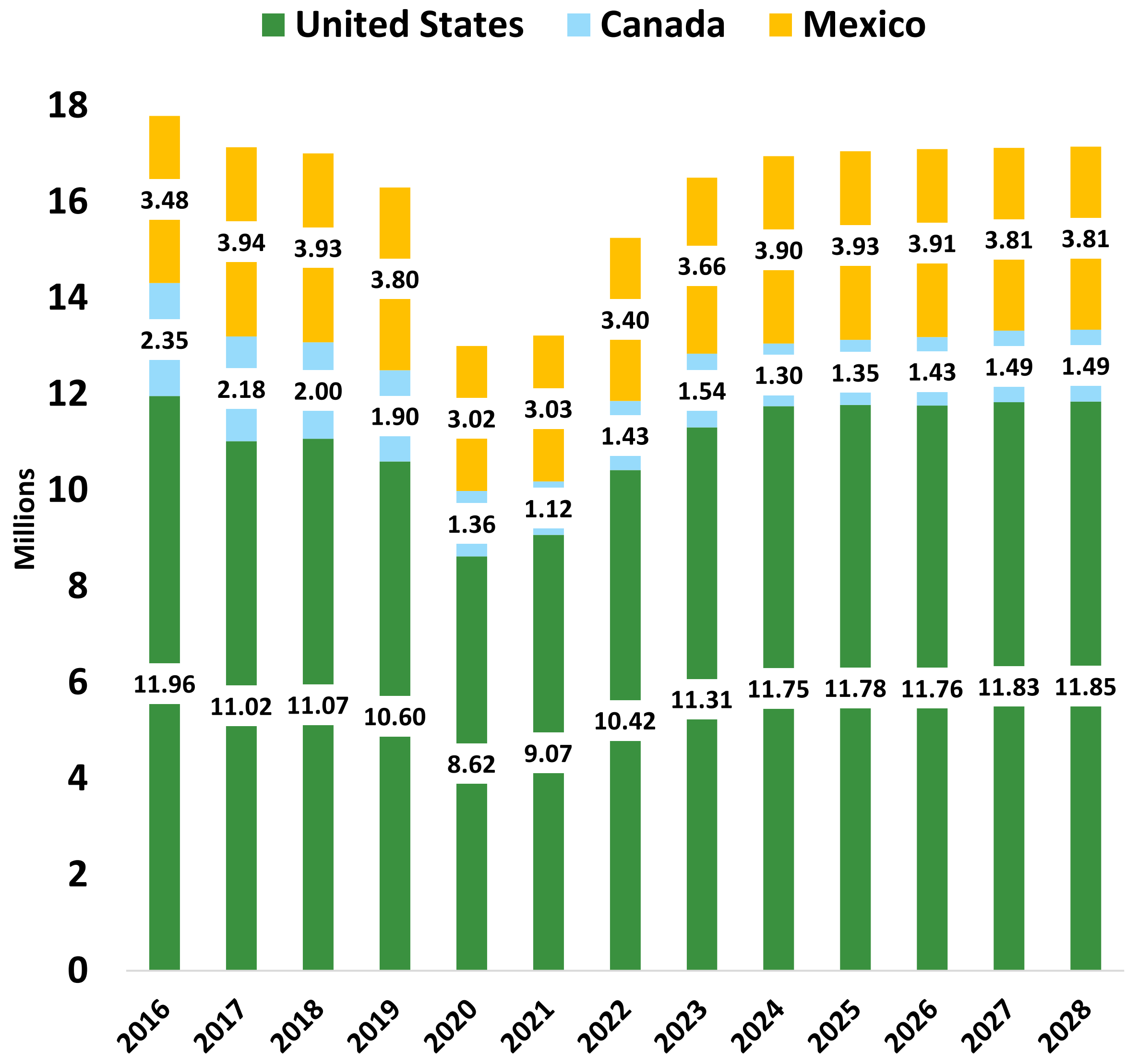
500K – 1 Million in 2028
Beijing Automotive Group
BYD
Dongfeng Motors
FAW
Isuzu
Subaru

Source: AutoForecast Solutions

THE NORTH AMERICA OUTLOOK

LONG TERM ANALYSIS

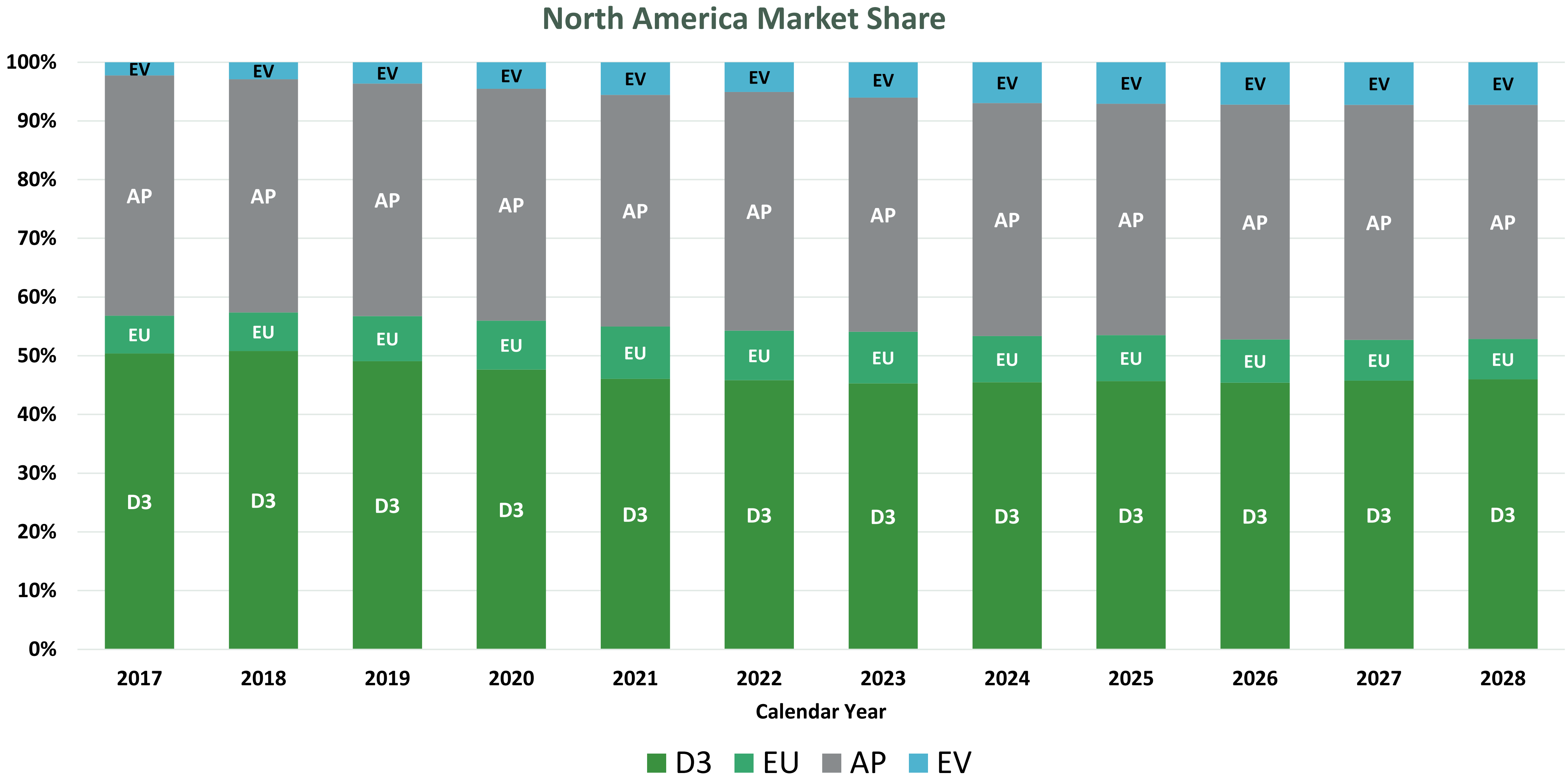
North America Growth Outlook and Growth



Jurisdiction	Growth (2020-2028)	CAGR (2016-2028)	CAGR (2020-2028)
North America	31.89%	-0.30%	3.52%
United States	37.39%	-0.08%	4.05%
Canada	9.63%	-3.72%	1.16%
Mexico	26.23%	0.76%	2.95%

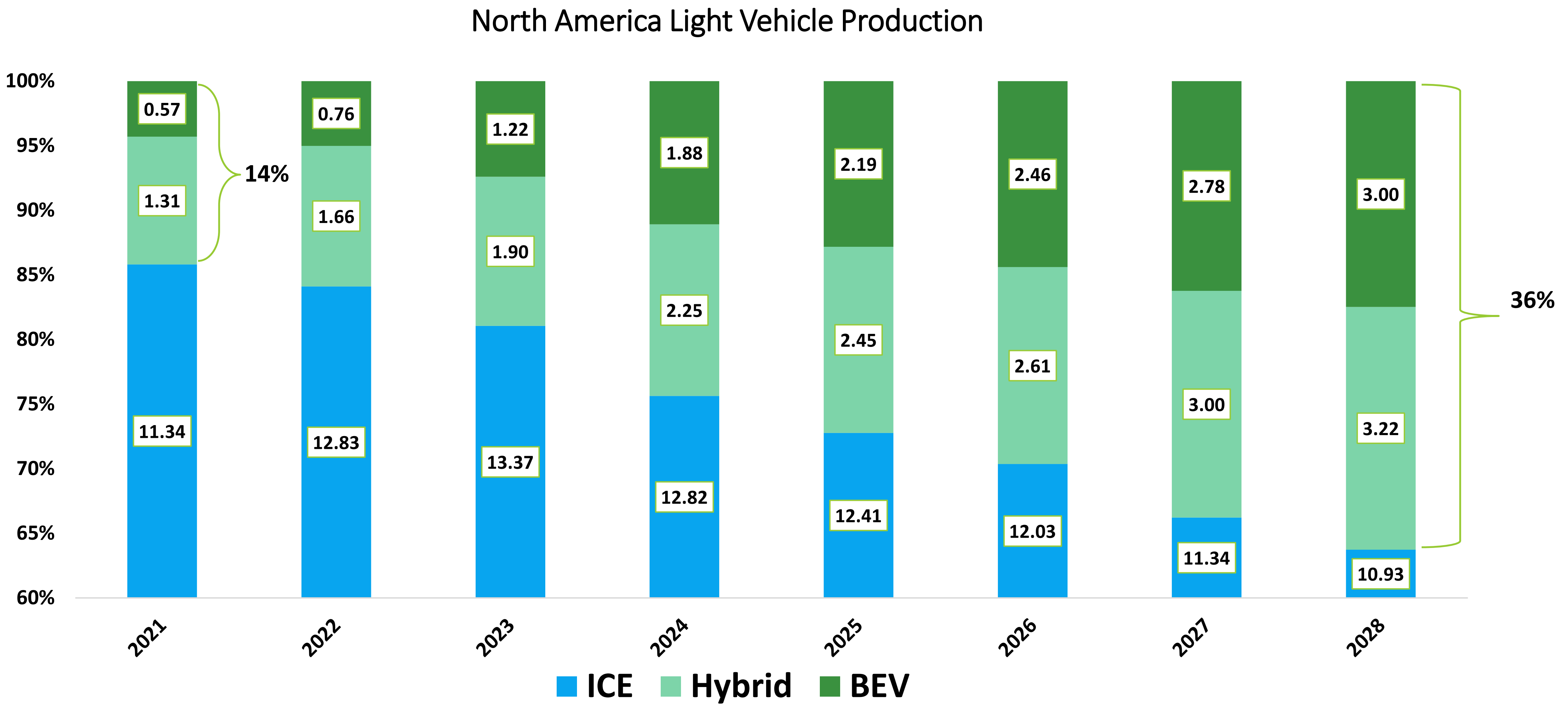
Source: AutoForecast Solutions

North America Market Share by VM Group



Source: AutoForecast Solutions

Powertrain Production Mix: North America



NOTE: Values in columns represent light vehicle production in millions

Source: AutoForecast Solutions

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Domestic Investment Opportunity: New Players

GAC

- Strengthening current China-based relationship with Stellantis to sell rebadged GAC models as Dodge vehicles in Mexico

CHERY

- U.S. plans to market Chery products under the VANTAS & T-Go brands with HAAH were cancelled; investigating new ways to enter the market

BYD AUTO

- Partially financed by Warren Buffett
- Currently produces electric buses in California

GEELY

- Owner of Volvo & Lotus
- 10% stake in Daimler and looking to invest in Aston Martin
- The Lynk & Co and Polestar brands developed as exports
- The new Volvo plant in the U.S. will assemble Polestar-branded vehicles; opportunity to add Lynk & Co in future

SAIC MOTOR

- Heavy expansion throughout southeast Asia and targeting Western Europe – with their sights on North America
- Already produces/assembles MG/Roewe products in China, England, India, and Thailand

VINFAST

- US$200 Million investment in California to sell two electric vehicles through a network of 60 dealers starting 2022.
- Simultaneous sales roll-out in Canada and Europe

ARRIVAL ZOOX Faraday Future FOXCONN LUCID RIVIAN

Source: AutoForecast Solutions

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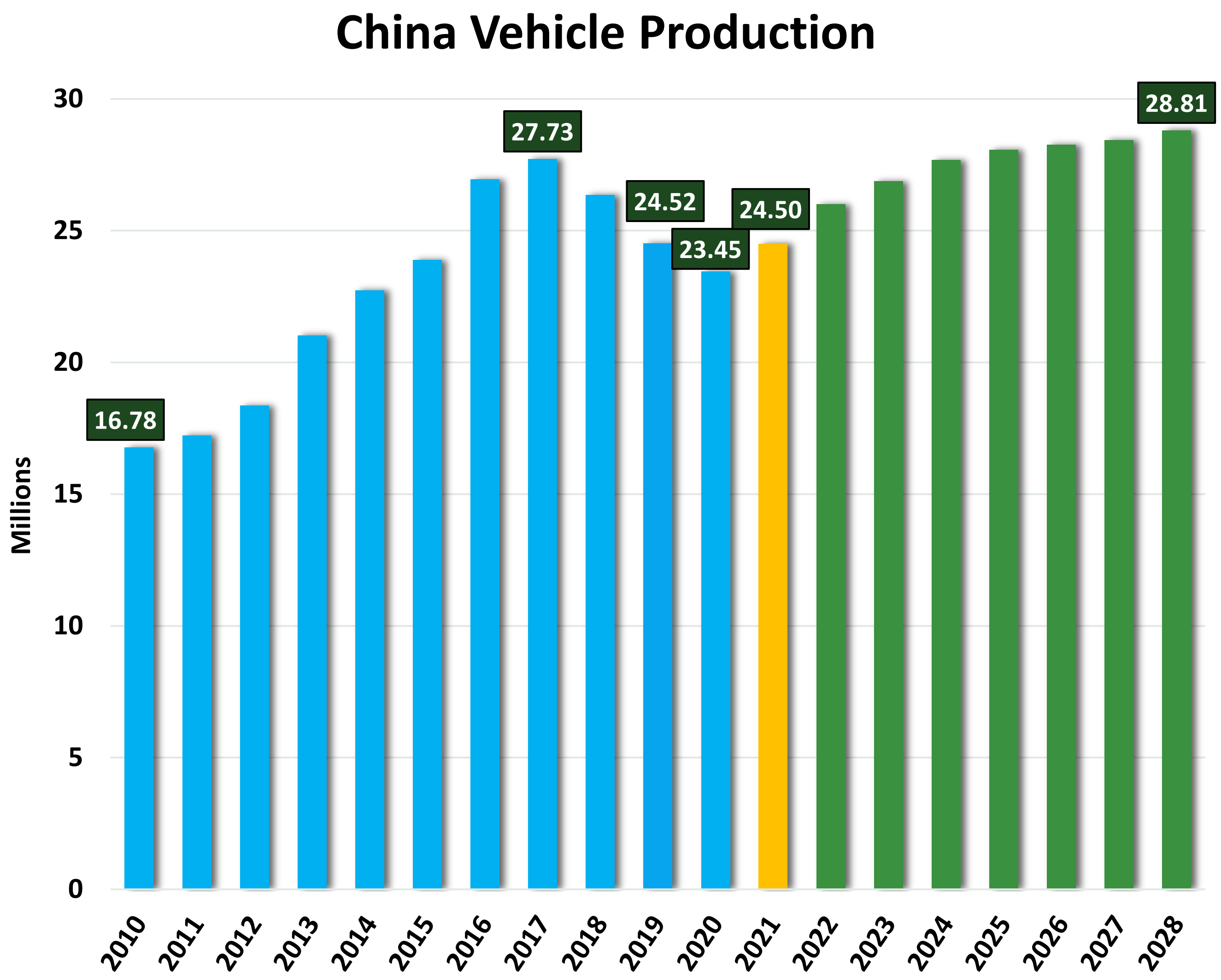
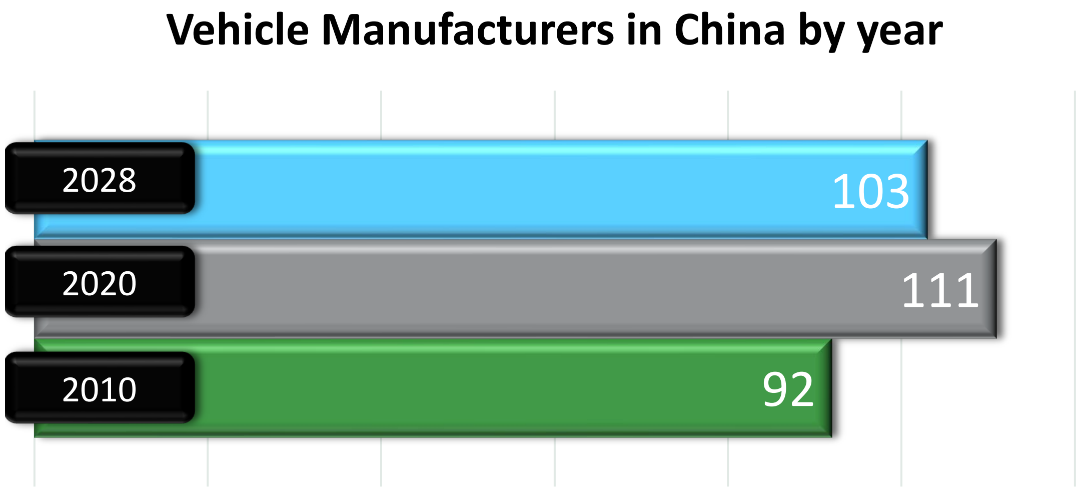
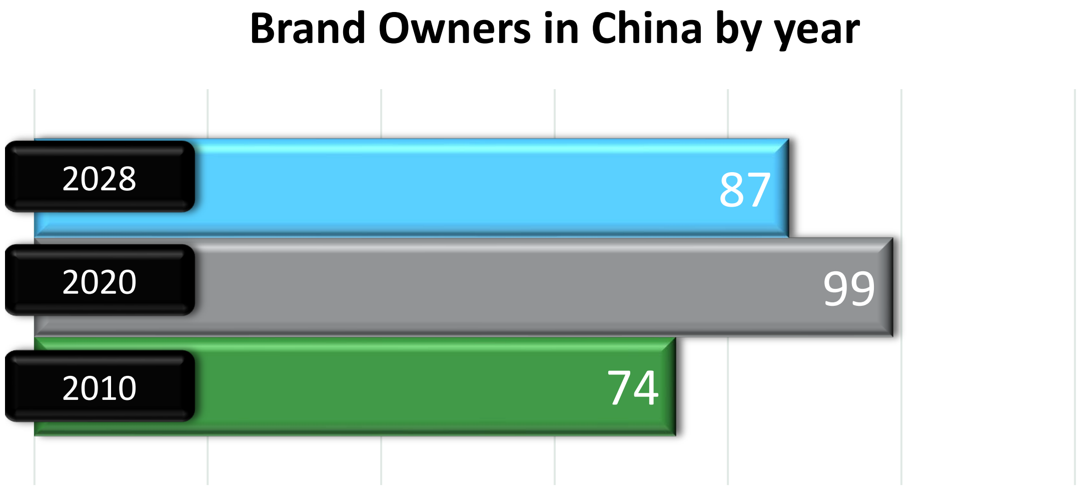
CHINA

China Vehicle Production Outlook







Source: AutoForecast Solutions

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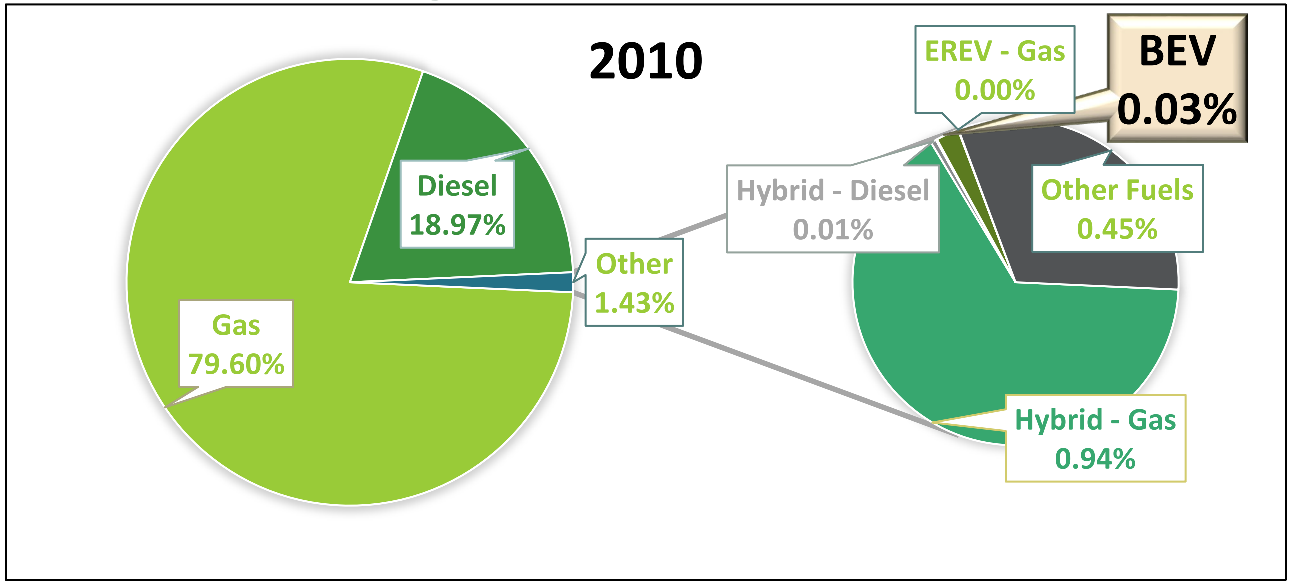
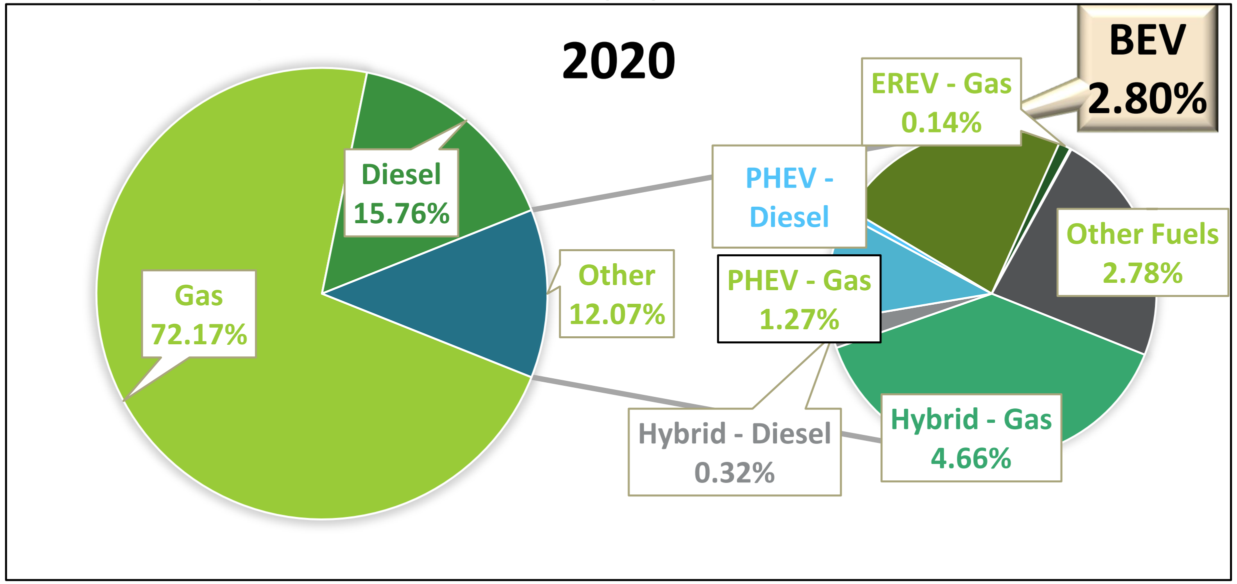
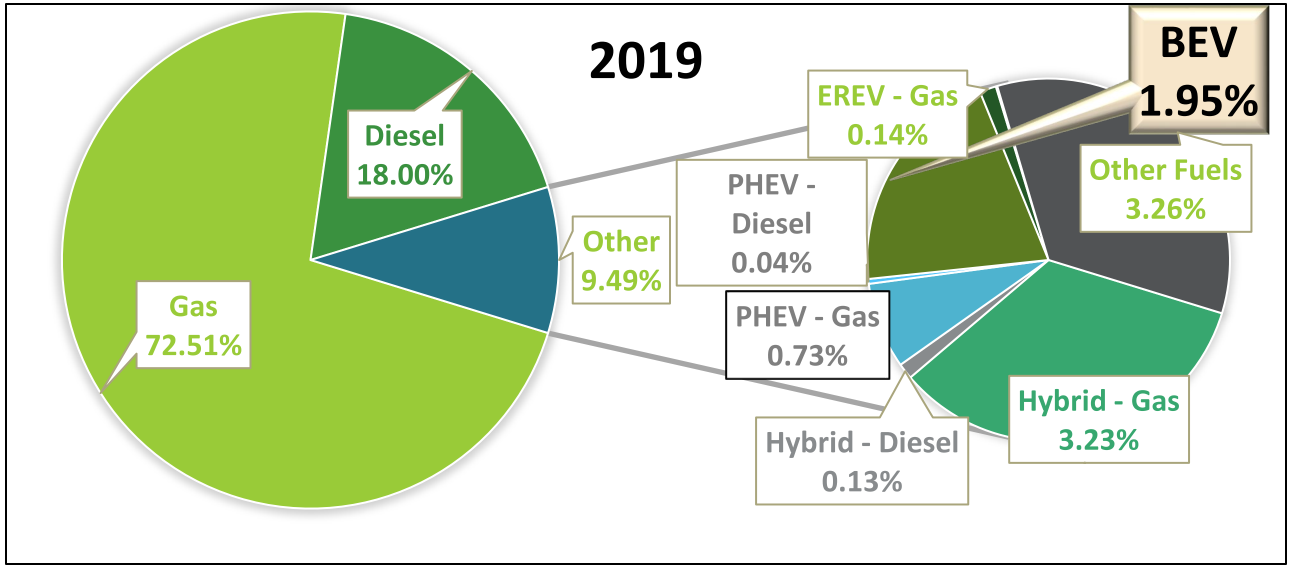
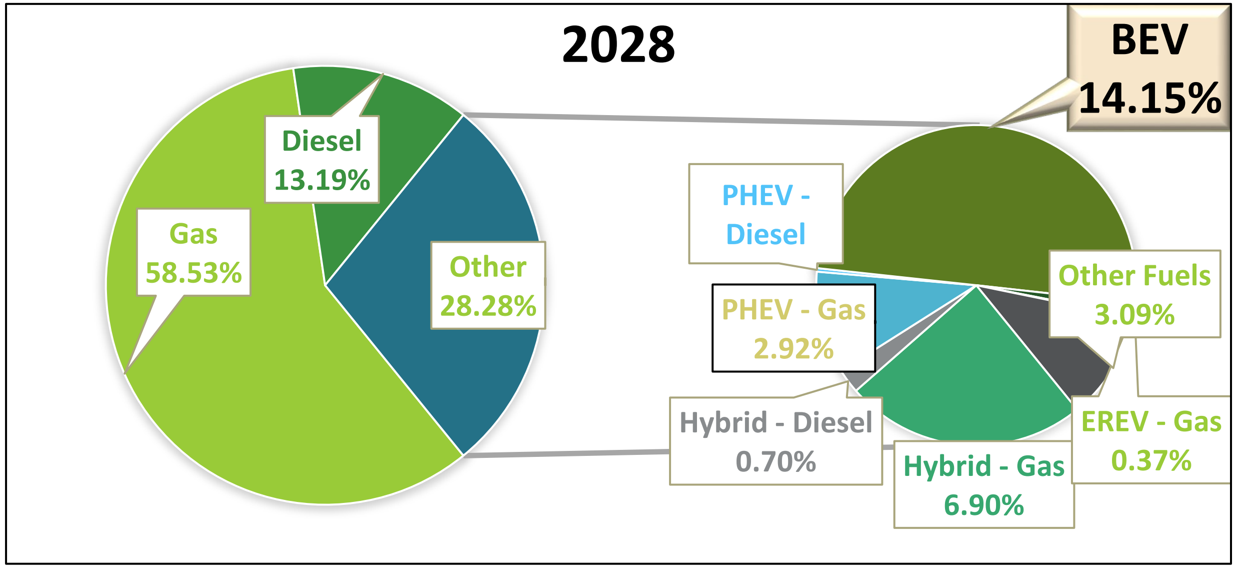
ELECTRIFICATION

Global Light Vehicle Production by Fuel Type



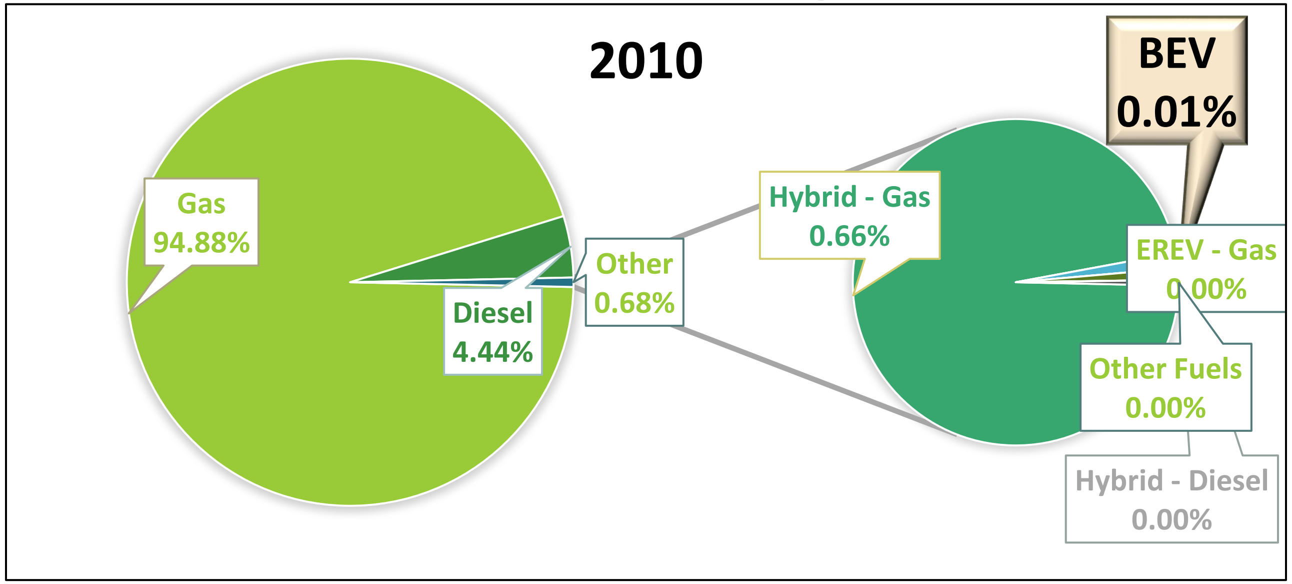


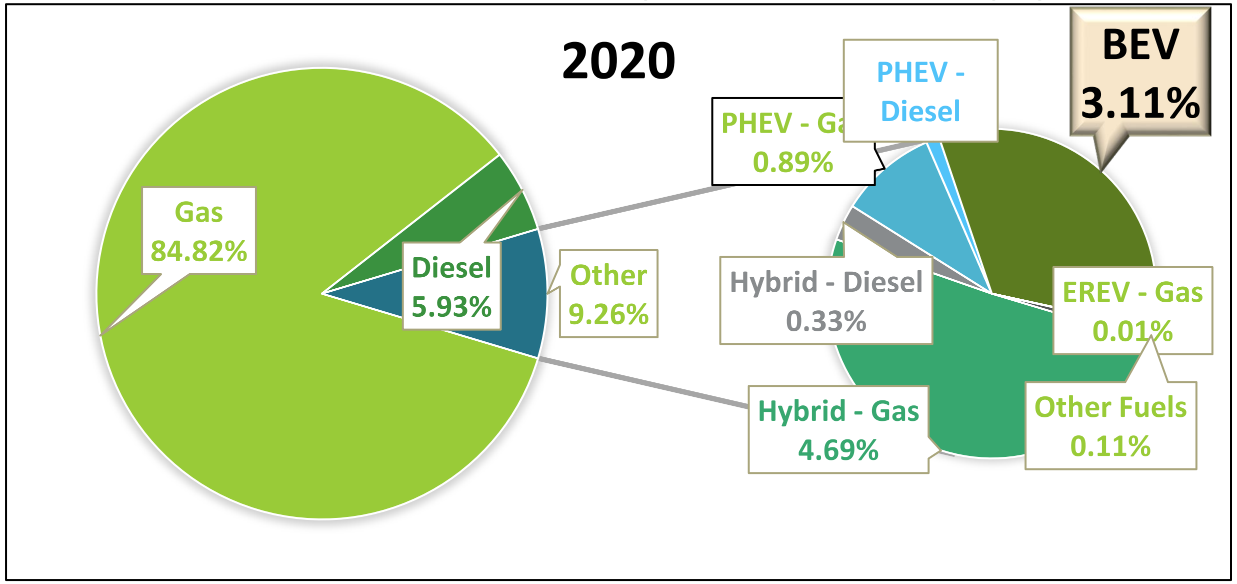


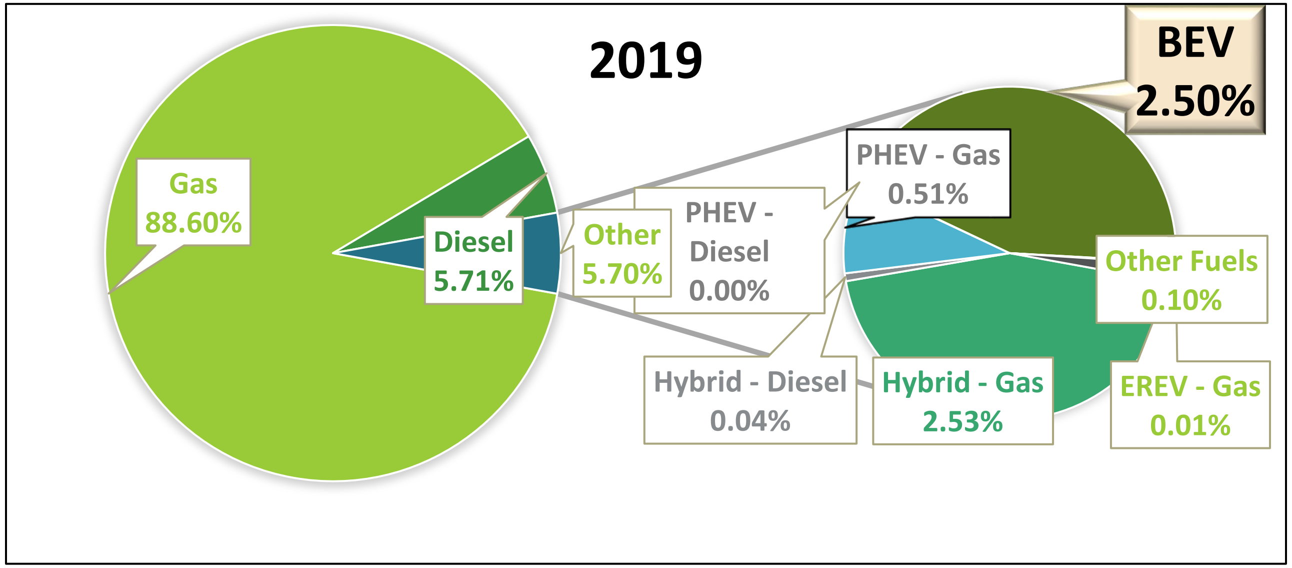


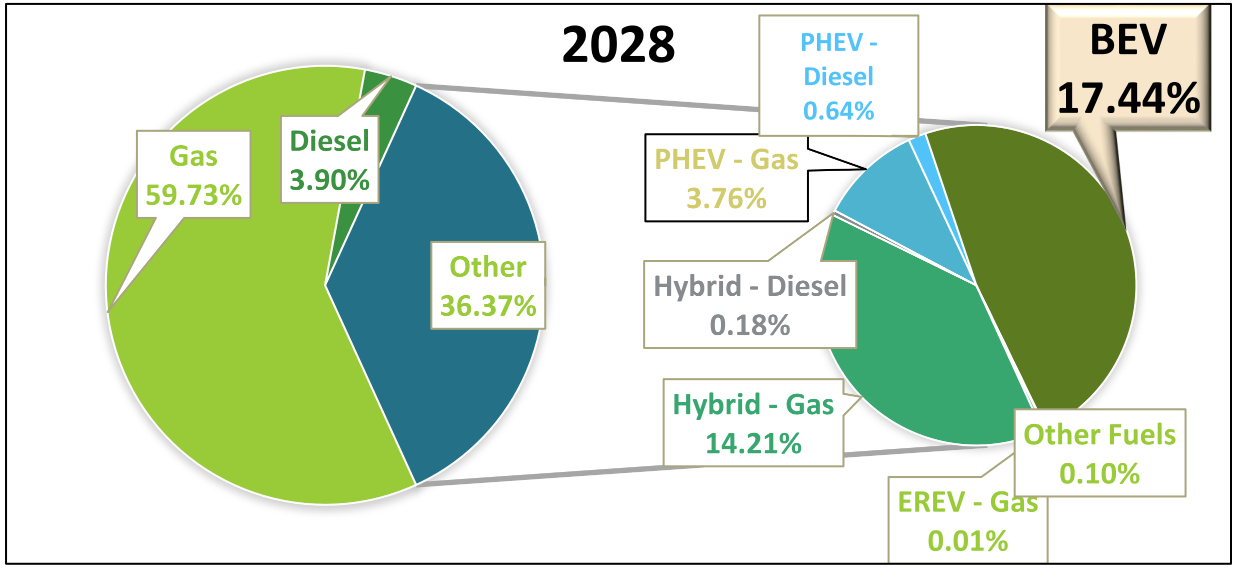
Source: AutoForecast Solutions

North America Light Vehicle Production by Fuel Type









Source: AutoForecast Solutions

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North America BEV Market

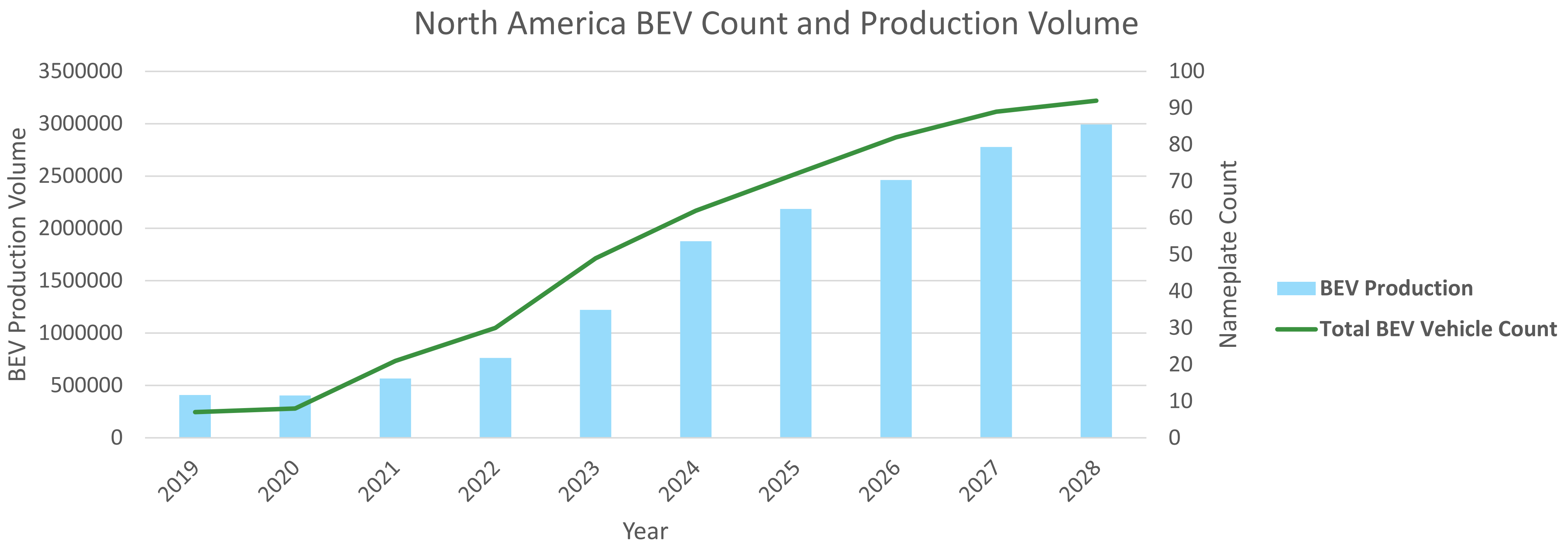
By 2028…

92 Unique, domestically-built Battery Electric Vehicle nameplates

Only 7 in 2019

31 Brands will be producing a total of nearly 3.0 million units

Chevrolet, Nissan, and Tesla were the only major BEVs in 2019



Source: AutoForecast Solutions

Key Electrified Platform/Program Launches: North America

Legacy VMs

- GM BV1: Sept 2021
  - BrightDrop brand: GM EV commercial vehicle strategy
  - Opening opportunities for contract manufacturing
  - Start in Livonia (KUKA) - shift to Ingersoll, Canada (2022)
- GM BEV3: March 2022
  - North America and China
  - Cadillac Lyriq, Celestiq, Symboliq; Chevy Blazer, Buick Variants, Cruise Brand and others
- GM BUT/BET: Sept 2021
  - GMC Hummer & Sierra, Chevy Tahoe & Silverado, Cadillac Escalade
- Ford TE1: July 2026
  - F-Series Lightning (next generation), Transit, and other models
  - Ford starting to electrifying F-Series Lightning on T3 (existing platform)
- Ford GE1: Sept 2020 (China in April 2021)
  - Mustang Mach-E and other small CUVs
- Ford GE2.1: June 2023
  - GE1 replacement
  - Addition small and mid-sized CUV EV variants
- STLA: Stellantis global electrification strategy: April 2023
  - Four versions: Small, Medium, Large, and Frame (Truck)
  - U.S. launch Oct 2023 (STLA Large @ Toluca and Belvidere)

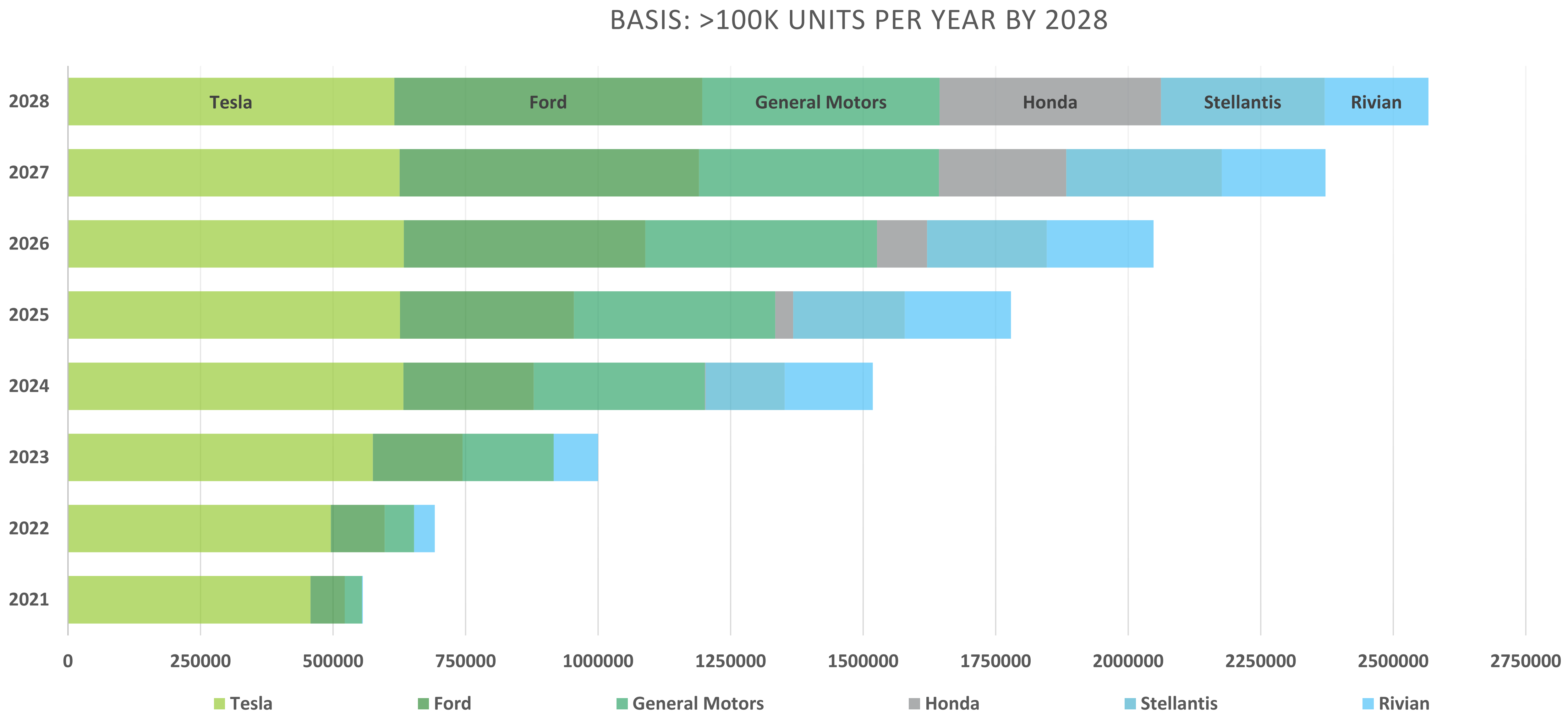
New Players

- Rivian: Q3 2021
  - Large van, pickup, and crossover
  - Normal, Illinois
- Lucid: Q4 2021
  - Lucid Air and Gravity
  - Casa Grande, Arizona
- Lordstown Motors: Q4 2021
  - likely delayed
  - Endurance large pickup
- Amazon Zoox: Q4 2021
  - Autonomous Minivan
  - Foster City, California
- Bollinger: Q4 2021
  - Mid-sized SUV, pickups, and large vans
  - Oak Park, Michigan
- Arrival: Q1 2022
  - likely delayed
  - EV vans and buses
  - Charlotte, North Carolina
- Faraday: Q2 2022
  - Mid-sized CUV
  - Hanford, California
- Canoo: Q2 2022
  - Minivans and mid-sized pickup
  - Pryor, Oklahoma
- Foxconn: Q4 2023
  - Fisker Pear EV
  - Lordstown, Ohio

NOTE: 2021/2022 launches most likely delayed due to COVID and semiconductor issues

Source: AutoForecast Solutions

North America BEV Production By Vehicle Manufacturer



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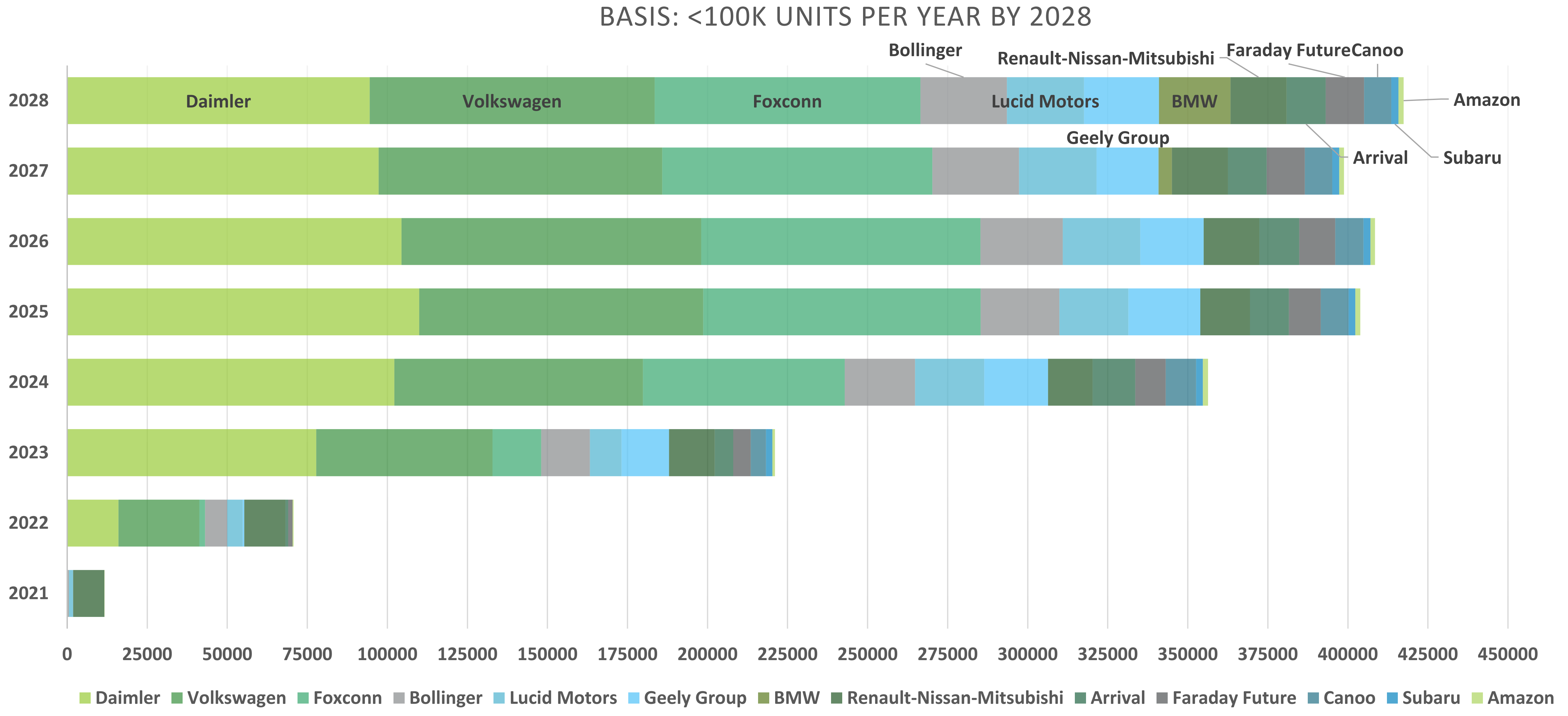
North America BEV Production By Vehicle Manufacturer (cont'd)



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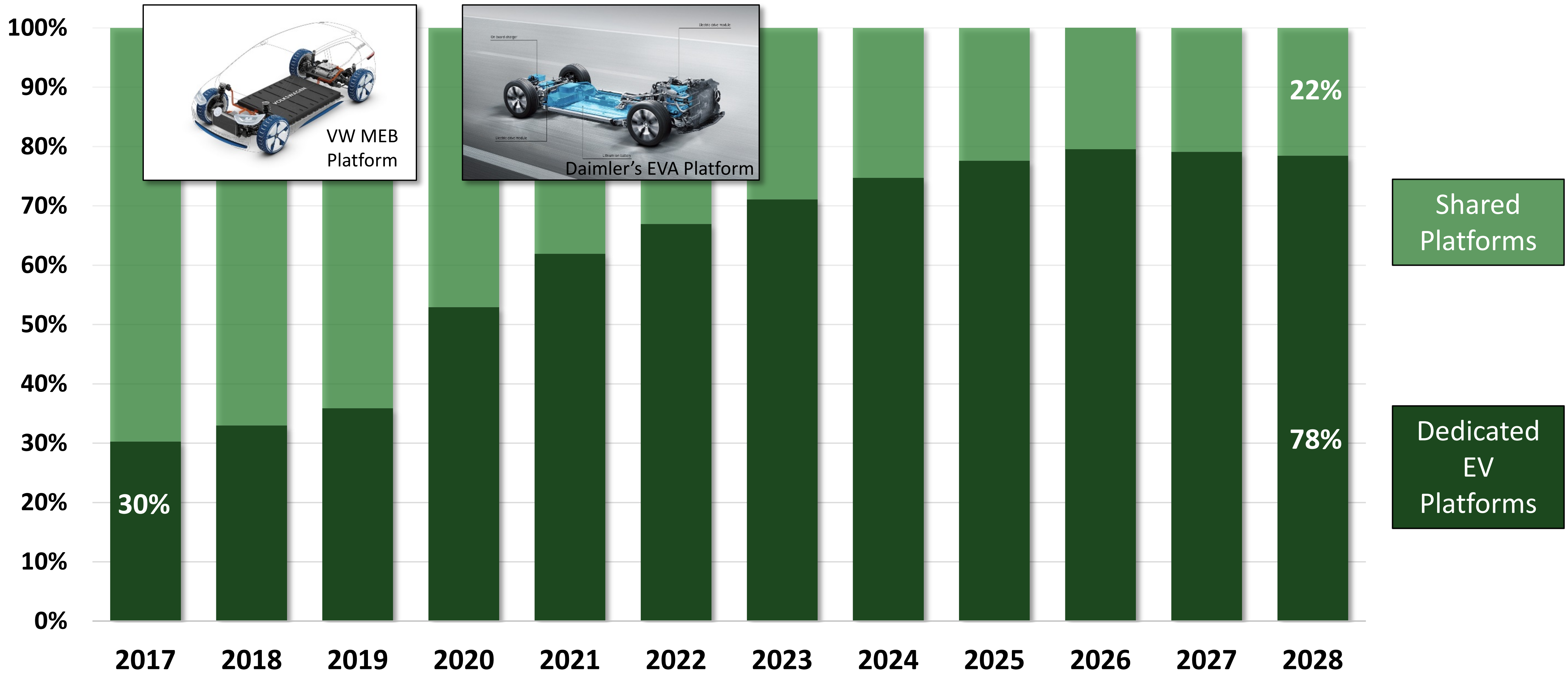
EV Adoption Concerns

The Macro Issues	The Fine Print	

• Range Anxiety
• Infrastructure
• Resource Limitations
• Cost Barriers
	• Identifying the stakeholders
	• Supply chain/VM vertical integration
	• Government involvement
	• Standardization: regulations, rules, and emission targets
	• Charging stations
	  • Home and highways
	• Financial incentives
	  • Direct sale incentives
	  • Tax incentives
	• Logistics incentives
	  • City center allowances
	  • HOV use
		• Material and manufacturing innovations
		  • Rare earth metal availability
		  • Current production capacity does NOT support EV build plans
		  • The need for improved battery chemistry
		• Penalties
		  • Consumer
		    • Fuel tax
		    • EV-consumer road use tax
		    • Cost of personal time during charging
		  • Manufacturer: Carbon credit mandates
		• Altered revenue models & the new consumer
		  • New players
		  • Understanding the target consumer
		  • Brand loyalty erosion
		  • Lower sales
		  • Transactional vs. Subscription-based model

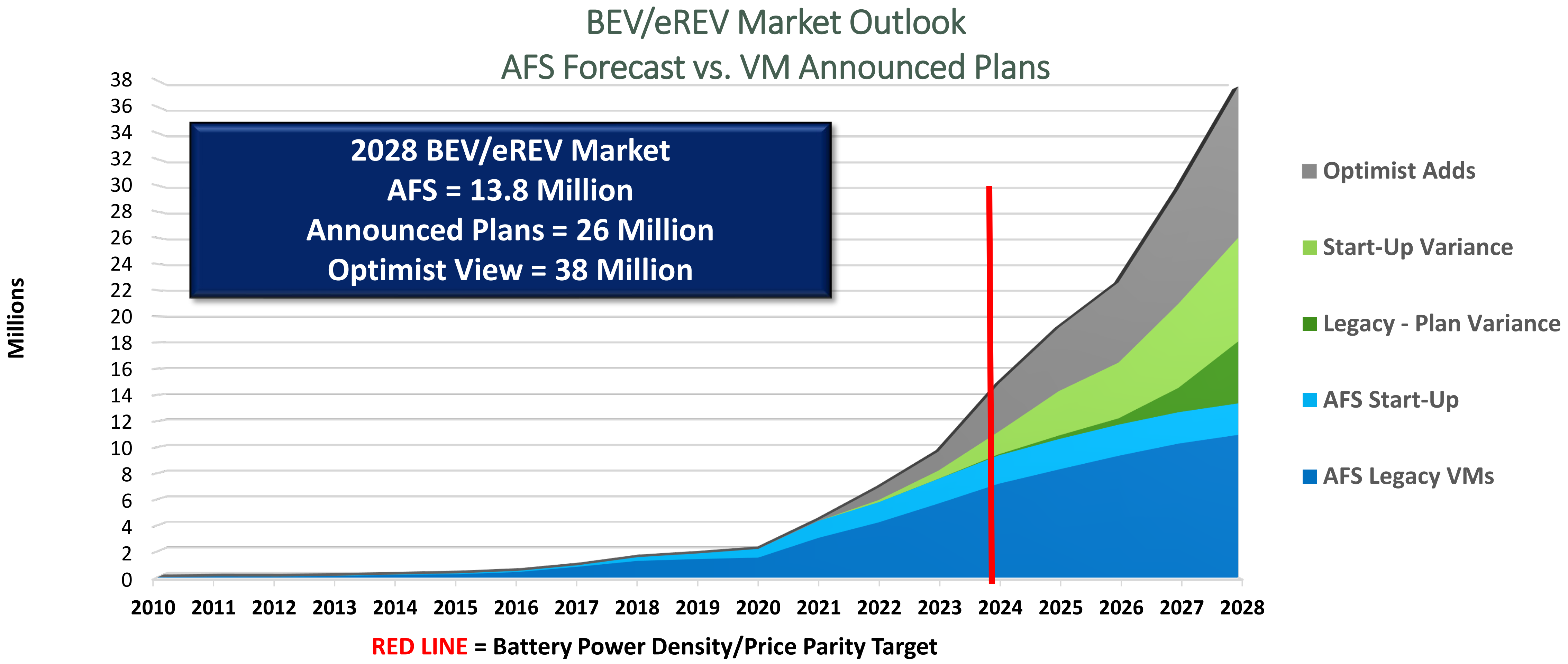
Source: AutoForecast Solutions

Electric Platform Production Volume - Global



Source: AutoForecast Solutions

Global EV Market Sizing: AFS Base Case



EVEN AN OPTIMISTIC VIEW REQUIRES OVER 60% OF VEHICLES TO HAVE AN ENGINE

Source: AutoForecast Solutions

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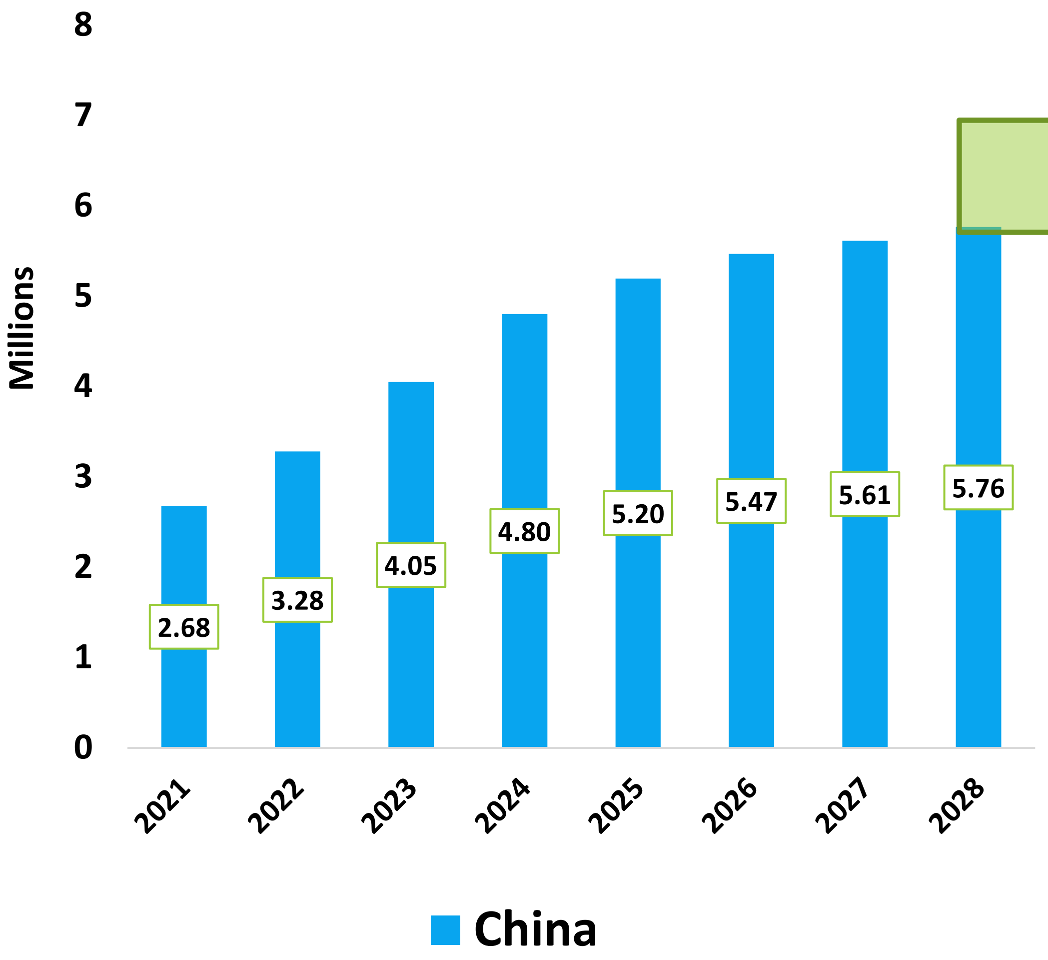
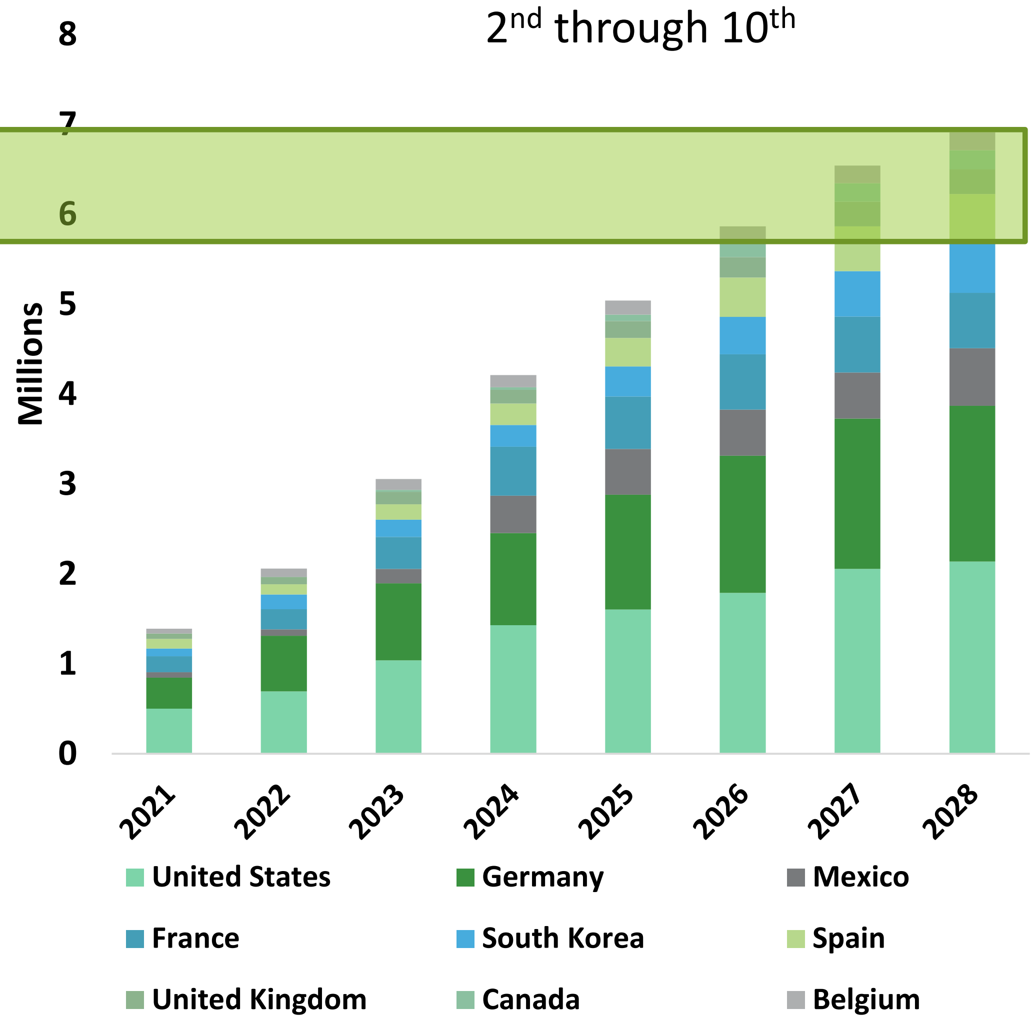
Global Light Vehicle BEV Production: Top 10 Countries





Source: AutoForecast Solutions

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Top 10 BEV Brand Owner Production Comparison

Brand Owner	2019 Production Volume
Tesla	365K
Renault-Nissan-Mitsubishi	190K
BYD	145K
Beijing Automotive Group	138K
Volkswagen	113K
SAIC-GM-Wuling	71K
Geely Group	60K
SAIC Motor	55K
Hyundai Motor	53k
Chery	47K
Other (57)	**495K**
TOTAL	**1.73M**

71%

↑ Level up 2028

↓ Level down 2028

★ New in 2028

	Brand Owner	2028 Production Volume
↑	Volkswagen	1.90M
↓	Tesla	1.48M
★	Stellantis	1.27M
★	Ford	1.14K
★	Daimler	996K
★	GM	624K
↑	Hyundai Motor	616K
↓	Geely Group	567K
★	Honda	514K
↓	Renault-Nissan-Mitsubishi	505K
	Other (72)	**4.08M**
	TOTAL	**13.69M**

70%

Source: AutoForecast Solutions

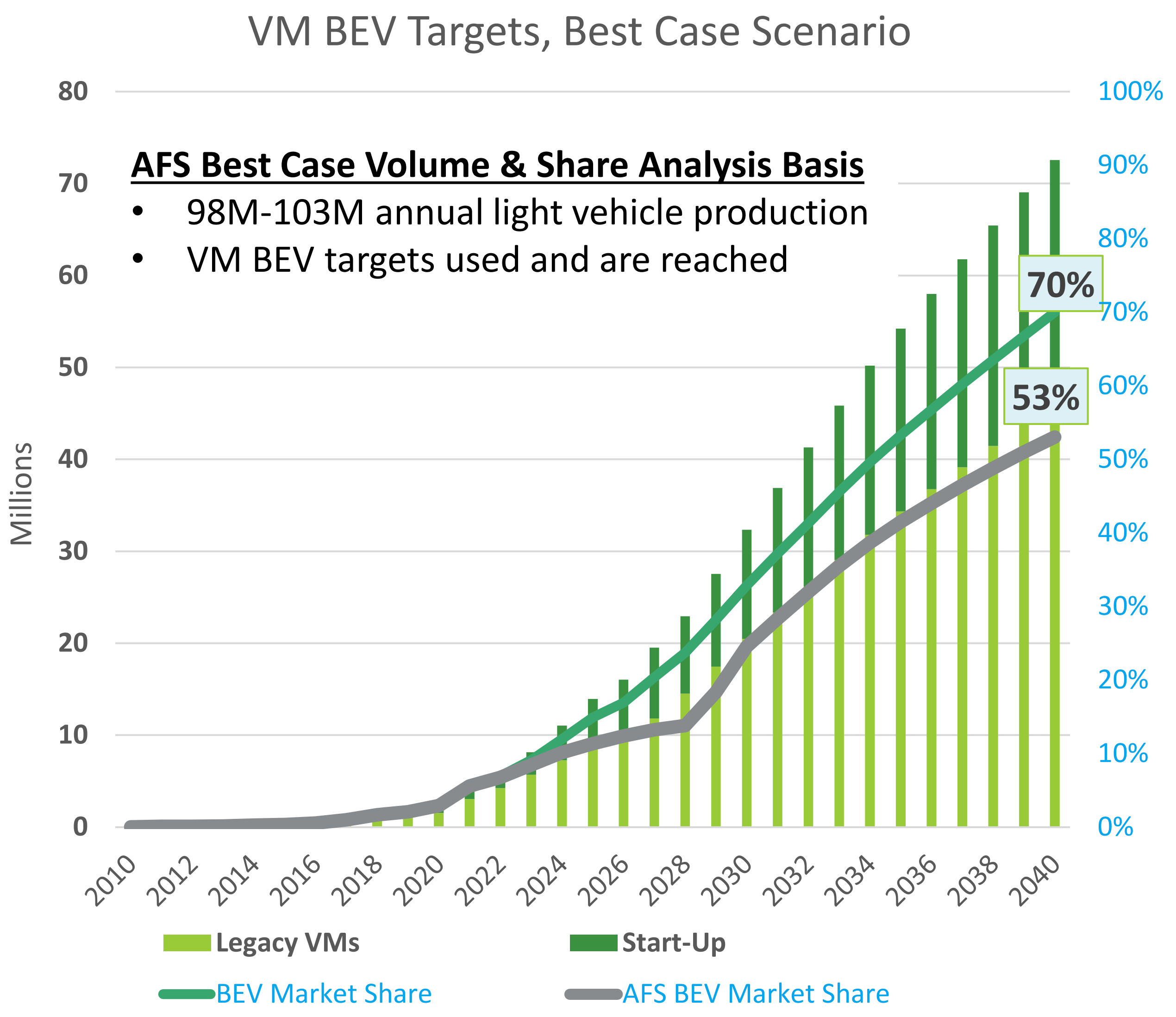
AFS Global Production Scenario: Long-term Outlook

Best Case: Potential Winners

- General Motors, Ford, Volkswagen
  - Aggressive targets are achievable
  - Consumer buying habits inline with VM investment strategies; mitigating financial losses
- Commercial Vehicle Startups
  - Delivery and fleet truck buyers are uniquely positioned to benefit from low-cost operation
- Government
  - Strong investment pays off politically

Base Case: Potential Winners

- Toyota, Mazda, Honda
  - Focusing on hybrids and fuel cells delays large investments on BEVs until the market is proven, saving billions of dollars



Source: AutoForecast Solutions

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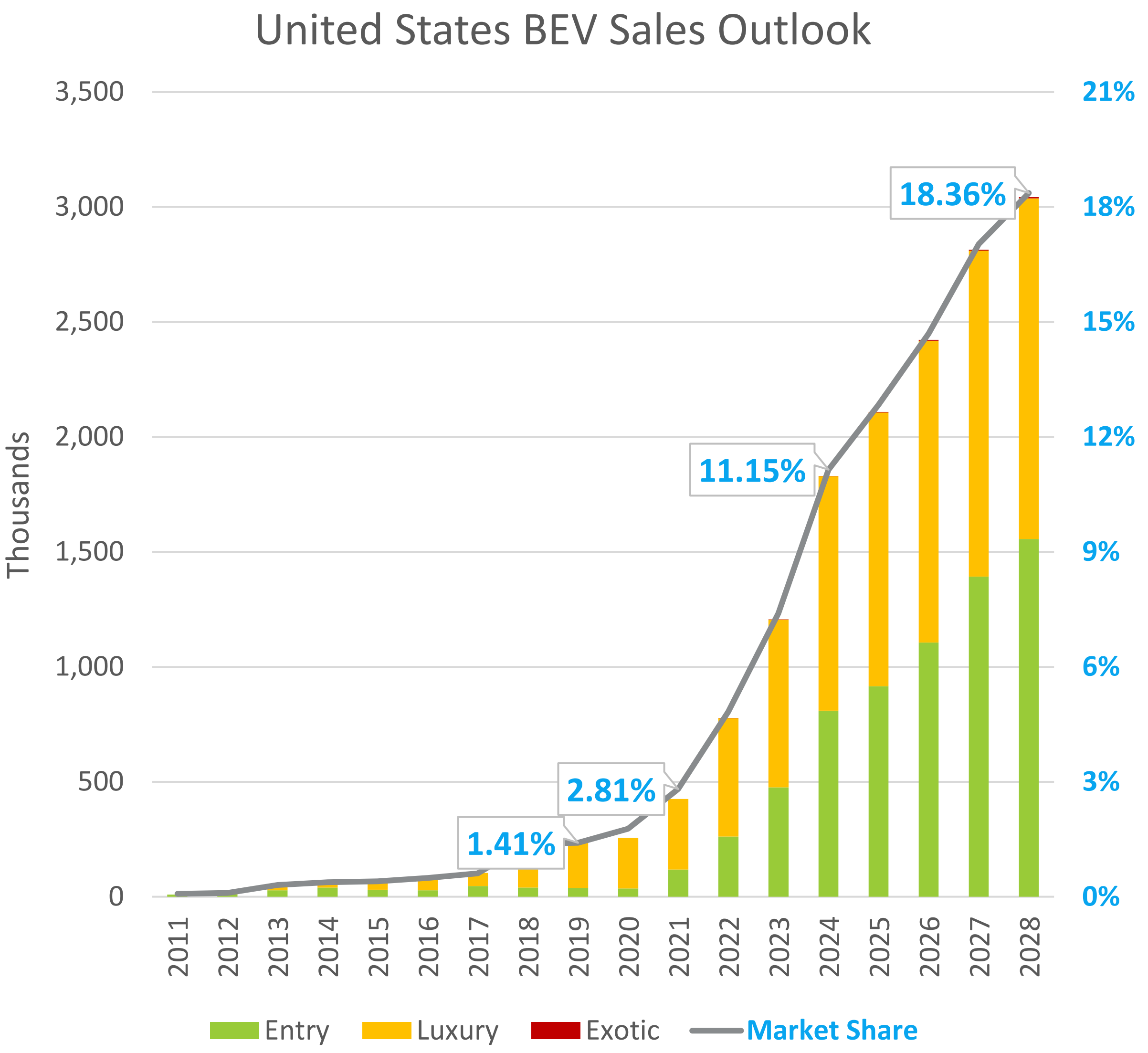
BEV Sales Outlook: United States

Analysis Assumptions:

- Significant uptick starting in 2023
- Growth needs to accelerate to hit any VM-announced BEV targets in 2030+
- Nearly 100% of domestically-built BEVs are sold domestically
  - Proposed U.S. incentives for domestically-produced BEVs will make imports more expensive
  - The list of “known” players with a firm U.S. production footprint is volatile
- Imports largely limited to luxury/low-volume models
  - Existing imported BEVs will grow, potentially to the point where they will may be built domestically



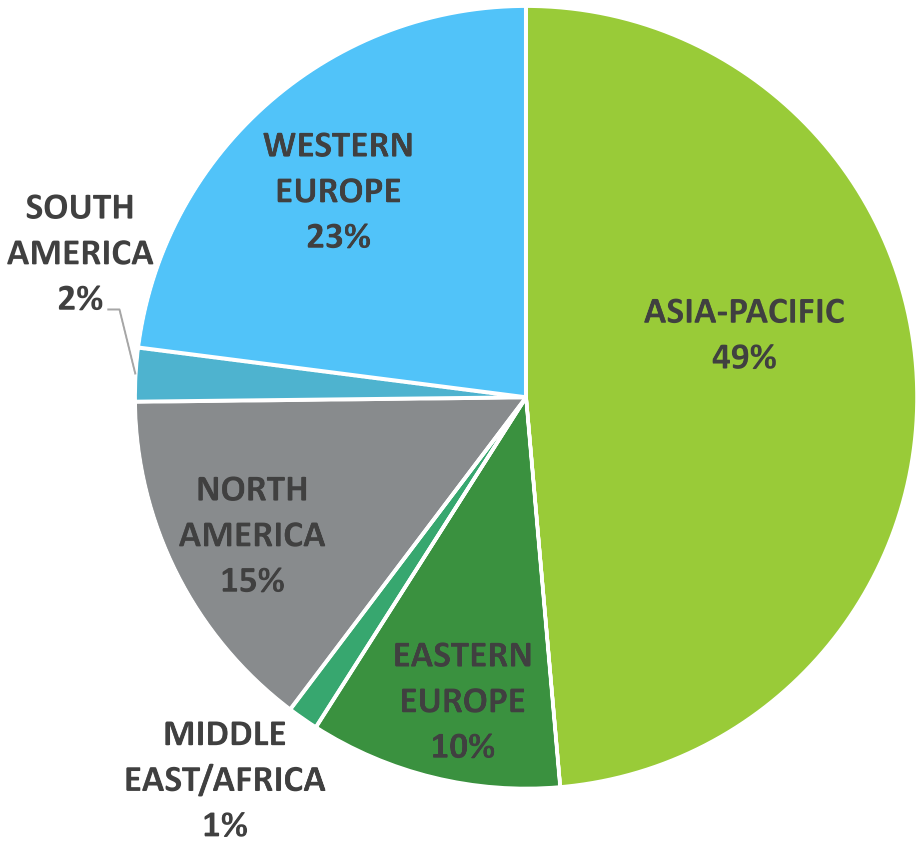
THE GLOBAL IMPERATIVE

Top 10 Global Vehicle Platform Architectures: 2019

Production in 36 Countries representing over 28% of global output

Platform Architecture	Platform Architecture Owner	2019 Vehicle Volume	% of Total Production
MQB	Volkswagen	7.0 million	7.8%
TNGA	Toyota Motor	4.0 million	4.4%
CMF	Renault-Nissan-Mitsubishi	3.0 million	3.3%
KP2	Hyundai Motor	1.9 million	2.1%
CCA	Honda Motor	1.7 million	1.9%
EMP2	Groupe PSA	1.6 million	1.8%
GSP	Honda Motors	1.6 million	1.7%
N	Hyundai Motors	1.5 million	1.7%
MLB	Volkswagen	1.4 million	1.5%
35up	BMW	1.4 million	1.5%
TOTAL		**25.0 million**	**27.8%**

2019 Vehicle Production



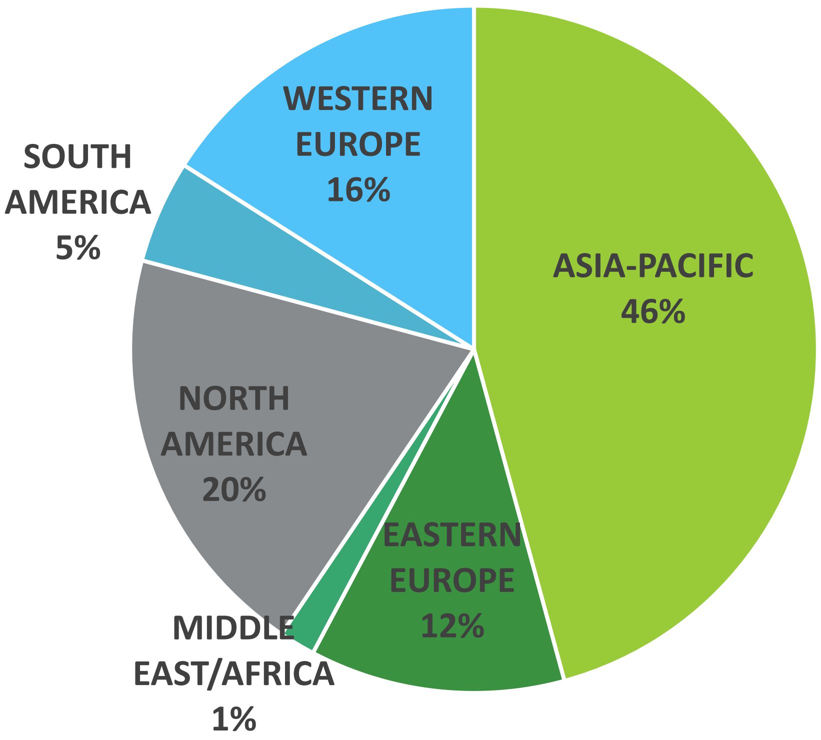
Source: AutoForecast Solutions

Top 10 Global Vehicle Platform Architectures: 2028

Production in 43 Countries representing over 43% of global output

Platform Architecture	Platform Architecture Owner	2028 Vehicle Volume	% of Total Production	% BEV Variants*
TNGA	Toyota Motor	9.5 million	9.8%	1.3%
MQB	Volkswagen	7.8 million	8.1%	0.0%
CMF	Renault-Nissan-Mitsubishi	5.9 million	6.1%	7.2%
Honda Architecture	Honda Motors	4.9 million	5.0%	7.4%
VSS-F	General Motors	2.9 million	3.0%	0.0%
N	Hyundai Motors	2.6 million	2.7%	0.0%
KP2	Hyundai Motors	2.6 million	2.6%	8.4%
EMP2	Groupe PSA	2.5 million	2.6%	0.0%
CMP	Groupe PSA	1.9 million	2.0%	0.3%
CLAR	BMW	1.5 million	1.6%	0.0%
TOTAL		**42.0 million**	**44.2%**	**2.7%**

2028 Vehicle Production



Most have electrified applications and/or BEV versions – NONE are dedicated BEV platform

*Vehicles with 100% BEV powertrain installation rate per Platform Architecture

Source: AutoForecast Solutions

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Final Thoughts

The Changing Landscape

Evaluate current methodologies & rethink how to plan for the future

The Changing Consumer

- Brand loyalty erosion
- Acceptance of a build-to-order strategy to minimize need for trim level pre-builds
- Subscription-based vs. transactional-based purchases
- Socially motivated buying decisions

The China Effect

- It's not "if" but when they will have a North America manufacturing presence
- Electrification and collaboration

Electrification

- Shareholder Value: a too-big-to-fail strategy
- Reduction in parts and manufacturing complexity
  - Labor reduction
  - Tooling reduction
  - Volume reduction

The Existing Customers

- GM and Ford electrifying entire line
- Partnerships & new brands indicate contract manufacturing direction
  - GM and Honda
  - GM BrightDrop
- Stellantis vs old-FCA
  - Moved from last to near-lead in EV space through alliance with former PSA

The New Customer

- EVs and SPAC money provides easier entry of new, unexperienced VMs; all looking for help
  - Elimination of ICE greatly reduces cost and time to market entry
  - Time to be proactive in your planning – reactive approach can limit growth and competitiveness
  - Compressed time to market when you can eliminate the ICE components is a game changer

Source: AutoForecast Solutions

Thank You,

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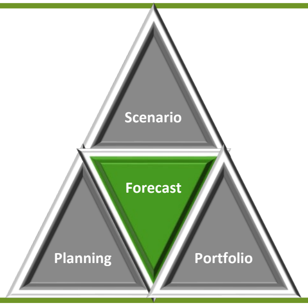
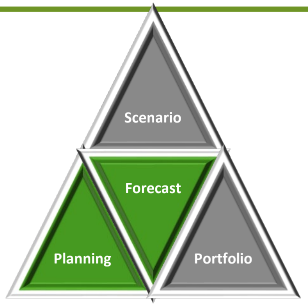
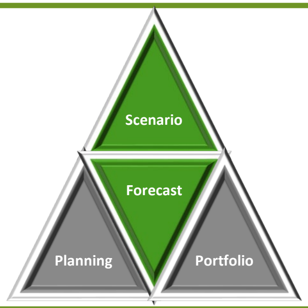


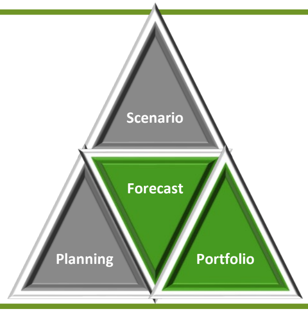
AFS Forecast is a comprehensive automotive production forecast database and at the heart of the AFS value proposition. Detailed monthly vehicle data: *Light Vehicle, Powertrain, Drivetrain, and Alternative Propulsion*. Updated and provided in a user-friendly, web-based, solution; on a monthly basis. Historical production volumes and an eight-year planning window of forecast volumes are updated every month on a global basis – with proven automotive subject matter expertise and support. Supplemental weekly and monthly market reports analyze and pinpoint changes that help improve your company's competitive position.



AFS Planning is a fully integrated quote management and revenue planning solution specifically designed for an automotive supplier. Track and analyze your sales, customers, products, production capacity, and more at a detailed monthly part number level. Used also by the financial and investment community for due diligence and revenue performance analysis.
Your company's global footprint in a live database - integrated directly with the AFS Forecast database for accurate and timely planning, analysis, and opportunity identification. For further intelligence, add-on AFS Scenario.



AFS Scenario is the only tool available in the industry designed to allow the user to create custom light vehicle and powertrain forecasts; on a regional basis for the global automotive market. Adjustments to annual, quarterly, and monthly production volumes can be done from the top down (total region) to the Vehicle/plant level – and all levels in-between (OEM, Platform, Program, etc.). Supported by a full suite of analysis reports to understand forecast changes over time.



AFS Portfolio is designed to allow an organization understand and track their competitive landscape. Customize around your products and services; track your product mix, volumes, competitive position, and identify your market share both from a volume and revenue perspective in the global automotive marketplace. Automatically updated every month to support a proactive approach in strengthening your core operations while identifying opportunities for growth.