
# The EV Transition Begins

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# WHAT WE DO

CENTER FOR AUTOMOTIVE RESEARCH

An independent nonprofit organization producing industry-driven research and fostering dialogue on critical issues facing the automotive industry and its impact on the U.S. economy and society.

| | |
|---|---|
| **RESEARCH** | CAR helps you navigate the uncertain automotive environment through thought-provoking, independent, multi-disciplinary, and unbiased research and analysis of important industry trends and changes. |
| **EVENTS** | CAR hosts industry-driven events to disseminate key research, update stakeholders on critical issues, and foster discussions among thought leaders to share their insights and solutions to meet the challenges of an ever-evolving global automotive industry. |
| **PROGRAMS** | CAR fosters communication and support to promote the auto industry and the issues it faces today by bringing together communities, automakers, suppliers, and technology companies. |

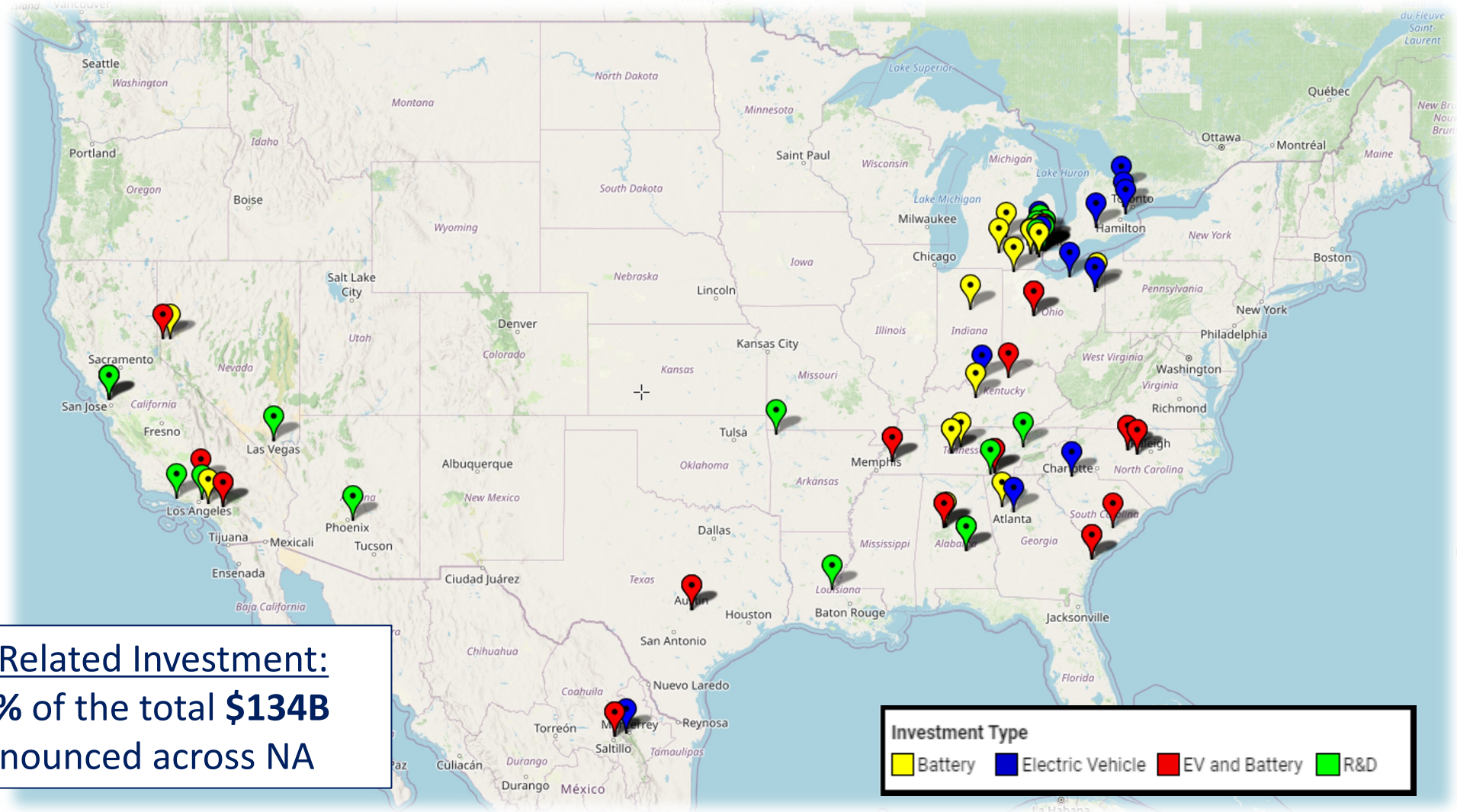
# Agenda:

- EV Transition
- Inflation Reduction Act
- IRA Impact on EVs
- EV Challenges


# EV Transition

# Major North America EV and battery investments by OEMs

## 2019 – 2023 YTD




**EV-Related Investment:**
**87%** of the total **$134B** announced across NA

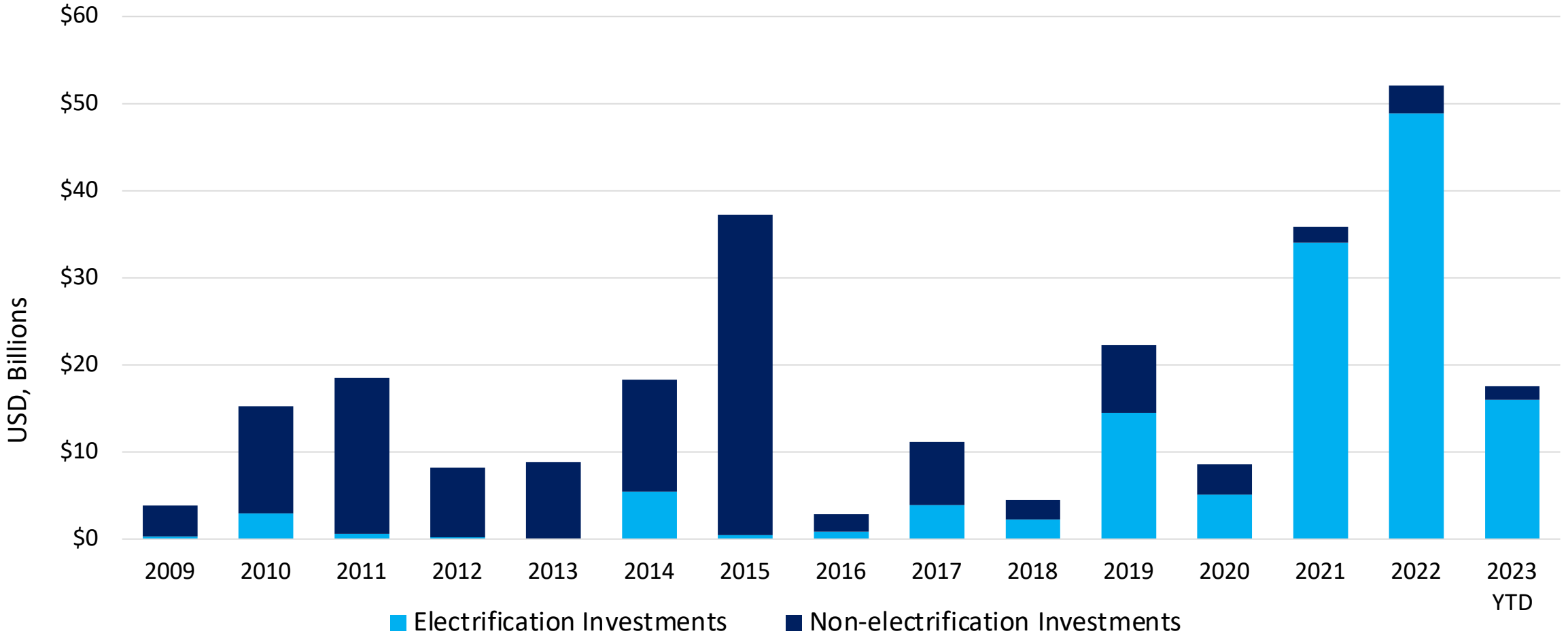


*Source: Book of Deals, Marklines, Center for Automotive Research, GPS Visualizer*

Note: Only Battery, Electric Vehicle, and EV and Battery announcements of over $1.0 billion shown on map

# Announced automaker EV/battery related investments

## North America, 2009 – 2023 YTD

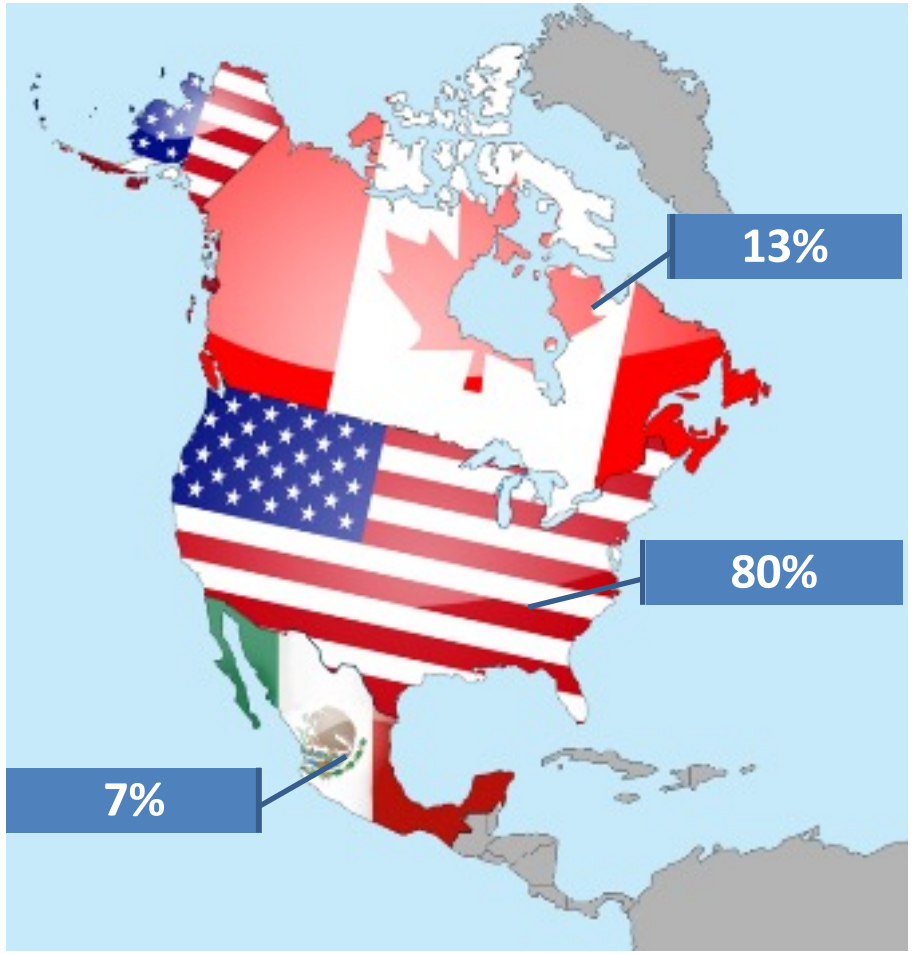





*Source: CAR Book of Deals, 2023*

# Announced automaker EV/battery investment by region
## North America, 2020 – 2023 YTD

| Region | Investment Amount ($USD) |
|---|---|
| Canada | $13.2B |
| United States | $83.8B |
| *U.S. Great Lakes* | $31.6B |
| *South* | $48.0B |
| Mexico | $7.1B |
| **Total** | **$104.2B** |

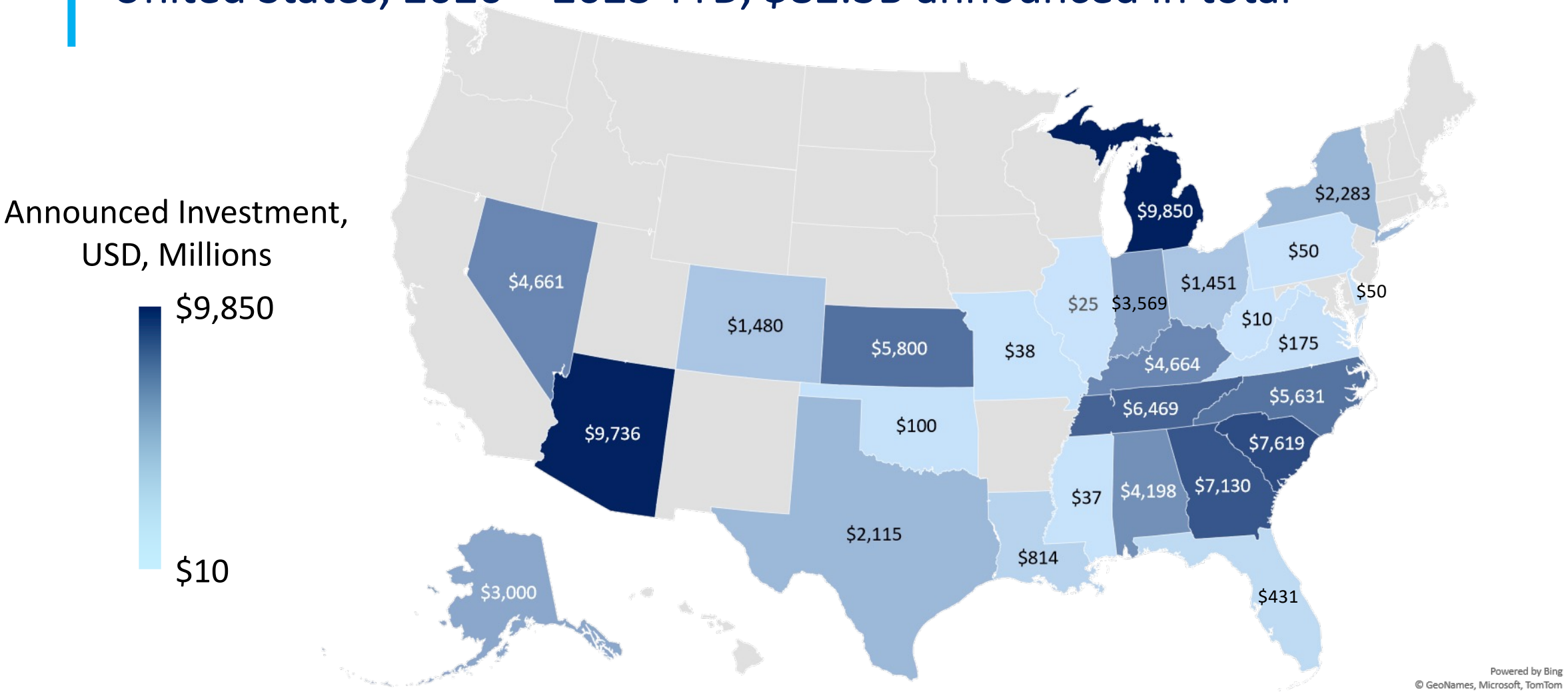



Note: U.S. Great Lakes includes: IL, IN, KY, MI, OH, and MO
South includes: AL, FL, GA, MS, NC, SC, TN, and TX

*Source: CAR Book of Deals, 2023*

# Tracked supplier announced investment

## United States, 2020 – 2023 YTD, $82.3B announced in total



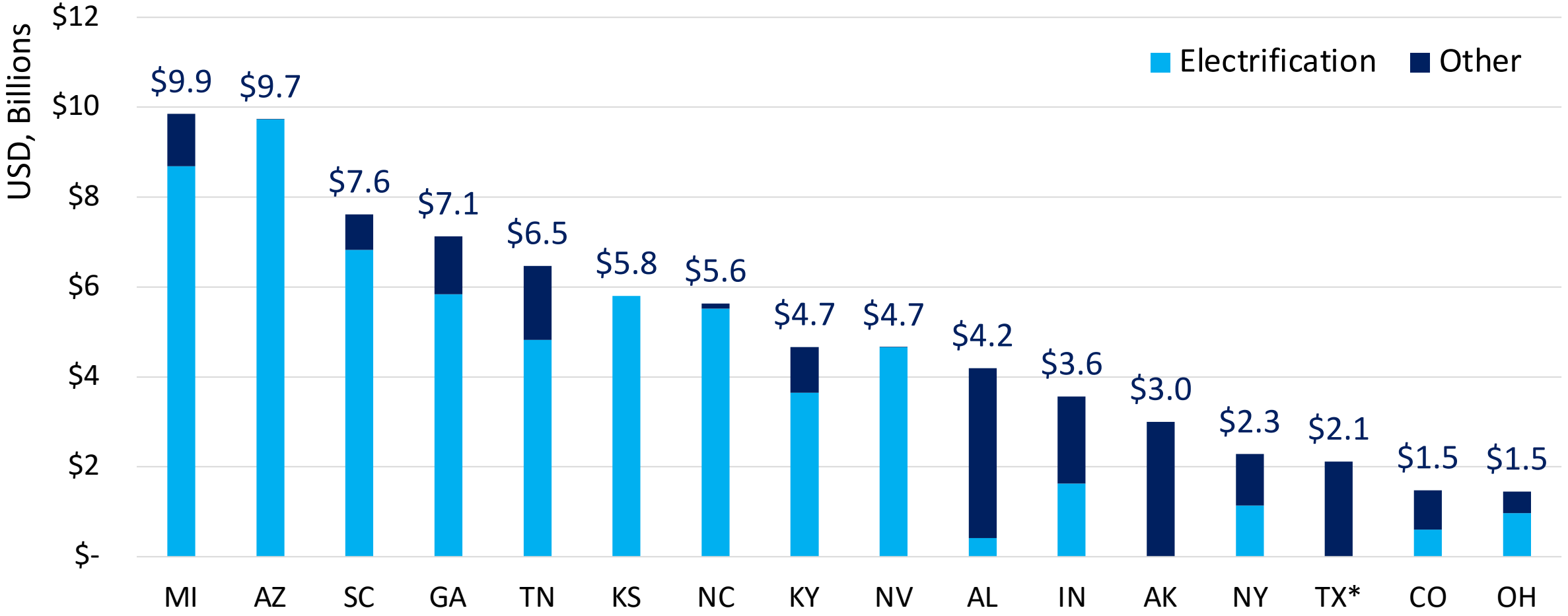

*Not included in chart: $30B in TX over coming decades for a 300-mm semiconductor chip fab, $15B in ID for a memory manufacturing fab, $11B in UT for semiconductor factory*



*Source: CAR Book of Deals, 2023*

# Tracked supplier announced investment

## United States, 2020 – 2023 YTD, over 75% towards electrification




** Not included in chart: $30B in TX over coming decades for a 300-mm semiconductor chip fab, $15B in ID for a memory manufacturing fab, $11B in UT for semiconductor factory*



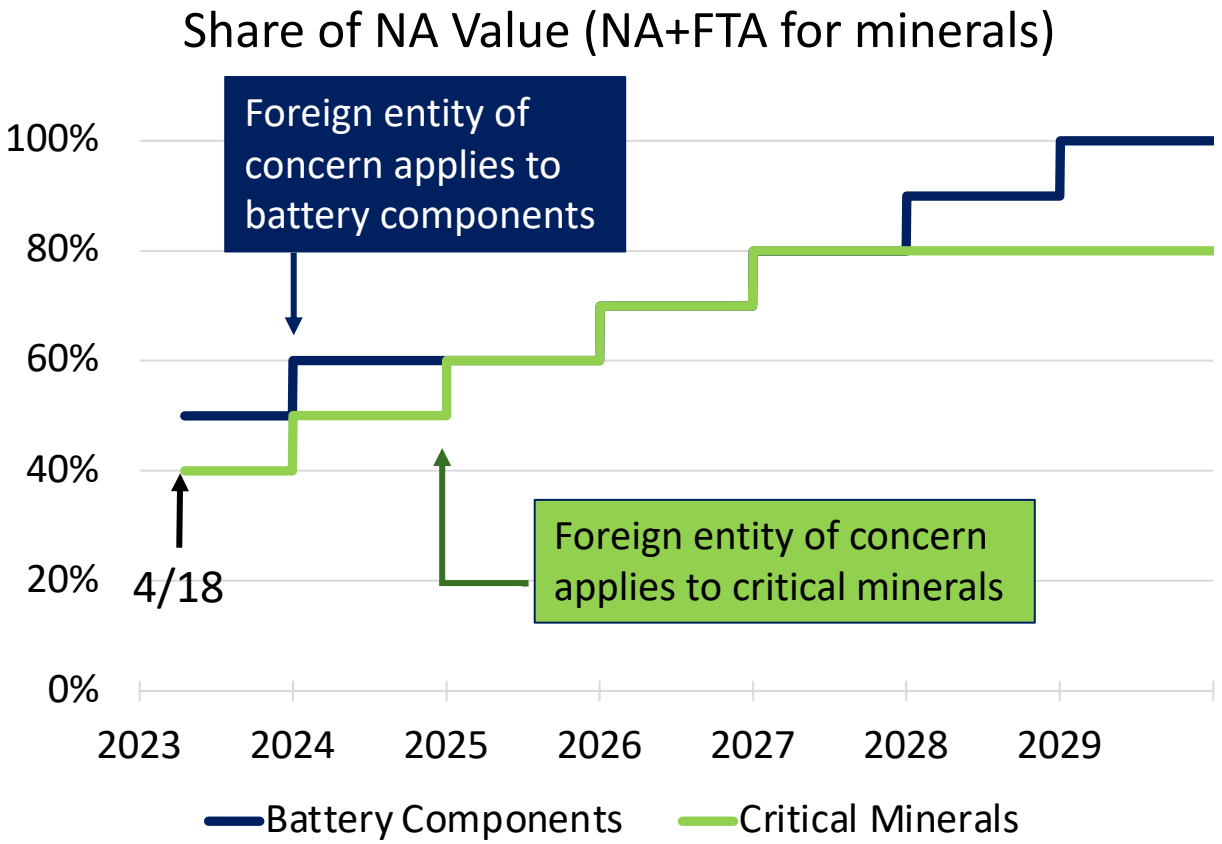
*Source: CAR Book of Deals, 2023*

# Inflation Reduction Act

- Clean Vehicle Credit
- Previously-Owned Clean Vehicles
- Credit for Qualified Commercial Clean Vehicles
- Advanced Manufacturing Production Credit

- **Clean Vehicle Credit (New Vehicles)**
  - Must be made in North America
  - Light-duty vehicle only (under 14,000 lbs.)
  - Up to $7,500 per new vehicle
  - Income and MSRP provisions applied
  - Critical mineral and battery component provisions applied 4/18/23
  - Foreign entity of concern restriction applied (2024, 2025 and after)
  - Available through 2032. No quota limit

# Clean New Vehicle Credit: Sourcing and MSRP requirements




| Vehicle Type | MSRP Cap |
|---|---|
|  Van | <$80,000 |
|  Sport Utility Vehicles | <$80,000 |
|  Truck | <$80,000 |
|  Passenger Vehicles | <$55,000 |

# Inflation Reduction Act

- Clean Vehicle Credit
- Previously-Owned Clean Vehicles
- Credit for Qualified Commercial Clean Vehicles
- Advanced Manufacturing Production Credit

- **Previously-Owned Clean Vehicles Credit**
  - Up to $4,000 credit
  - Must be purchased through a qualified auto dealer
  - Income provision applied
  - Vehicle price < $25,000
- **Credit for Qualified Commercial Clean Vehicles**
  - Light-duty vehicles up to $7,500
  - Rental and leased vehicles qualify
  - No income, MSRP, battery, or critical mineral provisions
  - No foreign entity of concern provision
  - Vehicles made outside of NA qualify

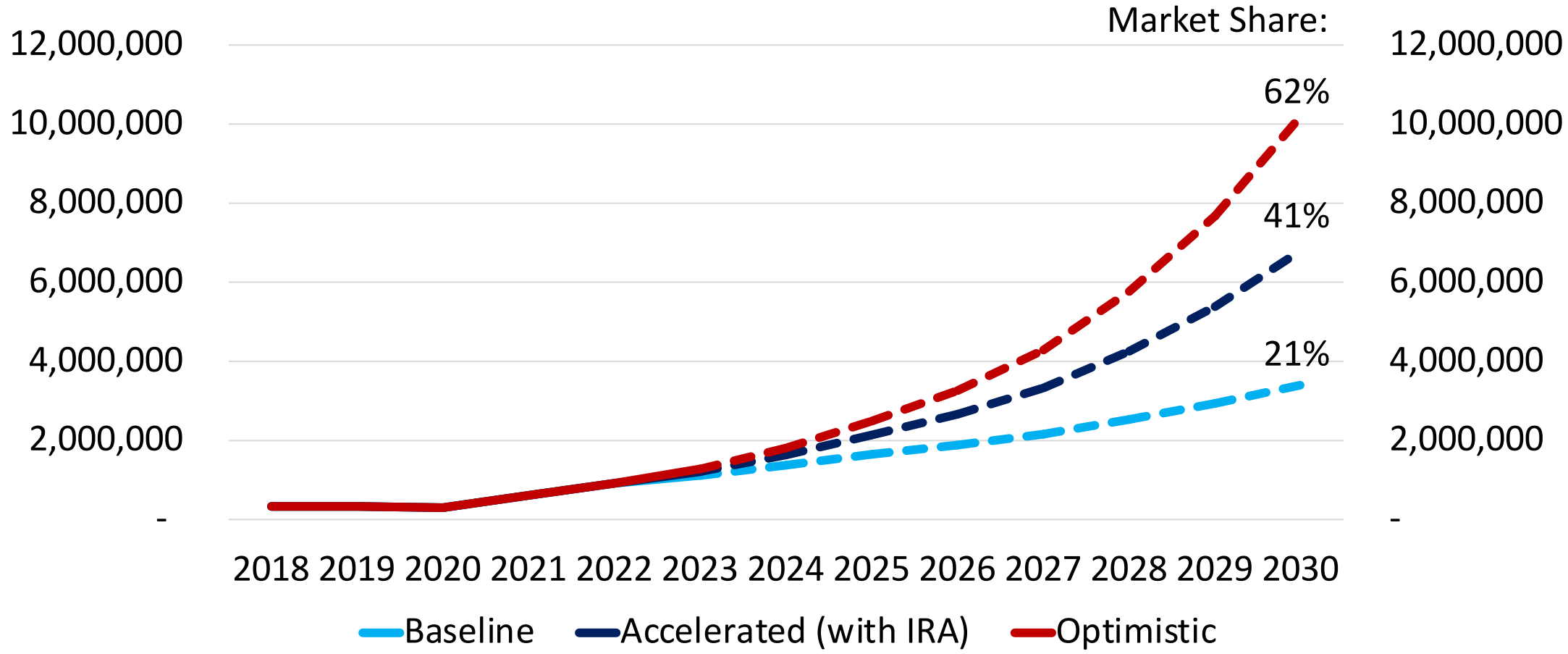
# Inflation Reduction Act

- Clean Vehicle Credit
- Previously-Owned Clean Vehicles
- Credit for Qualified Commercial Clean Vehicles
- Advanced Manufacturing Production Credit

- **Advanced Manufacturing Production Credit**
  - Credit is refundable
  - Battery Cell – $35 per kWh
  - Battery Module – $10 per kWh
  - Battery Module not using cells – $45 per kWh
  - Electrode Active Materials – 10% of production cost

# US electric vehicle sales

## 2018 – 2022 Actual; 2023 – 2030 Forecast




*Electric Vehicle: BEVs and PHEVs*

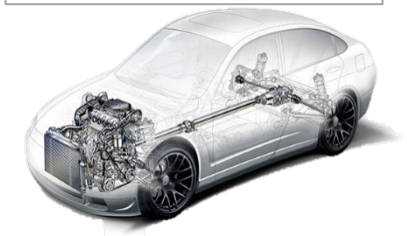


*Source: Center for Automotive Research*

# BEV drivetrain

## Important $ content implications for suppliers

ICE Example @ $35,000 MSRP Passenger Car



### Major Systems Affected by Transitioning to BEV


| | Est. $ Impact per Vehicle |
|---|---|
| Axles, driveshafts & auxiliary components (Reduced content) | ↓ $300 |
| Exhaust system (Eliminated) | ↓ $400 |
| Fuel system (Eliminated) | ↓ $500 |
| Clutches, planetary gears & torque converter replaced with electric drives | ↓ $500 net |
| Engine (Eliminated) | ↓ $4,500 |
| Power electronics & high-voltage electrical architecture (Added) | ↑ $3,000 |
| Battery pack (Added) | ↑ $10,000 |
| Body structures (increased content), infotainment (upgraded), safety (upgraded), Climate Ctrl. (upgraded) | ↑ $2,000 |



*Source: BofA Global Research, Intellicosting LLC , Wolfe Research & CAR analysis; Note- For illustrative purposes & figures rounded. to the nearest $100 Light trucks & performance models could differ significantly.*

# EV Challenges

- **EVs 500-1000 kg heavier than ICE**
  - Tire composition and design
  - Vehicle crash characteristics
- **Battery repair, replacement, recycling**
- **EV charging infrastructure build out lagging**
  - Safe location
  - Maintained and operational
  - Accessibility
- **Affordable & profitable?**
  - Giga press
  - Electric motors
  - Component integration

# Summary

- **Unprecedented investment in EV across North America 2018 - 2023**
- **IRA new guidance: critical mineral and battery components**
- **EV sales forecasted to exceed 30% in 2030**
- **OEMs looking for innovative solutions for reducing weight and cost**


# Thank you!