

# Prospects for AGM Lead-Acid Battery Demand Growth

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## CLARIOS: THE WORLD LEADER IN ENERGY STORAGE FOR LOW-VOLTAGE

#1

Global Market Position

~4X

Larger than the Closest Competitor  
Based on Production Volume

1 IN 3

Vehicles Powered by a Clarios  
Battery Worldwide

150M+

Batteries Sold Annually

100+

Countries Supplied by Our Volume  
Globally

~80%

Of Sales Focused on Highly Resilient  
and Reoccurring Sales in the  
Aftermarket Channel

UP TO 100%

Of the Materials in Our Batteries  
can be Recovered, Recycled and  
Reused

130+

Year Tradition of Innovation  
and Growth

7 IN 10

Start-Stop Vehicles in Europe  
have a Clarios AGM Battery

CLARIOS BRANDS

VARTA

LTH

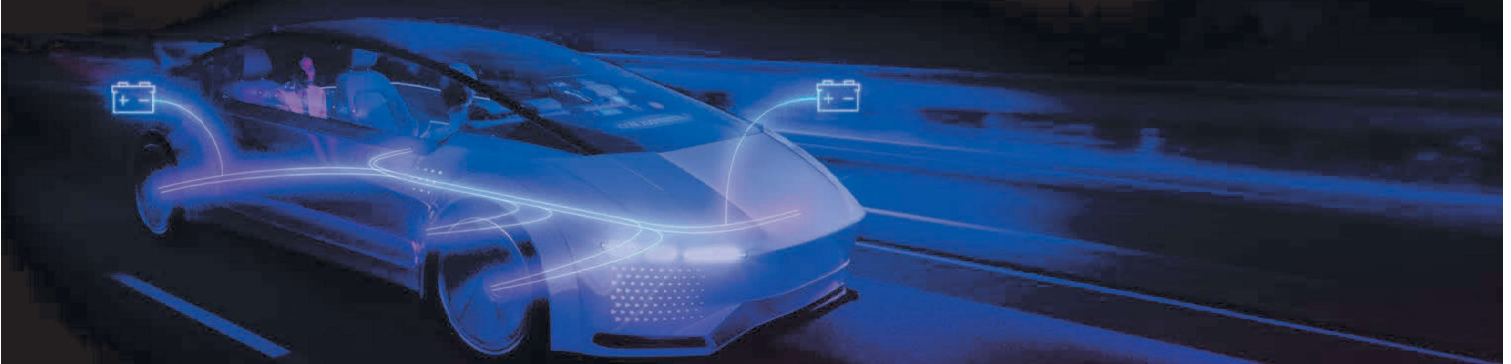
Delkor

Heliar

OPTIMA  
BATTERIES



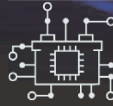
**AS WE LOOK TO THE FUTURE, OUR INDUSTRY IS BEING TRANSFORMED BY THREE KEY TRENDS:**



**The low-voltage power system is essential for next wave of automotive innovation.**



ELECTRIFICATION



DIGITALIZATION



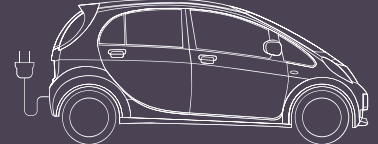
CIRCULARITY

**LOW-VOLTAGE BATTERIES ARE ESSENTIAL FOR ALL VEHICLE POWERTRAINS**

ICE

HYBRID

BATTERY ELECTRIC VEHICLE



**Cranking and Enable fuel-saving functions (Start-Stop)**

**Ensure optimum performance in and provide constant power for crucial safety and comfort functions**

# SHIFT TO SOFTWARE DEFINED VEHICLES HAS SIGNIFICANT IMPLICATION ON THE LOW-VOLTAGE SYSTEM

## To meet the Increasing Power demand for:


1. Critical Safety Requirements
2. Enhanced User Experiences
  - Demand for Peak Power Vehicle Requirements have Increased +50% over last 10 Years

## Future Projections

- Expected to drive a further 15% CAGR in power consumption needs (2022 – 2030)



## Therefore ....

1. Continuing the trend for Electrical Content in our vehicles
2. Need to install multiple advanced low-voltage batteries in one vehicle to meet these power needs. 



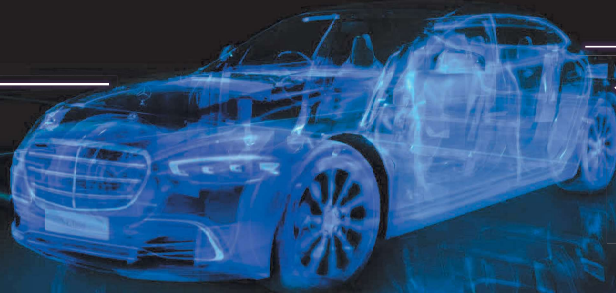
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## NEW GENERATION LUXURY SEDAN Example

### \*\* Multiple Advanced Low Voltage Battery System

#### 48V Li-ion

Starter Battery  
Electrical Boost  
Regenerative Braking Energy Storage  
12V loads – Ignition on via DC/DC



#### 12V AGM

Safety / ADAS System Redundancy

#### 12V AGM

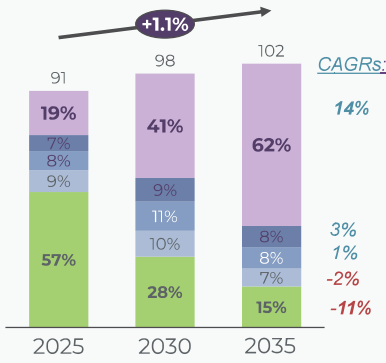
12V loads – Car Parked / Ignition Off  
i.e. Security System, Infotainment, Over the Air Updates,

**Clarios expects the global demand for advanced low-voltage systems will grow by 7% per year till 2030.**

# Long-term Automotive Industry Trends: 2035

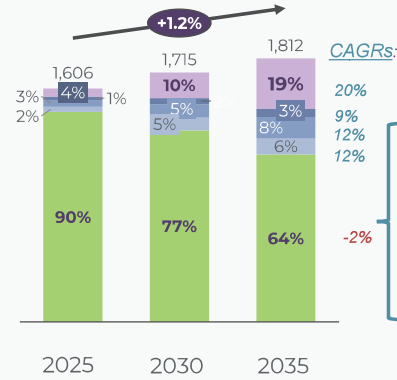
## Global New Vehicle Production: Full Electric vehicles growing at 14% p.a.

Units in millions



## Global Car Parc: Majority ICE through 2035

Units in millions



**What about Fully Electric (BEV)?**

**ICE and Hybrids = Lead Acid battery (~80% Car Parc) And some vehicles w/more than one!**

■ BEV ■ PHEV ■ HEV ■ mHEV ■ ICE (w/ Start-Stop)

Source: S&P Global plus Clarios internal analysis

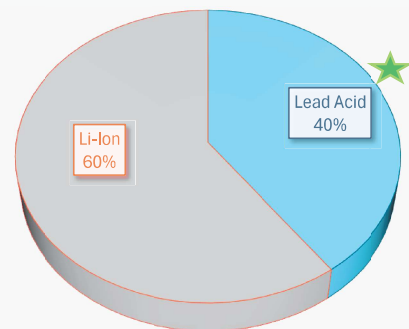
## Fully Electric Low Voltage Battery System

Expectations of Different Technologies By Region by 2035

Americas	~65%/35% AGM/SLI vs Li-Ion	Pb
Japan	~75%/25% SLI/AGM vs Li-Ion	Pb
Europe/EMEA	~20%/80% AGM vs Li-Ion	!?
China/Korea	~15%/85% AGM vs Li-Ion	

**What about Fully Electric (BEV)?**

### BEV BATTERY TECHNOLOGY 2035



#### Lead-Acid Advantages vs Li-Ion

- Battery Voltage Range
- Maximum Battery Temperature
- Established Supply Base
- Battery Voltage Range
- **Cost**

★.....But Lead will still have a place in BEV Low voltage system in the next decade +

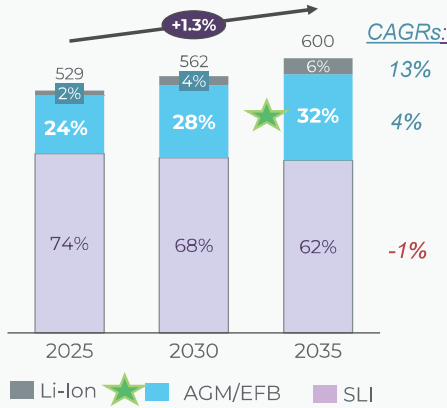
# Long-term Automotive Industry Trends

Advanced battery demand will continue to grow to meet the needs of the vehicles for today and tomorrow



## Global Battery Sales by Technology: Adv. Batteries (Li-Ion & AGM) driving growth

Units in millions



>90% of Battery Sales will still be Lead-Acid in 2035

With significant Increase in share of AGM/EFB!  
**Why is this good for Lead??**

### EFB Auto



~+35% in Pb Content vs Traditional SLI

### AGM Auto



~+60% in Pb Content vs Traditional SLI

Source: S&P Global plus Clarios internal analysis

# Heavy Duty Industry Trends



Growing Industry Also requiring greater Power Source and more Sustainable solution

- 1. More driver assistance technology:**
  - Safety features such as lane departure alerts, forward-collision avoidance and autonomous emergency braking
- 2. More creature comforts for Long-haul truckers: While engine is off...**
  - Power for heating/cooling as well as smartphones, tablets, microwave ovens and more.
  - Industry and regulatory requirements to reduce idling mean trucks need batteries that allow for deeper discharge.
- 3. More regulation:**
  - Regulatory requirements and sustainability expectations are rising as rapidly as power loads.
  - Vehicle manufacturers and fleet owners seek to reduce carbon dioxide emissions even as operating hours increase

Therefore.....AGM Heavy Duty Batteries Introduced Into the Industry in 2020

## Heavy Duty Industry Trends

### AGM Heavy Duty



~+65% in Pb Content vs Traditional SLI



\*\*\* Li-Ion Technology introduced at as **much slower/lower rate** in the OEMs than vs Automotive and **not** expected to take significant share in the next decade

### ...And the Global Market has a Positive Growth Projection

- Annual Growth rate (CAGR) of 5-7% expected until 2031

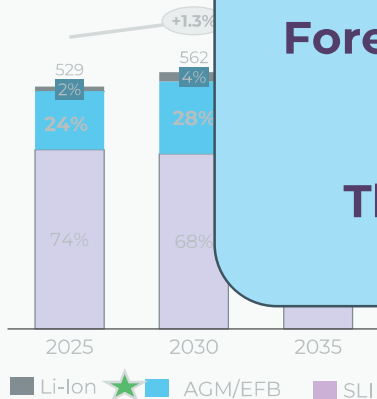
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Global Battery Sales by Technology:  
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Units in millions



**Global Automotive and HD Market Forecasted Lead Demand by 2035**  
**>13% or >700k MTs**

**Through Volume Increases & Technology Shift**

Why is this good for Lead??



+5% in Pb Content vs Traditional SLI

+60% in Pb Content vs Traditional SLI

# Clarios AGM Investments in Europe ~€200m

## Main Investments in Germany

- Investments Started 2022 – Target Completion 2026
- Will increase Clarios AGM production by +~50% by 2026
- Creation of 150 New Jobs



Major Investments also being made in Americas and China!

## In Summary.....

- Increase to Fully Electric Vehicles will not be the death of Lead

### And Due to positive outlook in.....

- ✓ More vehicles with multi-battery LV systems
- ✓ Automotive Technology Shift (>AGM): More Pb/Battery
- ✓ Heavy Duty Technology Shift (>AGM) : More Pb/Battery
  - ✓ w/Investments being made by the Industry to add capacity
- ✓ Higher expected Global Car / HD Parc
- ✓ BEV's still requesting lead-acid batteries

## In Summary.....

CLARIOS

### ➤ Increase to of Lead

### And Due to po

- ✓ More vehic
- ✓ Automotiv
- ✓ Heavy Dut
- ✓ w/Inves
- ✓ Higher exp
- ✓ BEV's still



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CLARIOS

# Thank you!

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## AGM stands for Absorbent Glass Mat

- The electrolyte is bound within a glass fibre mat.
  - This prevents electrolyte stratification, the main cause of faults in lead starter batteries.....this significantly increases service life.
  - An additional benefit of AGM technology is the very high charging capacity.