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EV Batteries – Risks and Mitigations for Vehicle Remarketers and their Ecosystem

Altelium is a battery-focused Insurtech underpinned by battery data analytics

Who are we

- Insurtech largely focused on the lithium-ion battery insurance market
- Partnership with multiple 'A' rated insurers
- Selected by Lloyds Lab (part of Lloyds of London) for its incubation programme
- InnovateUK award winner

Products

- EV battery OEM, Extended and Enhanced insured Warranties
- EV battery – health reports to dealers and vehicle owners/drivers
- Liability insurance for the battery value chain
- Innovations: EV V2X warranties and BESS warranties using EV 2nd life batteries

Clients

- Manufacturers: EV (domestic and commercial), Battery cell, BESS and Battery integrators
- Asset owners and distributors: EV dealers, fleet owners, leasing companies, energy companies, BESS developers, owners and operators
- Insurers, broker networks and various on/offline service providers and intermediaries

Tech platform

- Proprietary end-to-end insurance and warranty management platform driven by data analytics, battery and actuarial expertise
- Use of real-time data to drive pricing and claims for batteries

Experience

- Over 100 years of insurance experience across engineering lines and warranties
- Big data analytics team
- Battery research, wind turbine and engineering expert

Academic Partnership

- Battery science, AI and academic partnership with Energy Lancaster, Newcastle University and Duisberg
- Battery laboratory to test batteries and cells to inform proprietary algorithms and software

Batteries – What can go wrong?

Battery can fail in a variety of ways...

Type of Breakdown



Accelerated Performance Degradation



Electrical and Mechanical Breakdown

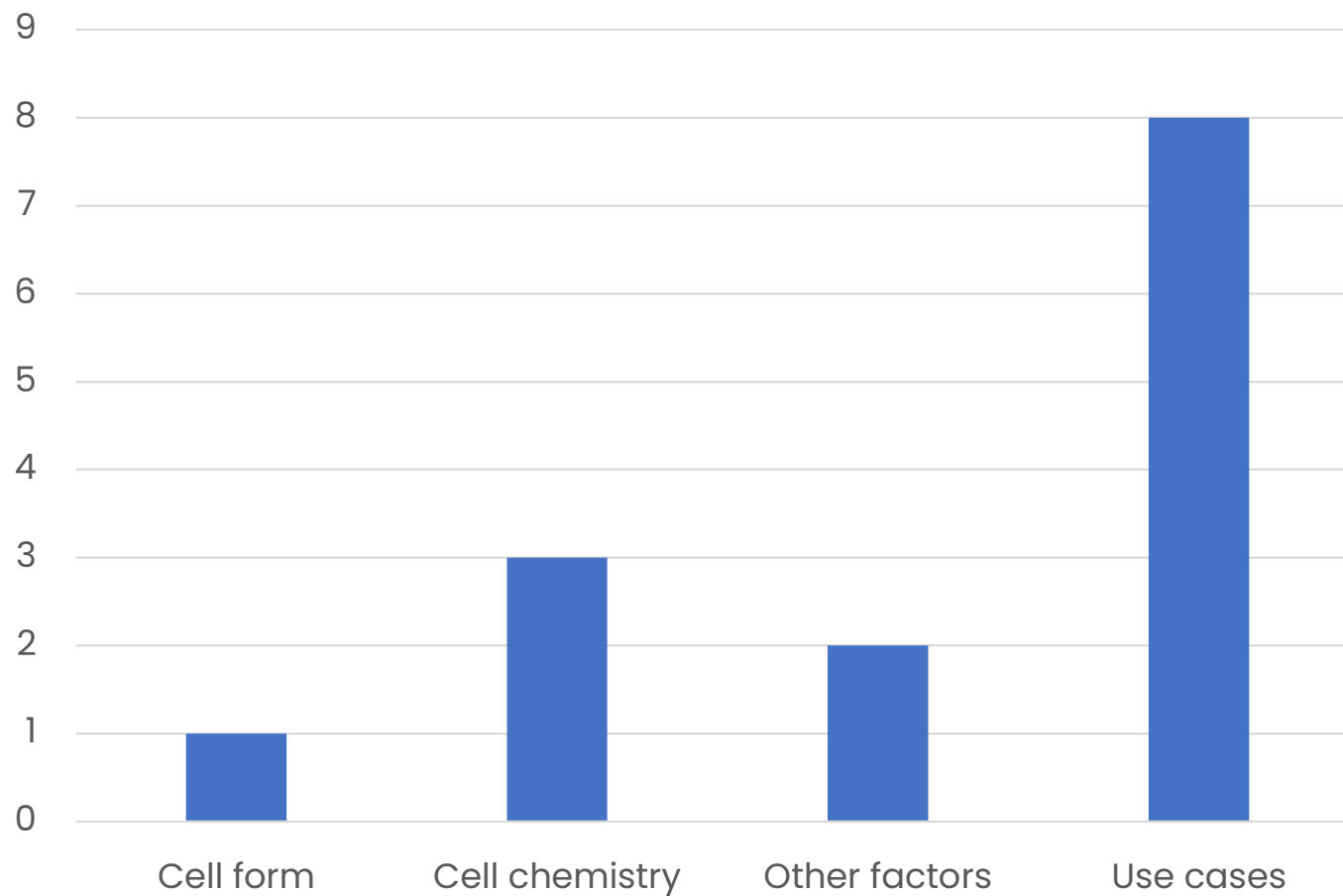


Safety / Fire Issues

Explanation

- Highly variable degradation based on EV usage and battery type / chemistry
 - Battery State of Health degrades quicker than expected for battery type
 - Residual value of the EV is driven by the battery capacity
 - Typically happens slowly overtime but can also happen quickly
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- Part failure of the battery and / or battery management system due to electrical and/or mechanical breakdown
 - Can happen very suddenly and can be difficult to predict
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- EVs / BESS: Battery cells heat up leading to thermal runaway resulting in battery fire or in certain circumstances an explosion following a fire
 - Difficult to predict

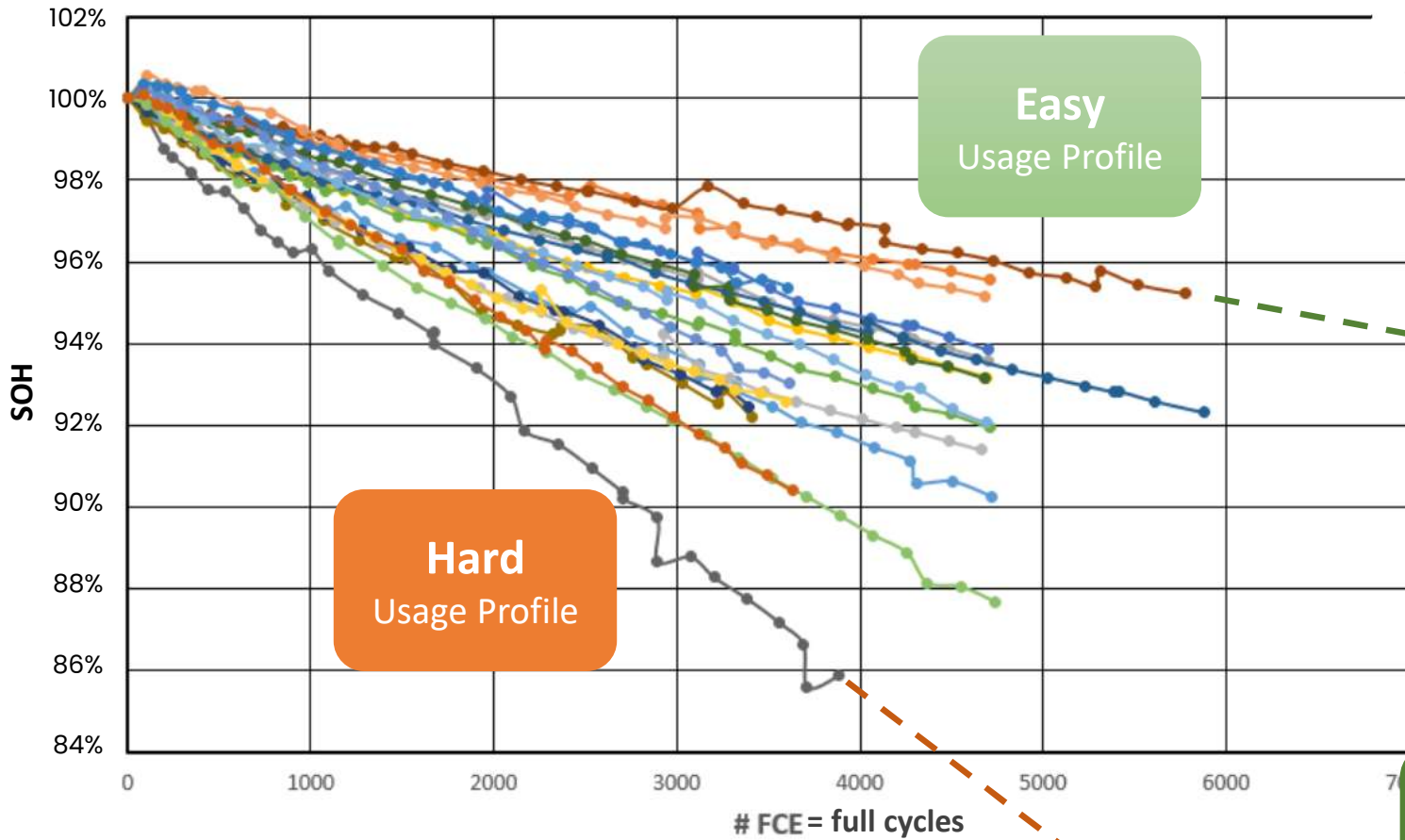
Indicative significance of factors affecting cyclic ageing



Performance degradation – real life



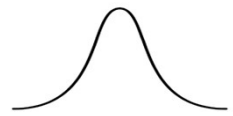
Capacity / Range Retention



Standard Automotive Cell

~15 years
till end of life

+400%



Significant
Variation
Expected

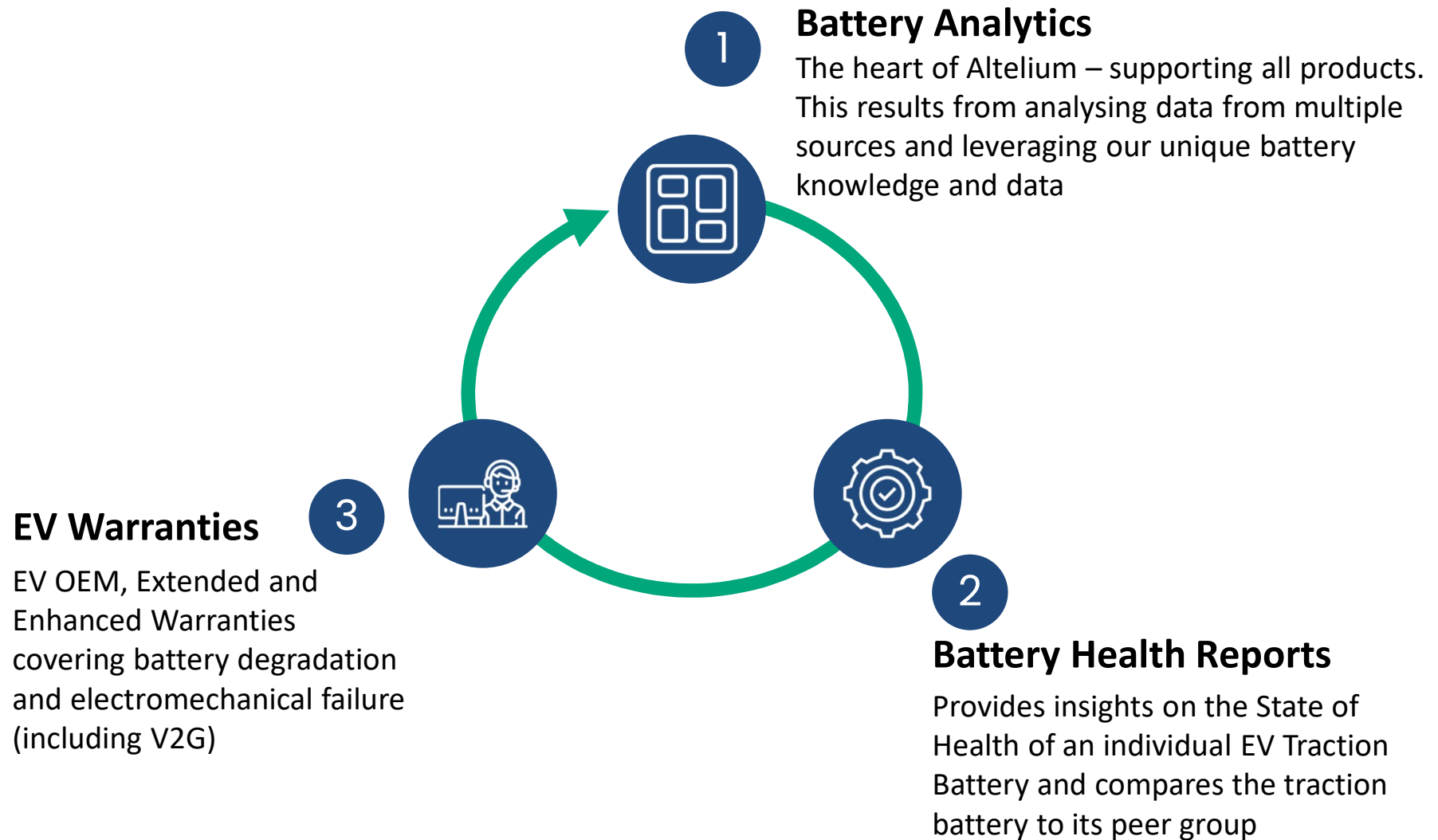
~4 years
till 80% EOL

Battery degradation is important

BUT

Battery degradation **DATA,**
ANALYTICS
and **UNDERSTANDING**
ARE ESSENTIAL

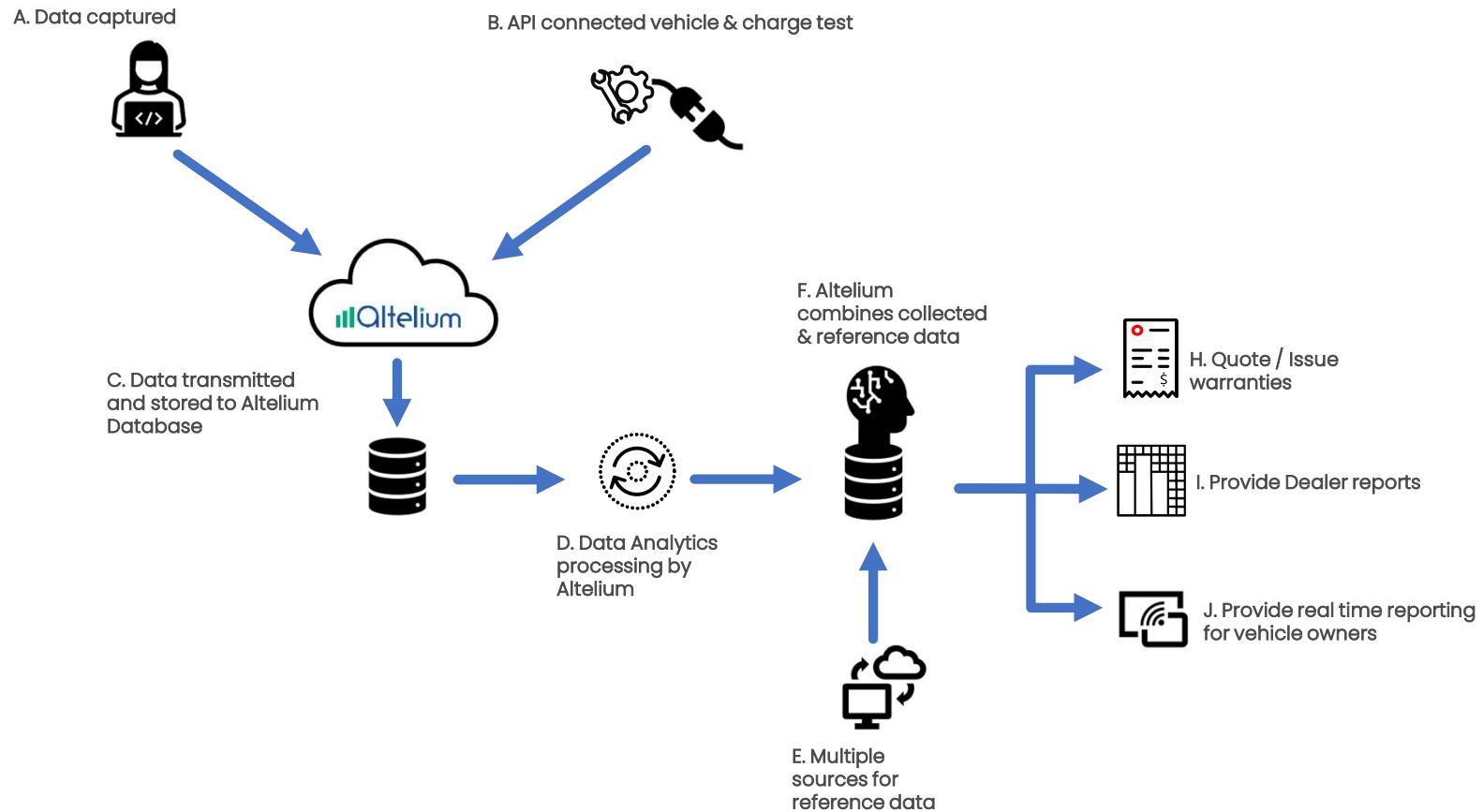
Altium's 3 Pillars of Battery Confidence



Methodology

Technology Overview

Our end-to-end tech platform enables the analysis of individual EV batteries on dealer forecourts, the provision of dealer reports and real-time reporting to vehicle owners.



Dealer Report

Altelium Hello Dealer! HOME EXPORT

2016 Nissan Leaf
 VIN: SJNFAZE0U6054537
 Reg. No.: IK09221
 Reg. Date: 03/03/2016

BEV OR PHEV: BEV
 COUNTRY OF MANUFACTURE: United Kingdom
 WARRANTY-YEARS REMAINING: Expired
 WARRANTY-MILES REMAINING: Expired

VEHICLE AGE: 7 year(s)
 ODOMETER: 45121 miles

Date created: 10/03/2023 18:22
 Expiry date: 10/03/2023 18:42

STATE OF HEALTH

The estimated state of health of the battery from capacity perspective compared to when new.



Current Capacity: 18.5 kWh

BATTERY HEALTH COMPARISON

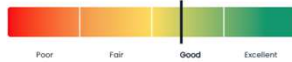
Comparison of the usable battery capacity with the average of vehicles of the same make and model with similar age and mileage.



The capacity of this battery is within the expected range for its age and mileage.

ALTELIUM BATTERY RATING

Altelium's assessment of battery condition and expected future performance*. Excellent or Good scores result in a service contract discount.



*The Altelium Battery Rating takes into account over a dozen factors from battery data, vehicle specs and degradation models to give an indication of the overall condition of an EV battery and how it is expected to perform in the future.

CHARGING INFO

	Slow	Standard	Fast
Charge Port	-	Type 1	CHAdeMO
Charge Power	3.3 kW AC	3.3 kW AC	46 kW DC
Charge Time	8h0m (0% to 80% SOC*)	8h0m (0% to 80% SOC*)	0h27m (0% to 80% SOC*)
Max range added per hour	17 miles	17 miles	210 miles

*SOC = State of Charge
 **A 7-pin plug will usually charge at under 3kW; a wall charger between 3kW and 22kW and a public charger at over 22kW up to 350kW with the right charger and compatible vehicle.

OVERALL RANGE

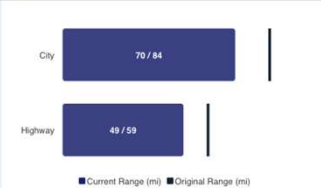


MILD WEATHER ESTIMATED RANGE



Current estimated range for varying conditions. Actual range will depend on many factors including driving style, external temperature and air-condition usage.

COLD WEATHER ESTIMATED RANGE



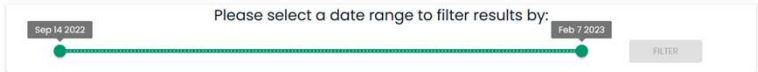
Current estimated range for varying conditions. Actual range will depend on many factors including driving style, external temperature and air-condition usage.

EV Insights

Altelium HOME

2022 Tesla Model Y
 VIN: LRWYGCEK9NC415816
 VEHICLE TYPE: BEV
 ODOMETER: 4809

MANUFACTURE LOCATION: 1050 Bing St, San Carlos CA 94070-5326, USA



55 Total Charges
 1598kwh

31 Slow Charges
 704.49kwh

24 Rapid Charges
 893.51kwh

Stress Level Over Time

You can protect your battery from stress (and extend its life) by avoiding rapid charging, minimising time spent at very high or low SOCs, and protecting your vehicle from extreme temperatures.



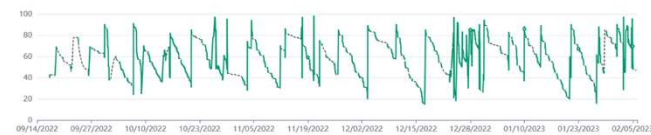
Overall Stress Level

This shows a summary of how much stress your vehicle battery has been exposed to while we've been monitoring it.



SoC (State of Charge) Levels Over Time

The State of Charge is how full your battery is at any given time. We measure your battery several times per day in order to determine the health status of the battery.



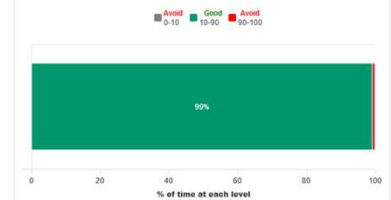
Number of Slow vs Rapid Charges Performed

Rapid charging reduces battery life. It is good practice to slow charge the vehicle whenever possible.



Percentage of Time Spent at Different SoC Ranges

Battery life is reduced when it operates outside its limits. It is good practice to avoid having the battery staying fully charged or completely discharged for a long time.



We provide Dealer Extended Warranties, Dealer Reports and EV Insights

Altium provides EV Warranty solutions across the EV ecosystem for OEMs, Dealers, Leasing Companies, Fleets and Battery Cell OEMs. Our solutions include customer centric Dealer Reports and EV Insights for EV Drivers.

EV OEM + Extended Warranty

Product: Battery data-driven OEM and Extended warranty

Coverages: Electrical and Mechanical Breakdown and Performance Breakdown (battery degradation risk)

Client: EV OEM / Dealer / fleet / leasing company

Benefits:

- Balance sheets protection
- Reduced buyer finance costs
- Increased buyer confidence
- Increased battery residual value

EV Liability Products

Product: Public Liability and Product Liability etc

Client: EV OEM / Dealer / fleet / leasing company

EV Dealer Report + EV Insights

EV Dealer Report

Benefit:

- Purchasing and pricing accuracy
- Ability to assess EV batteries
 - SoH and battery quality etc.

EV Insights for EV Owners as part of extended warranty

Benefit:

- Battery health reports
- Tips to prolong battery life
- Rewards program

- Batteries
 - Range
 - Failures
 - Lifespan
 - Values
 - Confidence
 - Limited historical performance data
 - Balance Sheets
 - Supply chain
 - Macro-environment – pandemic, war, energy costs, etc.
 - Legacy OEM viability
 - Chinese competition
 - Changes to the structure and business models of the industry
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1. Monitor, analyse and share data as much as possible
 2. Generate and share EV battery reports to build consumer confidence
 3. Link report findings to incentives
 4. Reduce risk profiles by deploying 'A' rated insurance capital wherever possible e.g. extended warranties
 - a. Improve "bankability"
 - b. Strengthen Balance Sheets
 - c. Lower the cost of capital
 - d. Improve consumer confidence especially in the second hand market
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