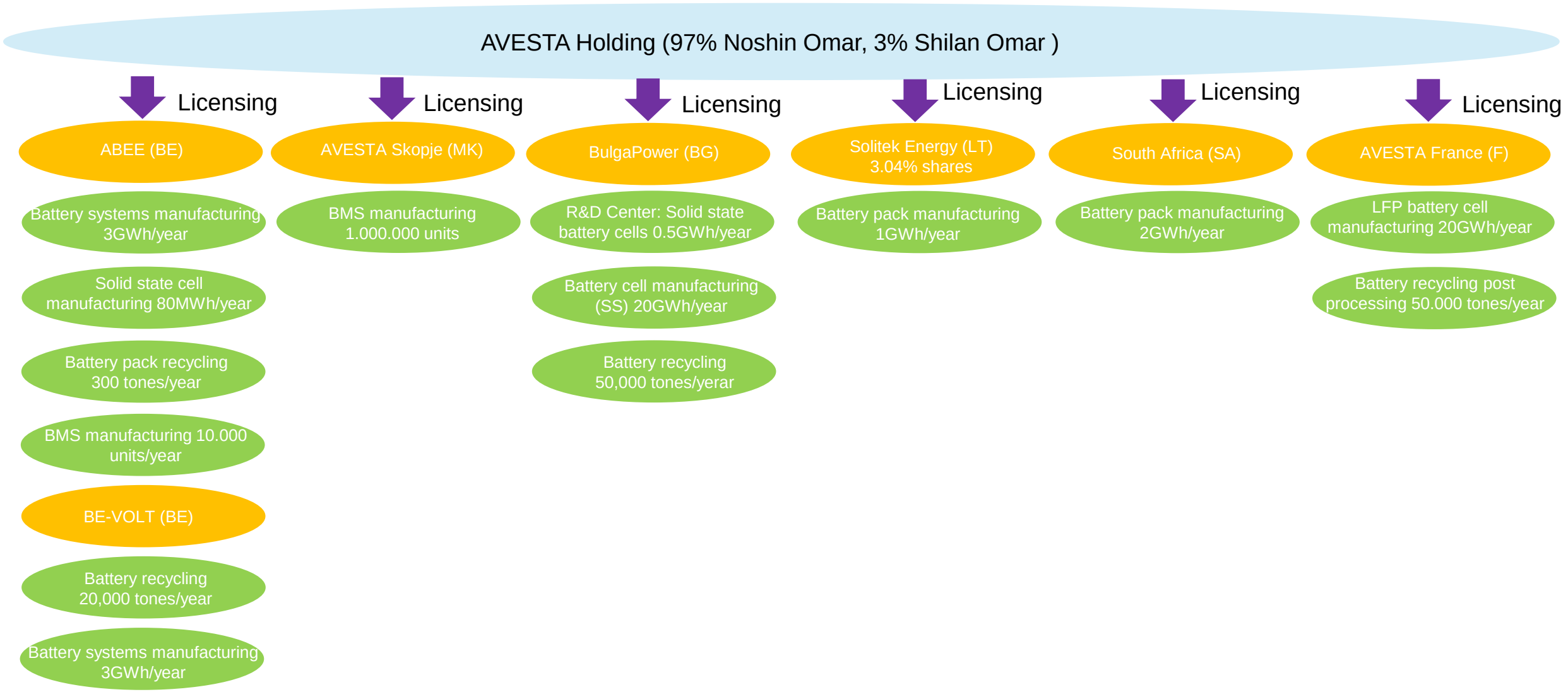
AVESTA

Your technological platform...

AVESTA Holding

PROF. DR. NOSHIN OMAR
PRESIDENT AND FOUNDER
Avesta Holding

AVESTA Holding structure



Summary

			Total	Belgium		Macedonia	Lithuania	South Africa	Bulgaria	France	UAE
				ABEE	BE-VOLT						
Cell	Solid state	GWh	**20.08**	0.08	-	-	-	-	20		-
	LFP	GWh	**20**							20	
BMS		K.units	**1.010**	10	-	1.000	-	-	-	-	-
Battery module/pack assembly		GWh	**12**	3	3	-	1	2	-	-	3
Recycling		Tones	**123.000**	300	20.000	-	-	-	50.000	50.000	-

AVESTA's Vision

Technology

Engineering Expertise → Sustainability → Cell to Recycling Technology → Economy of Scale → European Supply Chain

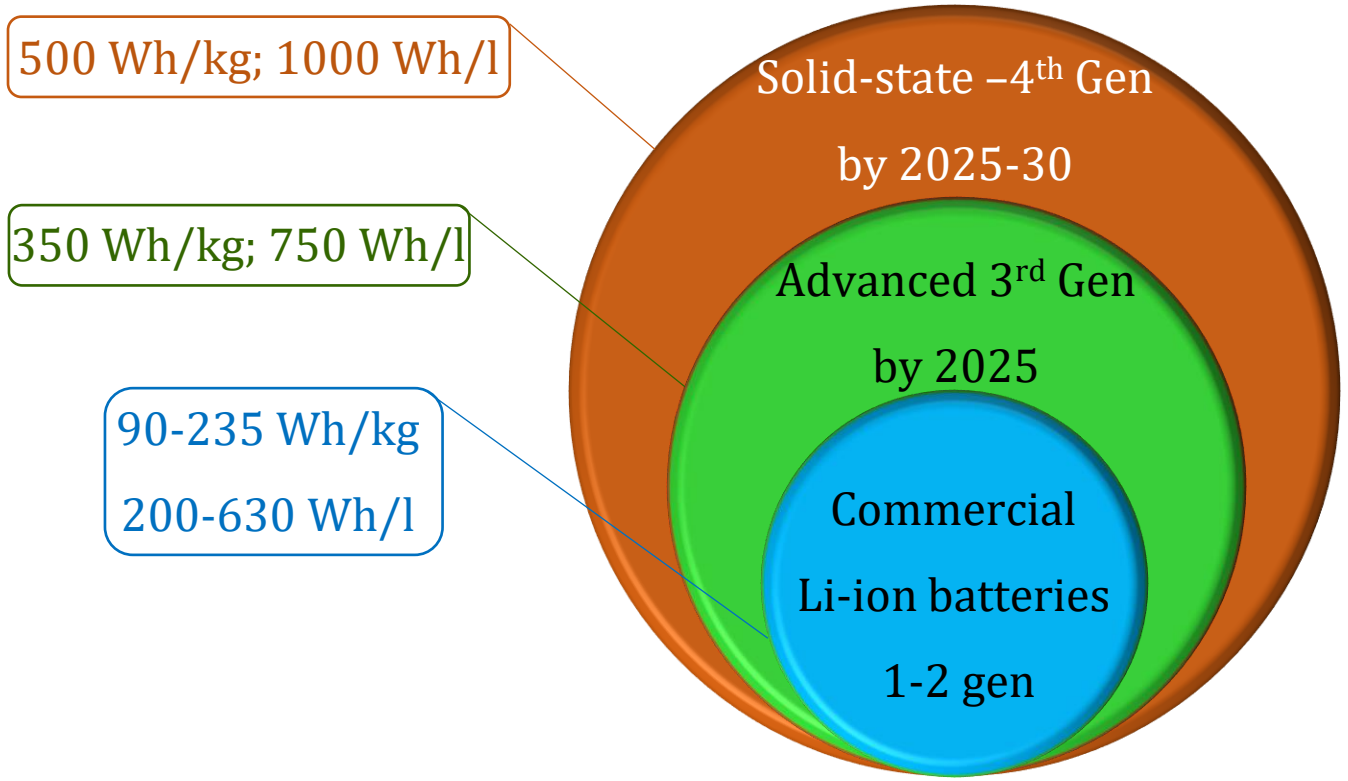
Market Approach

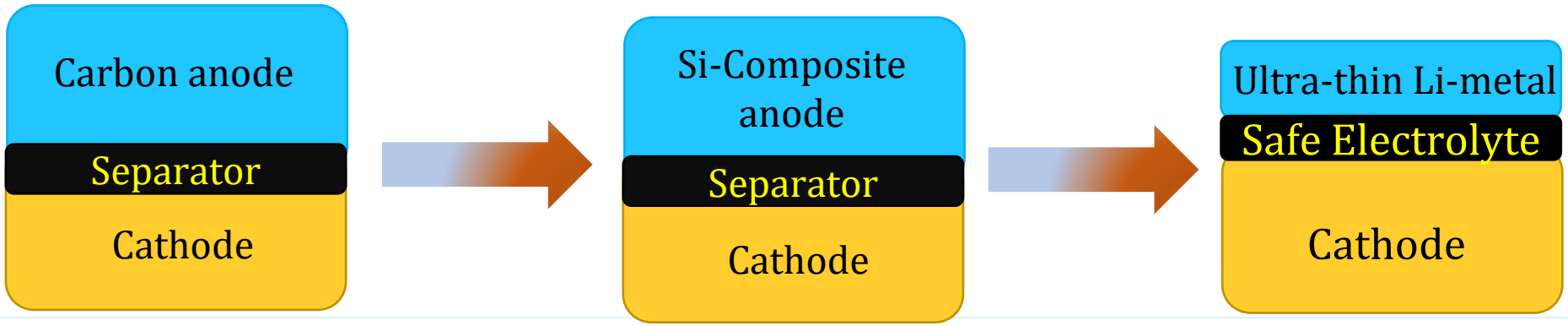
Licensing → Manufacturing Contract → B2B/B2C

AVESTA's knowhow

Consultancy	Battery cell	BMS	Battery Module & Pack	Battery recycling
Market studies	LFP development	Development	ESS	Pre processing
Feasibility studies	Solid state	Manufacturing	Transportation	Post processing
Due diligence	First producer LIM in EU	Largest plant in EU	Marine	LFP technology
	Upscaling			
	Manufacturing			

AVESTA technology position





AVESTA Roadmap – Cell Development

Optimization at prototyping line (TRL 4-5)

- 300-320 Wh/kg & 700 Wh/L
- 300 cycles
- Increase of charging rage towards 0,5C
- 10Ah pouch cells

Bulgapower R&D centre (0,5 GWh; TRL 7-8)

- >450 Wh/kg
- Lifetime 1000 cycles
- Charging rate 1C
- 100 Ah prismatic cells

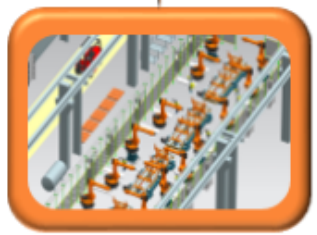
2022 | 2023 | 2024 | 2025 | 2026

Lab level (TRL 3-4)

- ASSB pouch cell (200 mAh to 1 Ah) with 250 Wh/Kg and 300 cycles
- Upscaling to 10 Ah - 20 Ah Cells in 2022 Q3

Moving towards prismatic cells (TRL -7)

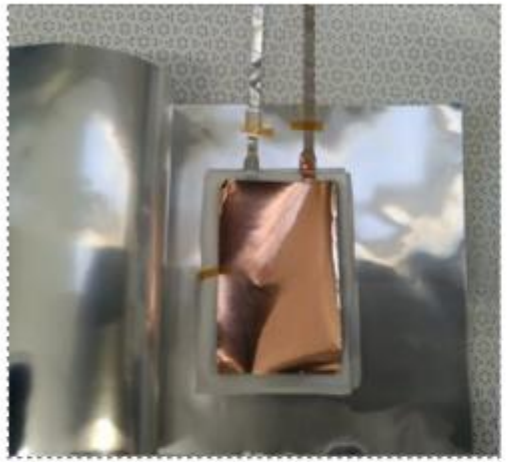
- Energy density >350 Wh/kg
- Lifetime : 500 cycles
- 30 Ah pouch and 60 Ah prismatic cells

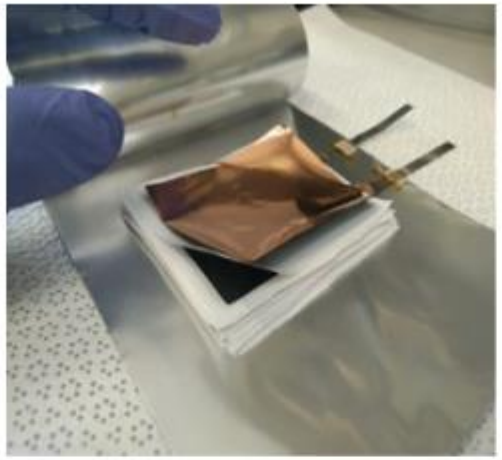


Bulgapower Cell gigafactory (TRL 9)

- > 450 Wh/kg
- Lifetime 1000 cycles
- Charging rate 1C
- > 200 Ah prismatic cells

Cell size – solid state technology



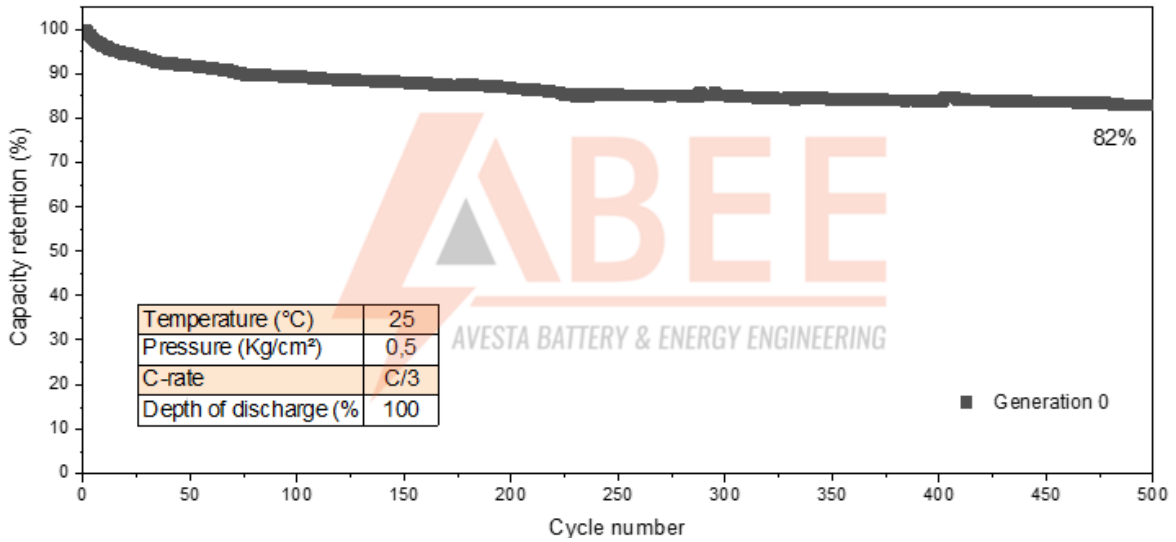


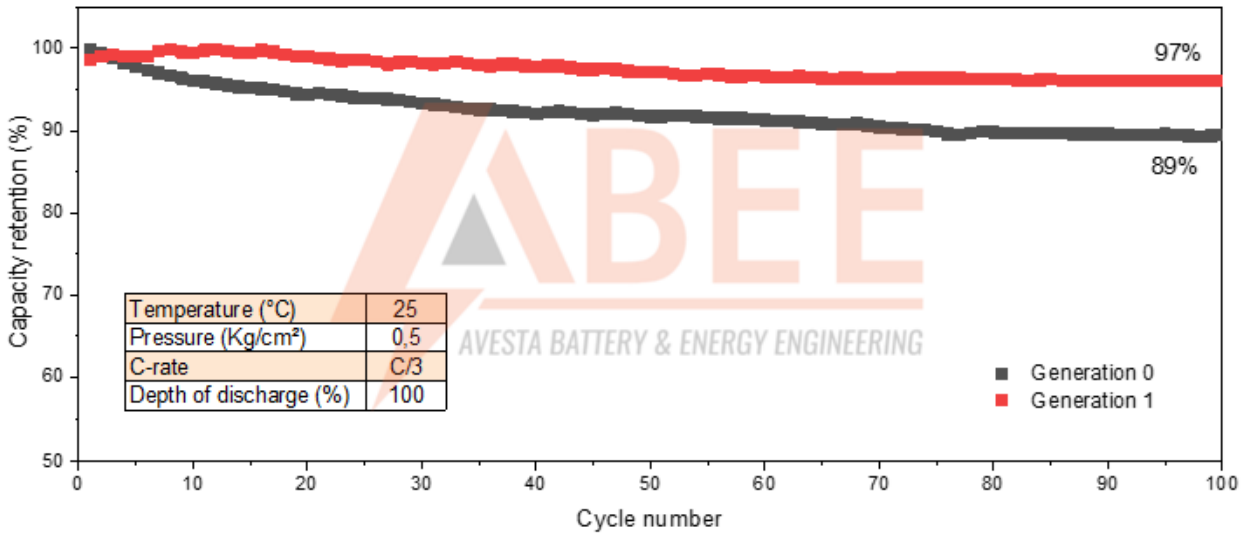
Optimisations are being done in pouch cell (low Ah) and will be transferred to prismatic layout when cell design is fixed

30 Ah pouch cell

100 Ah cell prismatic stacking

Solid state test results





AVESTA - battery cell pilotline (solid state) – 80MWh/year

Mixer

Coater + Calendar

Li metal coater

Gloveboxes

Cell assembly line

Formation equipment

AVESTA - battery pack production line

- Production of battery modules between 15 and 100kWh
- Max. production capacity: 30.000 battery modules of 100kWh
- Air and liquid cooled
- Fully automated

AVESTA - BMS production line

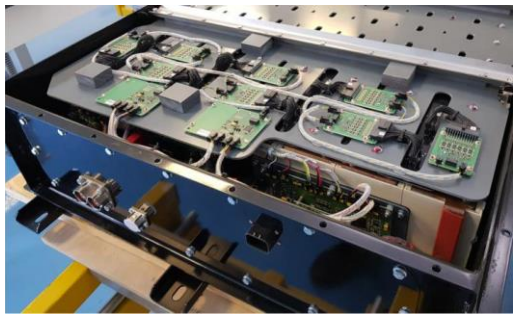
AVESTA - Battery testing facilities

- From cells to packs (500kW)
- >100 test channels
- Wide range of climate and safety chambers
- Safety bunker

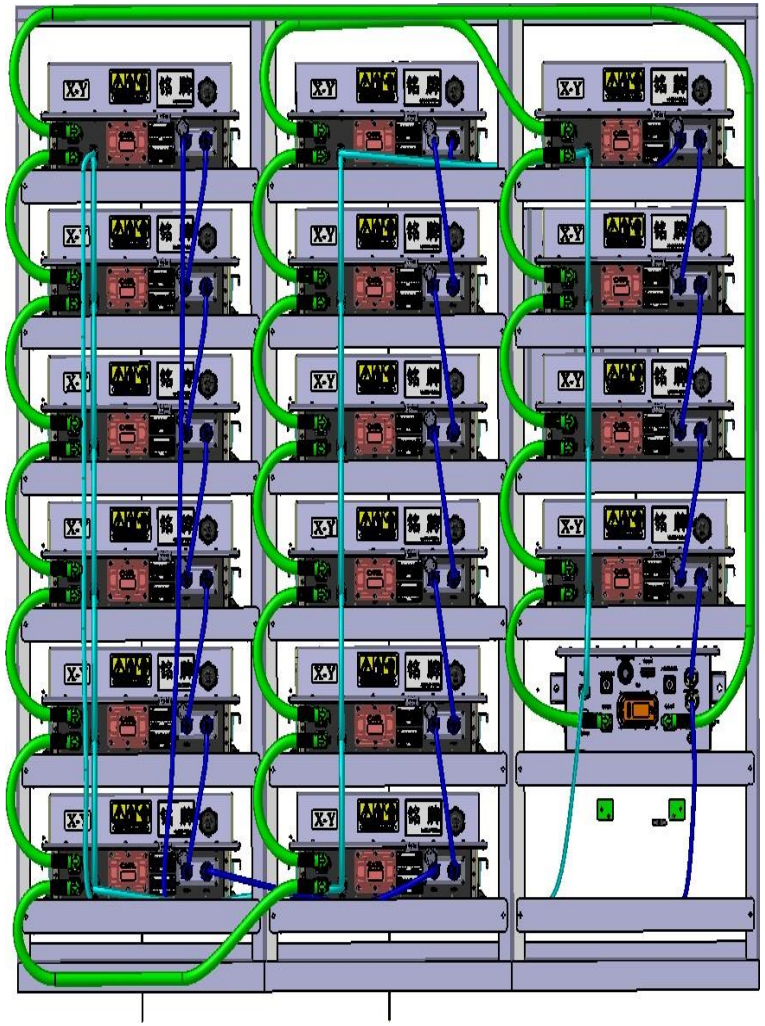
Battery packs for Evs & traction applications

ELECTRICAL DATA						
Energy	**38kWh**	**76kWh**	**66.5kWh**	**133 kWh**	**76kWh**	**152kWh**
Technology	Li-Ion NMC	Li-Ion NMC	Li-Ion NMC	Li-Ion NMC	Li-Ion NMC	Li-Ion NMC
Nominal Voltage	345.6V	345.6V	604.8V	604.8V	691.2 V	691.2V
Voltage max.	403.2V	403.2V	705.6V	705.6V	806.4V	806.4V
Voltage min.	259.2V	259.2V	453.6V	453.6V	518.4 V	518.4V
Discharging power max. (10s)*	152 kW	304kW	266kW	532kW	304kW	608kW
Charging power max. (10s)*	76 kW	152 kW	133 kW	266kW	152 kW	304kW
Continuous power (RMS)	38 kW	76 kW	67 kW	133 kW	76 kW	152kW
Internal HV-Fuse	500A	1000A	500A	1000A	450A	900A
Power consumption in standby mode	5W	5W	5W	5W	5W	5W
Cycle life (at 80% DoD, 25°C)	>3000cycles	>3000 cycles	>3000 cycles	>3000 cycles	>3000 cycles	>3000cycles

MECHANICAL DATA						
Operating temperature range during discharging	-20 to 60°C	-20 to 60°C	-20 to 60°C	-20 to 60°C	-20 to 60°C	-20 to 60°C
Operating temperature range during charging	-10 to 45°C	-10 to 45°C	-10 to 45°C	-10 to 45°C	-10 to 45°C	-10 to 45°C
Protection classes	IP67	IP67	IP67	IP67	IP67	IP67
Weight (incl. contactor box)	274	550	481	952	550	1076
Dimension (W x L x H) in mm	503x1802x190	735x2395x190	910x1469x210	910x1469x454	735x2395x190	735x2395x426



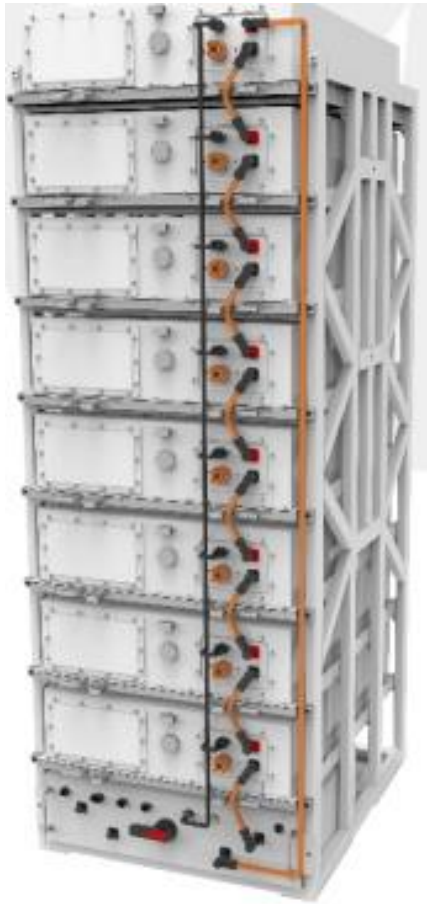
Battery packs for ESS



Rack	One layers	Two layers	Three layers	Four layers	Five layers	Six layers
Dimension (mm³)	600x800x420	600x800x820	600x800x1220	600x800x1620	600x800x2020	600x800x2420
Weight (kg)	140 kg Air C. 145 kg Liquid C.	265 kg Air C. 275 kg Liquid C.	395 kg Air C. 405 kg Liquid C.	515 kg Air C. 535 kg Liquid C.	630 kg Air C. 655 kg Liquid C.	760 kg Air C. 795 kg Liquid C.

As per customer need layers can be customized

Battery packs for ESS



- Battery cluster (max. 8 modules in series)
- 344 kWh/1228 V
- Charging/discharging: 0.5C
- CANBUS 2.0, RS485, Ethernet
- Dimensions: W862, D1074, H2374mm
- Weight: 2700kg

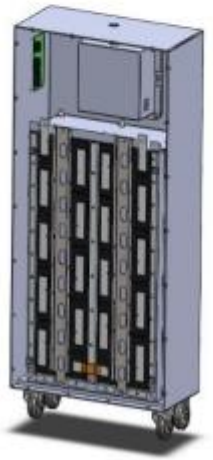
- Battery module
- 43 kWh
- 153 V
- IP 54
- Liquid cooling

Battery packs for ESS (cluster)

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6	Cluster 7	Cluster 8	Cluster 9	Cluster 10	Cluster 11	Cluster 12	Cluster 13	Cluster 14
Module 1 (kWh)	43	43	43	43	43	43	43	43	43	43	43	43	43	43
Module 2 (kWh)	43	43	43	43	43	43	43	43	43	43	43	43	43	43
Module 3 (kWh)	43	43	43	43	43	43	43	43	43	43	43	43	43	43
Module 4 (kWh)	43	43	43	43	43	43	43	43	43	43	43	43	43	43
Module 5 (kWh)	43	43	43	43	43	43	43	43	43	43	43	43	43	43
Module 6 (kWh)	43	43	43	43	43	43	43	43	43	43	43	43	43	43
Module 7 (kWh)	43	43	43	43	43	43	43	43	43	43	43	43	43	43
Module 8 (kWh)	43	43	43	43	43	43	43	43	43	43	43	43	43	43
Total ESS capacity (kWh)	344	688	1,032	1,376	1,720	2,064	2,408	2,752	3,096	3,440	3,784	4,128	4,472	4,816
Power (kW)	100	300	500	500	500	1000	1000	1000	1000	1000	1000	2000	2000	2000

Residential batteries

BATTERY ELECTR BATTERY ELECTRICAL SPECIFICATIONS	
NOMINAL VOLTAGE	54,4 V dc
MAXIUMUM VOLTAGE	61,2 V dc
NOMINAL CHARGE CURRENT	66 A
NOMINAL DISCHARGE CURRENT	66 A
NOMINAL ENERGY CAPACITY	16,6 kWh
NOMINAL POWER	3.6kW/5 kW
PEAK OUTPUT POWER	3.6kW/5 kW
BATTERY CHEMISTRY	LFP
CYCLE LIFE 90% DOD	≥10000 Cycles
BATTERY MANAGEMENT SYSTEM	
CELL BALANCING	Up to 300 mA
COMMUNICATION	CAN FD up to 5 Mbit/s SPI UART (RS485, RS232)
MEASURMENTS	18 volt. measurements, 8 temp. measurements, plus 6 auxiliary measurements.
SAFETY	Up to Automotive Safety Integrity Level D
PROTECTION	abnormal voltage, current, temperature protections, low soc protection, etc
DIMENTION	165 mm x 65 mm x 15 mm
Operating Temperature (battery should be kept in door)	-20 to 50 °C
BATTERY MECHANICAL SPESIFICATIONS	
DIMENSIONS	520 X 1100 X 235 MM
WEIGHT	190 kg
DISCHARGE TEMPERATURE RANGE	(-20 to 50°C)
CHARGE TEMPERATURE RANGE	(0 to 50°C)
ENCLOSURE PROTECTION	IP20 INDOOR
COOLING	NEUTRAL CONVECTION
NOISE AT 1 M DISTANCE	< 30 Dba
MAX ALTITUDE	5000 M
MOVING AND STABILISATION	WHEELS WITH BRAKE



Costing & pricing strategy

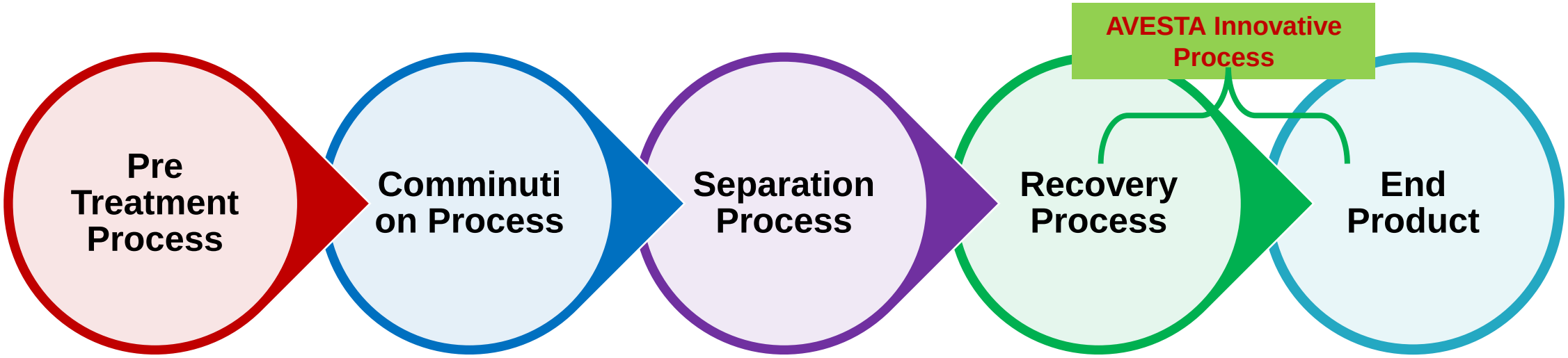
- Full development in house of battery modules & packs (from engineering to certification)
- Fully automated production lines to guarantee high quality
- Covering the entire TCO (transportation, custom clearance, testing, support to integration, project management, recycling, service (no hiden costs compared to Chinese products
- In house developed and manufactured BMS
- Economy of scale (CATL/EVE/GOTION do not have battery pack production factories in EU)
- Lower or equal TCO compared to products from China (based on same quality)
- Lower CO2 footprint

BE-VOLT Battery System Gigafactory

- First battery system gigafactory in Benelux,
- Location: Seneffe Manage (Belgium)
- Total production capacity: 3GWh/year
- Fully operational: Q3 2025
- Total investment: >50 millions EUR

Processing of Recycling

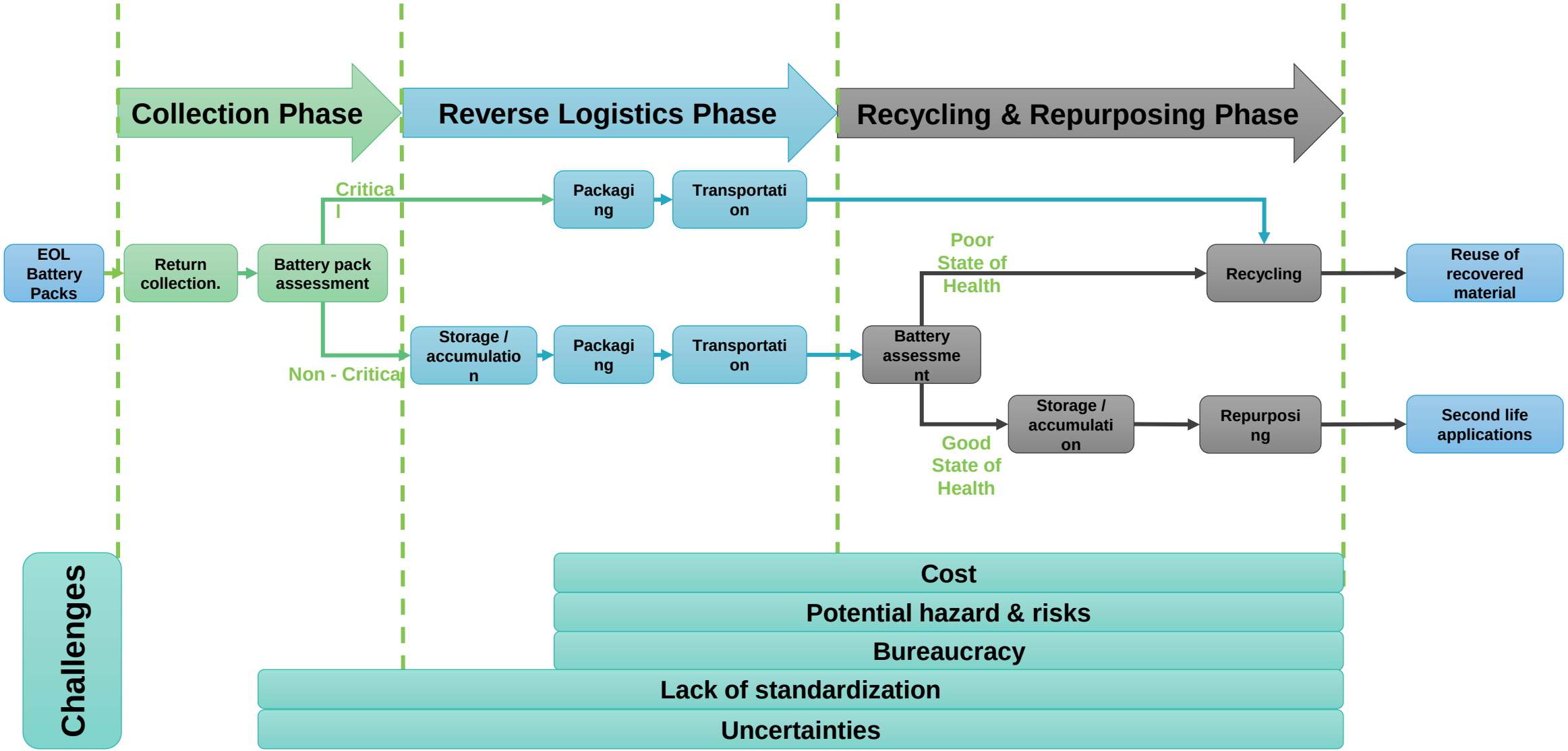
❑ **AVESTA innovative idea of Recovery process is to adopt Flexible process flow selection to attain high EOLRR.**



Pollution Control system
All process studied is performed under proper dry and wet pollution control system

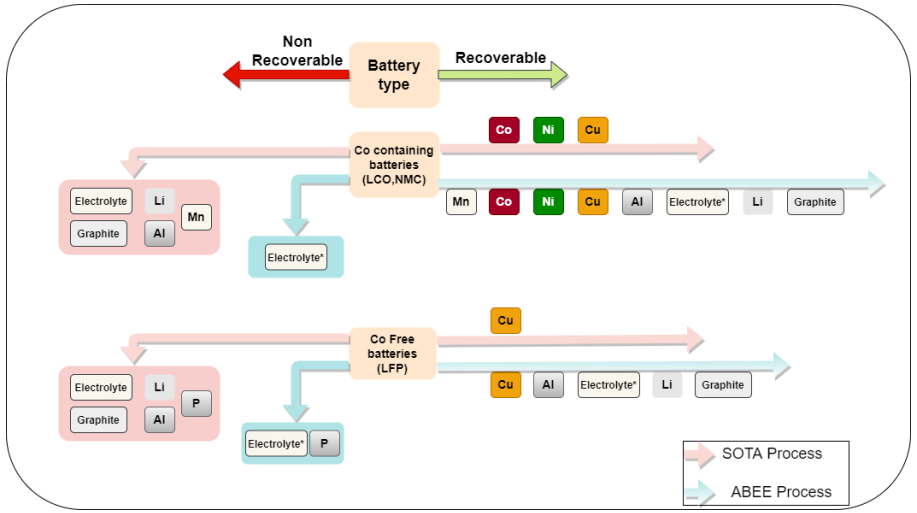
Hazard and Safety Management
Electric, Chemical, Fire and Explosion hazard risks are priorly identified for each process by set of experts

Processing of Recycling



AVESTA's uniqueness

Hybrid - Direct recycling is a promising with significant sustainable and economical benefits



Process	Li	Ni	Co	Cu	C
Pyrolysis	0%	40-60%	40-60%	n.c	0%
Pyrolysis - Hydrometallurgical	50-60%	> 95%	> 95%	> 95%	0%
Mechanical - Pyrolysis (slag)	0%	40-60%	40-60%	n.c	0%
Mechanical- Hydrometallurgical (black-mass)	> 90%	> 99%	> 99%	> 99%	0%

Hybrid - Direct Recycling for EOL batteries and production scraps are

- **Short-Loop** to close the battery material cycle.
- Safer, energy efficient and low carbon footprint technology
- Potential to slash the **environmental burden to half & double the economical values**; compared with existing & projected recycling facilities.

- Economics of scale with **integrated material processing industry**

- **Innovative process design** capable of adapting Current & Next generation batteries with requiring less Energy, less materials, less cost and less capex.

BE-VOLT Battery Recycling

- First battery recycling in Europe for LFP technology,
- Location: Dour(Belgium)
- Total production capacity: 20.000 tonnes/year
- Fully operational: begin 2026
- Total investment: >85 millions EUR

AVESTA Holding

Prof. Eng. Noshin Omar (President & Founder)

Email: noshin.omar@abeegroup.com

Main email: contact@abeegroup.com

Tel: +32 486 99 74 51

Doorn noordstraat 10

9400 Ninove

Belgium

Thank you