



skeleton⁺

Rebuilding industry for a **net-zero** future.

The high power energy storage company.

A Pan-European Company

European value chain, European energy storage innovation

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Tallinn, Estonia

- Software development
- Electronics engineering
- Module & system development



Berlin, Germany

- Sales & application engineering
- Grant & IP management
- Solid-state battery development



Großröhrsdorf, Germany

- SuperBattery R&D and production
- Supercapacitor research & development center
- Main production location from cells to systems



Varkaus, Finland

- SuperBattery pilot production
- Electrode manufacturing



Markranstädt, Germany

- The largest and most modern supercapacitor factory in the world
- Start of production in 2024



Bitterfeld-Wolfen, Germany

- Curved Graphene synthesis and production
- Material pilot & development plant
- Solid-state material research



Technological Advantage Through Superior Carbon Raw Material

Backed by the largest R&D team in the industry

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Li-ion Batteries

use a chemical reaction to store energy

 **Slow**

- + Limited power density (0.5 kW/kg)
- + **High energy density** (205 Wh/kg)
- + Limited cycle life (<3000)
- + Slow charge rate (1.5 C)
- + Safety concerns
- + Lithium, nickel, cobalt

Supercapacitors

use an electric field to store energy

 **Fast**

- + **High power density** (up to 60 kW/kg)
- + Limited energy density (up to 16 Wh/L)
- + Extreme cycle life (>1 million)
- + Extremely fast charge rate (2000 C)
- + High inherent safety
- + No rare metals

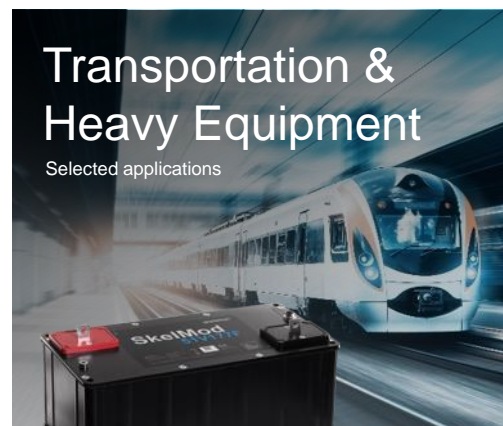
Key Enabling Technology to Power Electrification Across Industries

A qualified supplier & system provider to industry leaders

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- Fuel cell power support solutions
- 48V active suspension
- KERS / Push-to-pass
- 12V board net stabilization & back-up solutions



- KERS for light rail
- Engine start
- Mild hybrid bus energy storage
- Fuel cell power support solutions for rail and bus transportation



- Wind turbine pitch control
- Virtual inertia / Grid forming in STATCOMs
- Microgrid power back-up and quality
- Backup power for medical equipment



- Peak load shaving to cover short-term peak power demands
- KERS for port cranes, forklifts, and elevators
- Fast-charging for warehouse AGVs and shuttles



Hitachi Energy

ŠKODA

CAF
Power & Automation

Danfoss

Honda Racing
Energies

esa

MITSUBISHI

MEDCOM

ATTABOTICS

Brush Traction
a Wabtec company

Backed by a Strong Investor Base – Over 300M EUR of Capital Invested

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Committed to supporting the company becoming a global market leader by 2024

Marubeni

SIEMENS

 **HARJU ELEKTER**

 **InnoEnergy**
Knowledge Innovation Community

FIRSTFLOOR CAPITAL


MM GRUPP

Co-founder of

adyen

Founder of

CTEK
MAXIMIZING BATTERY PERFORMANCE

Co-founder of

 **wise**

“Enabling carbon-neutral electrification is a key priority for us and Skeleton Technologies fits in our portfolio perfectly. The company has **validated its competitive advantage** in **real-life applications** and has shown **strong commercial traction.**”



Masayuki Omoto

COO, Next Generation Business Development
Marubeni Corporation

Led by a World-class Management Team of Industry Veterans

Energy storage experts, entrepreneurs, and experienced leaders

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Oliver Ahlberg

Chairman of the Board

- Co-Founder of Skeleton Technologies
- Successful exits in e-commerce and digital marketing



Taavi Madiberk

CEO

- Co-Founder of Skeleton Technologies
- Member of the board in the European Innovation Council
- Former Chairman of the Supervisory Board of Estonian Railways



Dr. Linus Froböse

CTO

- PhD in solid-state batteries from Technische Universität Braunschweig
- Previously Head of operations at Vitesco Technologies, and Head of Manufacturing Technology Battery and Electric Engines at Continental



Tobias Hüppe

COO

- Long experience in the automotive and battery manufacturing industries
- Formerly Senior Director of Manufacturing at Northvolt, Plant Manager at Faurecia Interior Systems



Dr. Jaan Leis

Materials Science Consultant

- Co-founder of Skeleton Technologies
PhD in Theoretical and Computer Chemistry from University of Tartu, Estonia
- 20+ years in nanomaterials research and co-author of more than 65 peer-reviewed research articles and 20+ patents in the fields of nanoporous carbon and energy storage.



Dr. Anti Perkson

Materials Science Consultant

- Co-founder of Skeleton Technologies
- PhD in Theoretical and Computer Chemistry from University of Tartu, Estonia
- 20+ years in nanomaterials R&D, co-author of 20+ peer-reviewed research articles and 10+ patents in nanoporous carbon and energy storage.
- Previously CEO and R&D Director of Silmet AS

From Single Cells to Full Energy Storage Systems

The only full value-chain manufacturer on the market

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Raw Material

Curved Graphene

Single Cells

300-5000F
Industrial supercapacitors

Industrial Modules

From low to high voltage needs
Supercapacitor modules with smart
balancing and management systems

Systems

MWs of immediate power
Modular, supercapacitor-based
energy storage systems

Technology Advantage Throughout the Entire Energy Storage Industry

Highest performance and quality for every energy storage application, powered by Curved Graphene

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SkelCap supercapacitors (Gen 1)

- 4x power density compared to competitors
- High power (up to 60x compared to batteries)
- 1,000,000+ lifecycles
- Ultrafast charging times (<1 s)



Graphene supercapacitors (Gen 2)

- +72% increase in energy (16 Wh/L), while maintaining high power
- 1,000,000+ lifecycles
- Ultrafast charging times (<1 s)
- Increased efficiency & lower footprint



SuperBatteries

- High energy density (65 Wh/kg)
- 50,000+ lifecycles
- Fast charging (60s)
- Extremely competitive cost-base compared to similar energy storage technologies

Addressable Energy Storage Application Space

High power from sub-second to up to 15 minutes duration

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Skeleton products provide **high power energy storage** for applications with **<5-minute charge / <15-minute discharge** cycle durations

Lower cost compared to **Li-ion batteries** in this application space

Supercapacitors



SuperBatteries



Lithium-Ion batteries



<1s to 60s

Fast
charging

1-5 min

1-15 min

>15 min

Independent 3rd Party Verified Advantage

Superior power and energy densities in energy storage

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“Your cells have very low resistance so are truly high-power devices. I think **they are the best in the world of the carbon/carbon type.**”

Dr. Andrew F. Burke

UC DAVIS
UNIVERSITY OF CALIFORNIA

“One property **that stands out is the ESR of the Skeleton capacitor**, which is significantly less than the others.”

C. N. Nybeck, D. A. Dodson, D. A. Wetz and J. M. Heinzel, "Characterization of Ultracapacitors for Transient Load Applications," in IEEE Transactions on Plasma Science, vol. 47, no. 5, pp. 2493-2499, May 2019



Supercapacitors

4X power density
vs competitors

64.3 kW/L

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15.6 kW/L

UCAP **Maxwell**
TECHNOLOGIES

SuperBattery

Uniquely fast charge times with high energy density

60 sec

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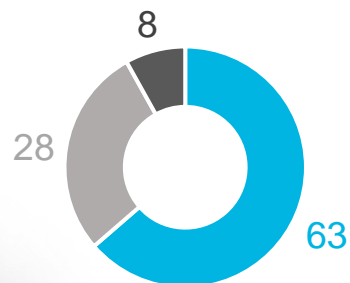
Charge time of 10 min

Competition

Increased Safety Compared to Lithium-ion Batteries

Lower cost due to Curved Graphene and abundance of other raw materials

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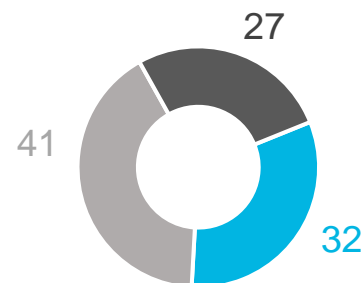


● Organic components
● Aluminum
● Other

Supercapacitor

Composition

- Mostly carbon and aluminum – easy to recycle
- Contains no heavy metals



● Organic components
● Aluminum
● Other

SuperBattery

Composition

- Safer to handle than Li-Ion batteries (no lithiated graphite)
- Contains lower cost elements compared to Li-Ion



Curved Graphene

- Proprietary carbon, produced without any rare earth materials
- Synthesis byproducts re-usable – zero waste created

Sustainable Products And Production Process

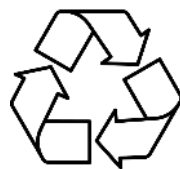
From supercapacitors to SuperBatteries

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Little to no rare earth metals used

- ✓ The only metal content in supercapacitors is aluminum
- ✓ SuperBattery uses no graphite, nickel or cobalt, and very little lithium (<5% of weight)



Easy and affordable to recycle

- ✓ Carbon and aluminum are easy to recycle
- ✓ Products use lower cost elements than in Li-ion



Sustainable production and processing

- ✓ Skeleton uses water-based process for coating and recycling
- ✓ Products are safer to handle than li-ion batteries due to no lithiated graphite or lithium plating

Modular, Intelligent Supercapacitor Energy Storage Systems

MWs of power, immediately available

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Systems

SkelGrid energy storage system

Supercapacitor-based turn-key
energy storage solutions for high-
power needs



High Performance Energy Storage - Made in Europe

Fully integrated production – control over the entire manufacturing chain

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**The largest
supercapacitor
factory in Europe**
(Großröhrsdorf, Germany)



Skeleton Materials

Curved Graphene production facility in Bitterfeld, Germany

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Skeleton Materials is Skeleton's material development arm, situated at the Bitterfeld-Wolfen Chemical Park in Saxony, Germany.

Led by world-class material scientists and researchers, Skeleton Materials is already the global leader in synthesizing capacity and scaling up Curved Graphene material production to industrial levels to meet the demand for Skeleton's GEN 2 supercapacitors, SuperBatteries, and solid-state batteries.

German Quality, Certified According to the Highest Standards

Qualified supplier to some of the largest OEMs in the world

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Linus Froböse
CTO

“Quality is the bedrock of Skeleton’s success and something we have put an enormous amount of work in – to produce the most robust and long-lasting products for our customers.”

Certified



Compliance and selected
product certifications



A Qualified Supplier & System Provider to Industry Leaders

To automotive, grid, transportation, and industrial companies, OEMs & Tier 1s

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MAJA



German automotive
OEM



North-American
Truck OEM



Enabling Higher Penetration of Renewable Energy & Stabilizing Power Grids

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MWs not, kWh business – 50 MW solution delivered



50% FEWER

➤ **supercapacitors needed
for power quality
applications compared to
competition**



“Most competitive supercapacitor-based ESS for grid applications.”
(Virtual Inertia)

Supercapacitors Electrifying Trams Across Europe

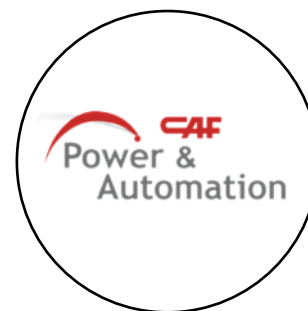
Kinetic energy recovery reduces costs and protects infrastructure

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"Skeleton Technologies brings the necessary quality mindset to critical applications. **The highest power density and efficiency in the industry provides us with a very clear competitive advantage.**"

Stanislaw Wizur
Škoda Electric



"**Skeleton's cells are a perfect fit to the rail and tram industry.** Adding them to our energy storage systems will greatly benefit our existing and future customers, **allowing to maximize energy efficiency at an unprecedented level.**"

CAF Power & Automation

Supercapacitors Kickstarting Fusion Reactors

Enabling technology to create clean energy

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The image is a horizontal composition. On the left is a close-up of a fusion reactor's toroidal chamber, showing its complex, segmented metallic structure. In the center is a large white plus sign. To the right of the plus sign is a black rack of supercapacitors, labeled 'SkelGrid 2.3MWs' and 'skeleton+'. The rack is open, revealing internal components. To the right of the rack is a large white right-pointing arrow. To the right of the arrow, the text '120 MW' is displayed in large blue font, followed by 'For 3s, enabling plasma to be heated to 100 million degrees Celsius' in white font.

120 MW
For 3s, enabling plasma
to be heated to
100 million degrees Celsius



Supercapacitors are used to provide **20 MW of power** for each gram of hydrogen to be heated in less than 1 second. Skeleton is supplying a global leader in fusion energy.

Key Benefits

To working with us

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IATF-certified & the **largest supercapacitor factory** in Europe



100+ MWs of grid & industrial installations, **10 000+** systems & modules in the field



Unique technology & product roadmap with **Curved Graphene**, protected by more than 11 patent families



World-class team of **350+ professionals** with vast experience in energy storage development & production

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Thank you!

For more information
contact us:

www.skeletontech.com

Certified

