

Lunch & Learn: Battery Trends 2021

25 March 2021

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Battery Trends for 2021



Learn the latest developments in Battery technology for 2021.

- Best Li-Ion variants for Application
- Plug and Play Modular Solutions
- Miniaturization Trends for Battery Cells
- Batteries with Benefits - Diagnostics

Battery Trends for 2021



Meet the Presenters:



Dan Friel
US National Business Development
Manager

Email: dan.friel@varta-microbattery.com



Eric Lineman
US National Business Development
Manager

Email: eric.lineman@varta-microbattery.com



Arkadiy Niyazov,
Senior Application Engineer / Project
Manager

Email: arkadiy.niyazov@varta-microbattery.com



Alex Stapleton
EU Business Development Manager

Email: alex.stapleton@varta-storage.com

Battery Trends for 2021

Definitions



- Cell vs. Battery
 - Cell is a single element
 - Battery is a collection of cells, often with a connector, etc.
- Battery Energy = Battery Capacity = How long Battery will run
 - Amp-Hours or Watt-Hours (has a time component)
- Power vs. Energy
 - Power is rate (of current): Usually expressed in Watts = Volts x Amps
 - Energy is duration of Power: Has a time component, i.e. Amp-Hours, Watt-Hours
 - Watt-Hours = Volts x Amps x Time



Battery Trends for 2021

Best Li-Ion Variants for Application:

Power Consumption of the Device determines How much Battery is needed

- Needs change as Power Consumption increases...
- Hearing Aid can use a non-rechargeable cell
- Bluetooth ear-bud prefers a rechargeable cell
- Tablets, Laptops require larger rechargeable batteries
- Mobile Robotics, Fork-lifts, Golf Carts have bigger rechargeable batteries
- Electric Vehicles & construction equipment are larger

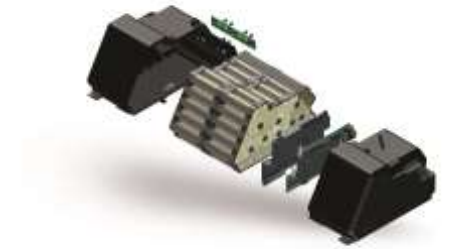


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Best Li-Ion Variants for Application

- Cell Size & Type - Impact on Application
- Power = High Current, Short Duration
- Energy = Low/Medium Current, Long Duration



High Power

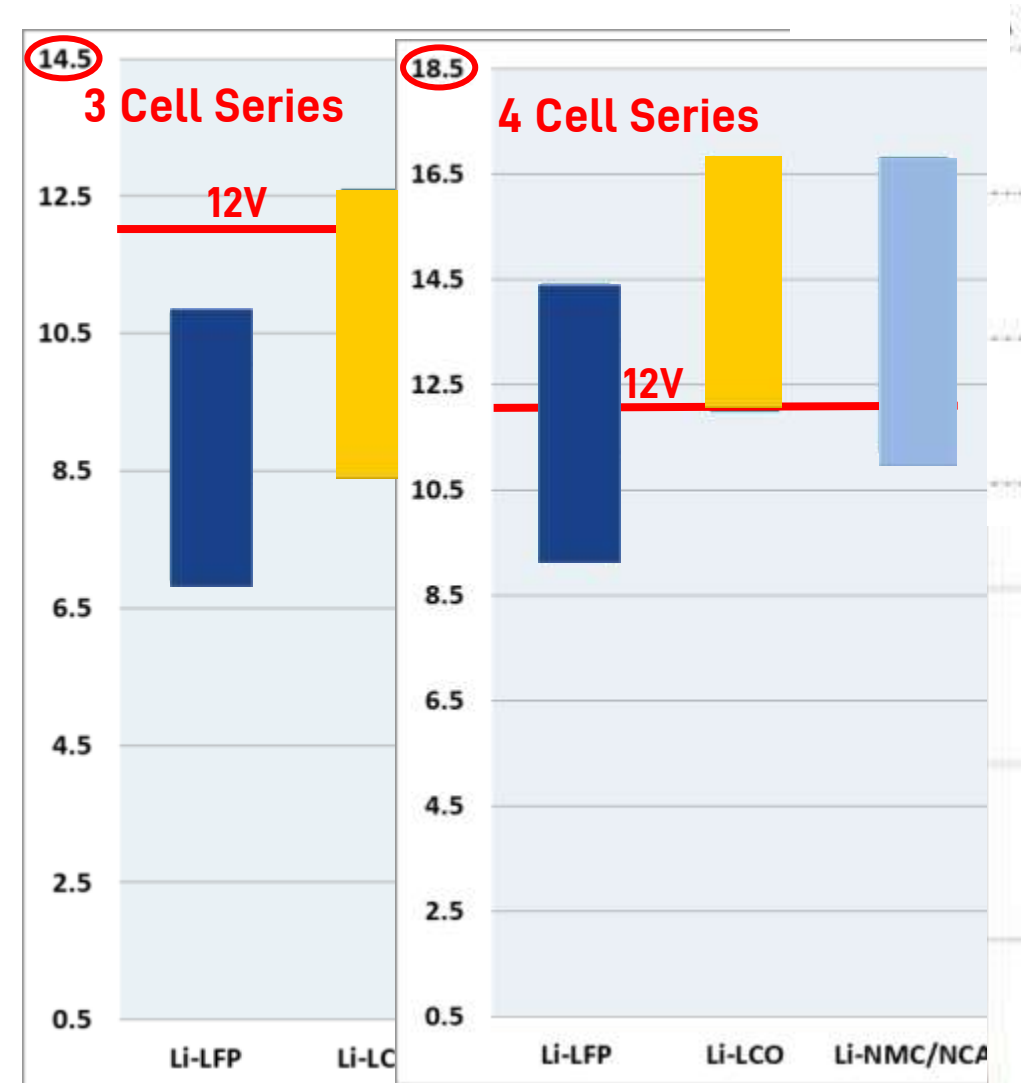
High Energy

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Best Li-Ion Variants for Application

- Voltage varies with Discharge Load, Temperature, & State
- Voltages differ across chemistry
- Must consider Battery Pack voltage swing and your system utilization voltage



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Modular Battery Systems:

- Goldilocks Principal
 - Not too big. Not too small.
- Just Right?
 - Defined by Requirements: Size, Weight, Run-time, Charge time, etc.
- Decision Criteria:
 - Energy Density (for Weight or Volume)
 - Power vs. Energy – Short Bursts of Current or Long Slow Discharge



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Modular Battery Systems: One Size Fits Many

Value Product

Basic Battery
(24V)



Economy
Product

Enhanced Battery
(48V)



Performance Line
Products

Standard Run-Time
(48V Battery x2)



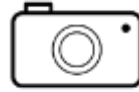
Extended Run-Time
(48V Battery x3)



Portable Devices with Small Rechargeable Batteries



IT / Communication



Consumer



Medical



Wearables



Hearing aids



IoT



Automotive

Coin vs. Pouch Cell



Coin supersedes pouch cells in various aspects. Disadvantages of using Pouch cells:

- Lower Energy Density due to the different sealing method
- Danger from lithium plating at pressure marks
 - Safety issue (thermal runaway)
- Unstable due to gassing
 - Cell expands -> pressure on surrounding components
- Uncontrolled bursting during overcharging
 - Critical to safety
- Decreased cycle life performance



Solutions for the Future

Battery Diagnostics and VARTA Smart Services



Current Basic Building Blocks



VARTA SOLUTIONS APPLICATION SPECIFIC BATTERIES

- 24V & 48V Lithium Batteries Modules
- Scalable from 0,58 kWh to 37.5 kWh

VARTA's new range of Application Specific Batteries (ASB) offers smart, modular system energy for 24V & 48V applications. ASB makes building applications easier for OEMs so they can focus on their own product.





VARTA Smart Services®
Service Strengthened by Technology

Four steps into a smart future



VARTA Smart Services 1.0

Data in the cloud and transparency about Battery status

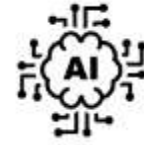
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VARTA Smart Services 2.0

Enable Pay per Use.
Reduce TCO.
Increasing battery utilization

2



VARTA Smart Services 3.0

Cost effective battery solution

3



VARTA Smart Services 4.0

Enable battery as a service

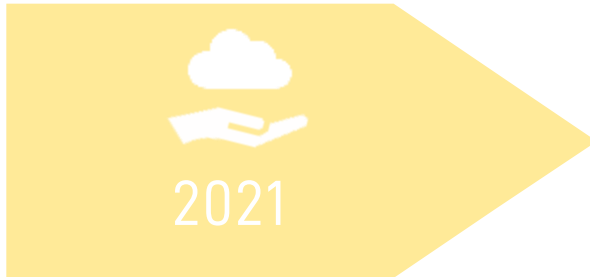
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VARTA Smart Services® - Step by Step




Smart Service 1.0

Data in the cloud and transparency about Battery status



 ASB Wireless

 Cloud Services

 Dashboard / App

Smart Service 2.0

Enable Pay per Use. Reduce TCO. Increasing battery utilization



 Pay per Use


 Pattern recognition

 Fleet optimization

Smart Service 3.0

Cost effective battery solution




 AI Based Products

Smart Service 4.0

Enable battery as a service



 The optimized use of the battery as product

 Smart contracts

 Second Life

Collect data

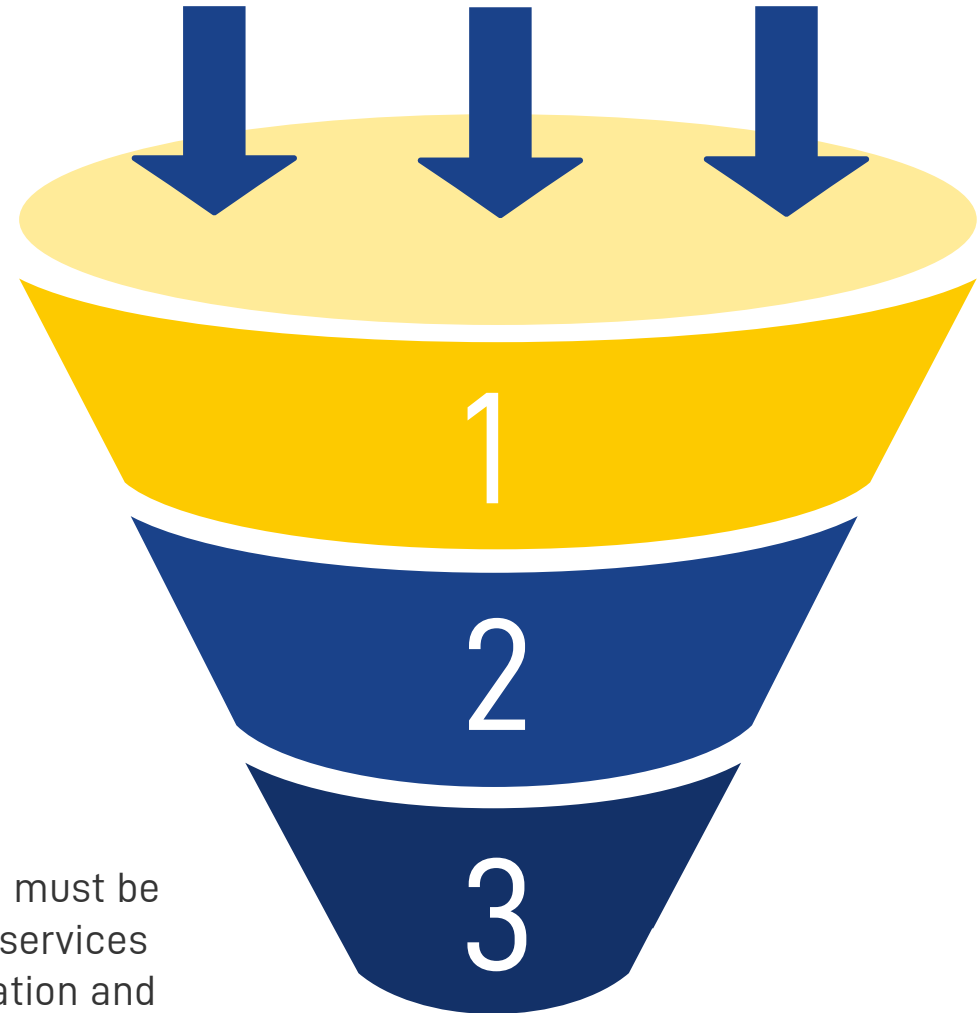
The first step of our odyssey is that we must be able to collect data

Process data

In the next step we need to be able to process the collected data

Smart services

In the final step, we must be able to offer smart services based on the evaluation and processing of the data.





Li-Ion-Solutions & Microbatteries

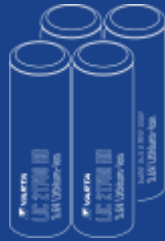
Micro



Li-Ion CoinPower



Li-Ion Large Batteries



PowerPack Solutions

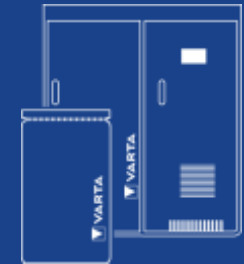


Household Batteries

Consumer



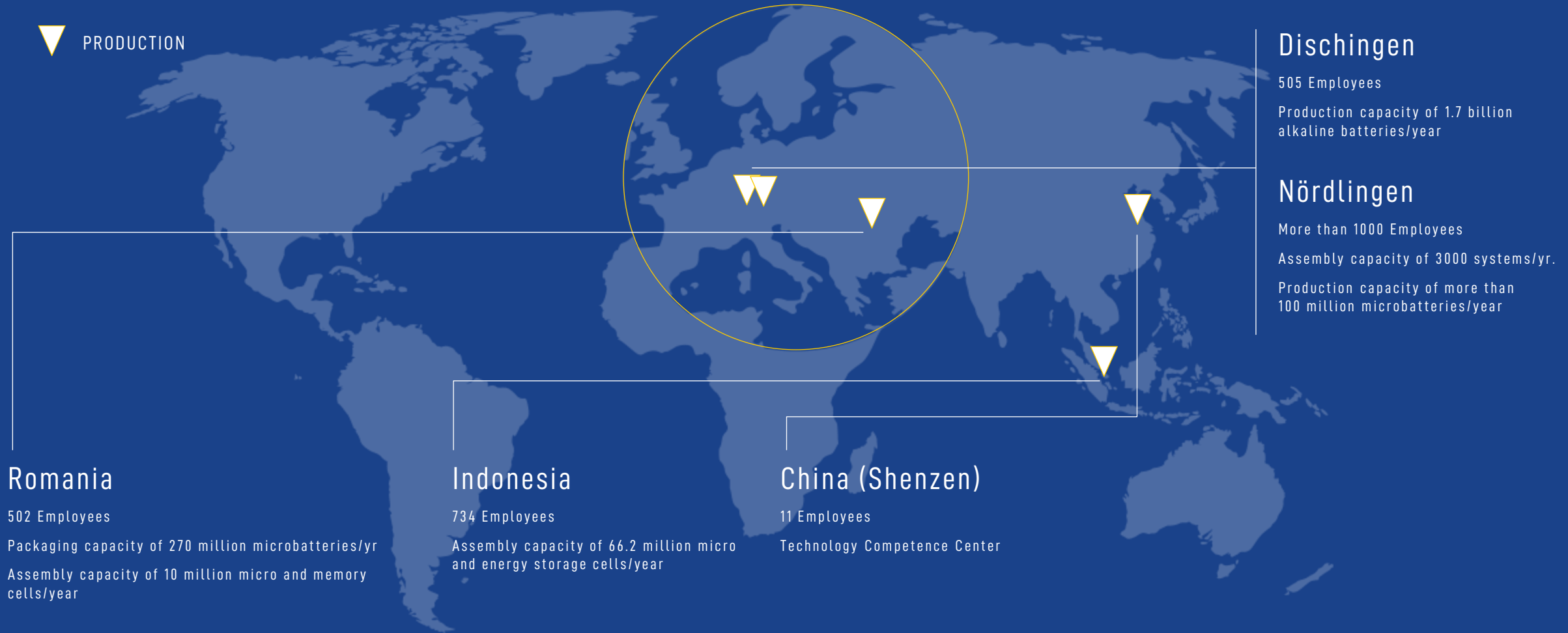
Energy Storage Systems



Global Presence



▼ PRODUCTION



Romania

502 Employees

Packaging capacity of 270 million microbatteries/yr

Assembly capacity of 10 million micro and memory cells/year

Indonesia

734 Employees

Assembly capacity of 66.2 million micro and energy storage cells/year

China (Shenzen)

11 Employees

Technology Competence Center

Dischingen

505 Employees

Production capacity of 1.7 billion alkaline batteries/year

Nördlingen

More than 1000 Employees

Assembly capacity of 3000 systems/yr.

Production capacity of more than 100 million microbatteries/year

Lithium-Ion Technology



INNOVATIVE
BATTERY KNOW-
HOW

VARTA'S
GENETIC
CODE

SCALED
PRODUCTION
COMPETENCE

1990

Start of primary lithium button cell production

1995

Start of assembly of lithium-ion cells

2000

Custom lithium-ion soft pack cell manufacturing

2009

Joint Venture, with Volkswagen AG for the purpose of materials research.

2010

Battery pack design now includes mechanical and electrical communications.

2011

VARTA sells AA and AAA lithium cells for the first time

2012

Introduction of residential stationary energy storage systems, including connection to solar and public infrastructure.

2014

Launch of VARTA CoinPower, innovative design enables high performance battery

2016

Implementation of commercial energy storage systems. Design and development of flexible energy management systems.

2018

Introduction of new CoinPower form factors. Introduction of rechargeable lithium-ion cells for hearing aids.

2019

VARTA enormously improves the energy density of its lithium-ion cells. Massive expansion of the production facilities in Ellwangen and Nördlingen.

2020

Continuous extensive expansion of our production facilities in Ellwangen and Nördlingen.

Battery Trends for 2021



Battery Partner:

- Technology Leader
- Well known in the Industry
- Standard line of products in a variety of sizes
- Previous Custom designs with well known customers
- History and Industry Experience in Battery systems
- High-volume Manufacturing Expertise (not just a Design House)
- Worldwide Reach & Support
- Multiple Manufacturing & Design locations
- Reputable firm – ideally a public company
- Financially Stable & Reliable



VARTA Sets New Standards as a Worldwide Innovation- and Technology Leader



- VARTA is the leading international manufacturer of microbatteries for a wide range of applications in the microbatteries segment.
- VARTA CoinPower combines our strengths, our experience and our market leadership in button cells with modern lithium-ion technology. Innovative design meets the highest energy density.
- More and more applications require battery cells with even better performance at high energy. The VARTA cell has a higher performance than all other competing products on the market.
- Power Pack Solutions: A highly individual, customized battery that acts as a driving force to bring ideas to life.



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