YEO Teknoloji | REAP Battery

Alper Baykut, PhD.
REAP Battery – CEO

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About Us

Founded in **early 2000s YEO** has become a **leading company** positioned along the electrification value chain–from power generation, transmission and distribution to the **smart & efficient application** of electrical energy.

The key and most active area of activities of YEO is the implementation of projects in the **renewable energy industry.** We successfully operate in this industry, providing a **full range of services** for the design, construction, and maintenance of solar power plants, floating solar power plants, wind power plants, biogas and biomass power plants with integration of **ESS (Energy Storage Systems)**, and **modern digital technologies**.

YEO Technology is a listed company in **Turkish Stock Exchange Market**.

19 Years Experience

3
Continents

30+
Countries

620+
Employees

150
Engineers

40
Women

400+
Completed Projects

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Broad Vision, Diversified Services & Superior Quality

International Offices

YEO CONTRACTING LLC. | MIDDLE EAST

YEO ENERGY INDUSTRY LLC. | UZBEKISTAN

ISS ENGINEERING INTEGRATED SYSTEM SOLUTIONS LLC. | AZERBAIJAN

YEO LIMITED LTD. | UKRAINE

Joint Ventures

DEFIC GLOBE ENERGY A.Ş. | TÜRKİYE

REY ENERGY | UNITED KINGDOM

MARINERGY YENİLENEBİLİR ENERJİ İNŞAAT VE TİCARET A.Ş. | TÜRKİYE

NI-CAT | TÜRKİYE

MİKROHES TEKNOLOJİ ENERJİ SAN. VE TİC. A.Ş. | TÜRKİYE

Partnerships

Hitachi Energy

Schneider Electric

ptc

Rockwell Automation

HUAWEI

ABB

Subsidiaries

YEO TEKNOLOJİ ENERJİ VE ENDÜSTRİ A.Ş. | TÜRKİYE

YEO HYDROGEN GMBH | GERMANY

YEO TECHNOLOGY BV. | NETHERLAND

YEO SOLAR | TÜRKİYE

YEO TECHNOLOGIE GMBH | GERMANY

REAP BATTERY | TÜRKİYE

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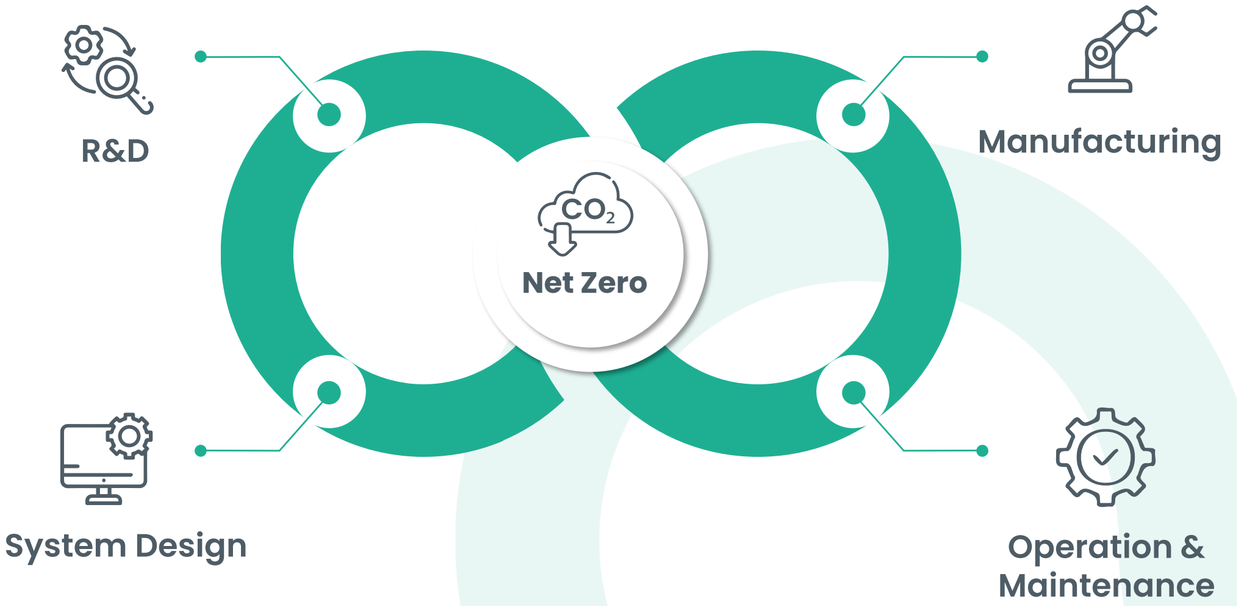
REAP Battery

Our Purpose and Values

REAP is committed to research, develop and produce technology-based ESS solutions for supporting the energy transition and helps customers for their **Net Zero targets.**

Our Vision is to be the number one ESS manufacturer in Turkey and among the top 5 in Europe in a short period of time.

Our Mission is to combine quality, advanced engineering and agile service together for delivering application specific **ESS products** for almost every use case with customer satisfaction in focus.



Technology

Field Experience in Battery Industry

Mechanic Design
Solid Modelling
Pack, Cabinet, …
Industrial Design
Computational Analysis
Structural, Thermal, CFD
Rapid Prototyping

Electronic Development
Software Development
Embedded, IoT, Cloud, AI, …
Hardware Development
BMS, EMS, …
Simulation (SIL, HIL)
Prototyping

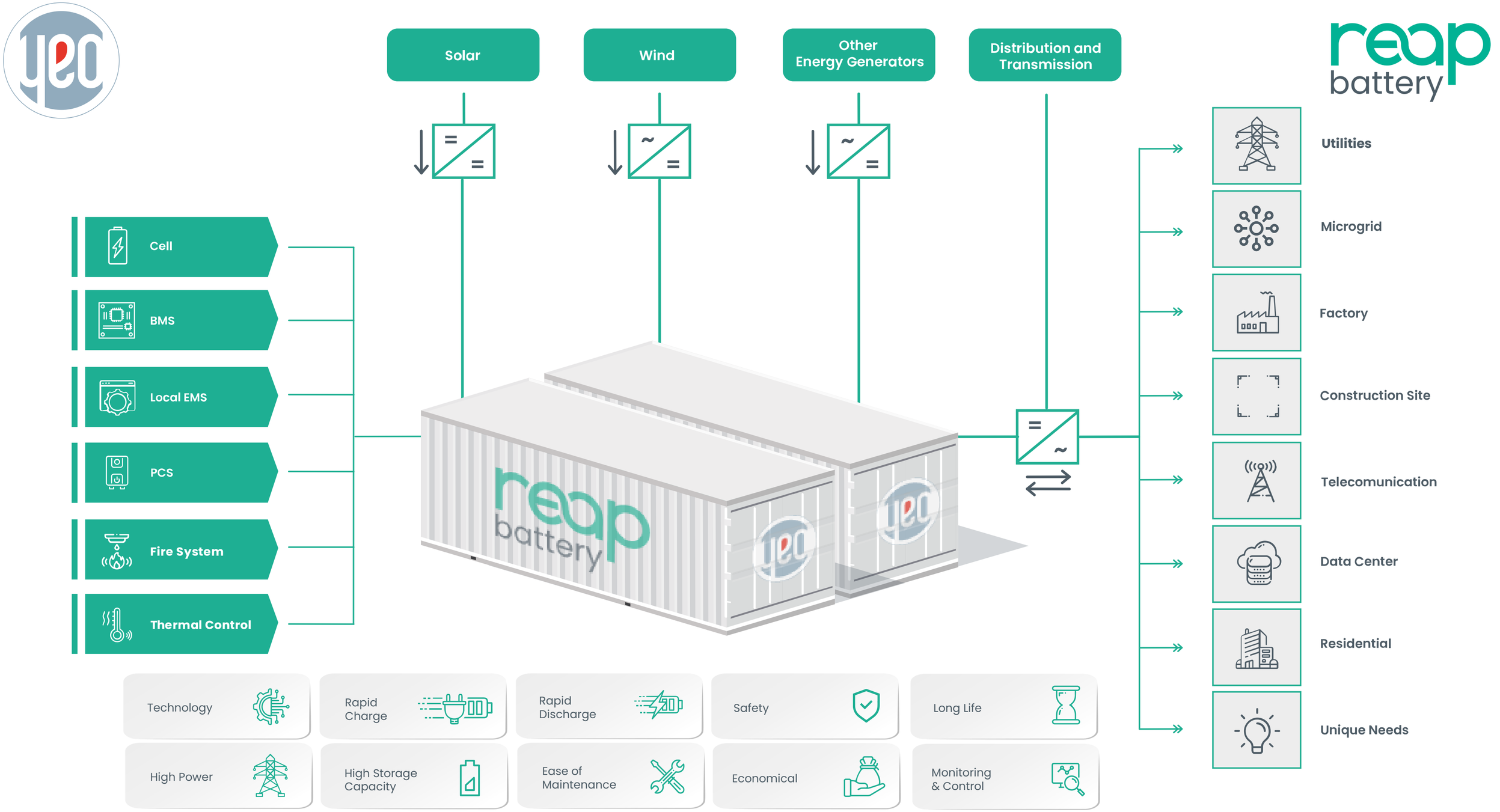
Electric & Control
Power Eectronic Design
Panel Design and Manufacturing
HV & LV System Design
Power Distribution Unit Design
Quality Control Station Design
Production Machinery Design

Advanced Material
Battery Chemistry
Cathode Material Research
Insulator & Conductive Materials
Membrane Material Research
Lightweight Materials
Recycling

Quality Assurance
Quality & Performance Testing
Life Testing
Certification
Manufacturing Database
Product Passport
Preventive Maintenance

Product & Project Development
Customer Specific Product Development
Cost & Performance Optimization
Product Life Cycle Management
Project Management
After Sales Services
Design for Second Life Battery

Supply Chain Management
Ecosystem Development
Procurement & Contract Management
Stock Control
Lean Production
Logistics
SKD & CKD Product Supply

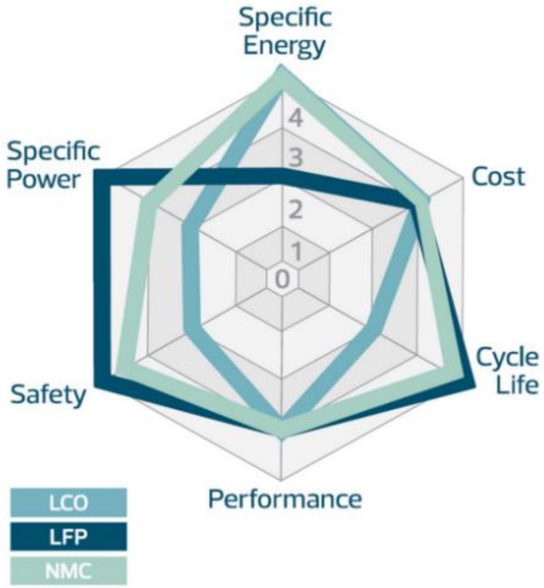

Solar
Wind
Other Energy Generators
Distribution and Transmission
Cell
BMS
Local EMS
PCS
Fire System
Thermal Control
reap battery
Utilities
Microgrid
Factory
Construction Site
Telecomunication
Data Center
Residential
Unique Needs
Technology
Rapid Charge
Rapid Discharge
Safety
Long Life
High Power
High Storage Capacity
Ease of Maintenance
Economical
Monitoring & Control

Technology

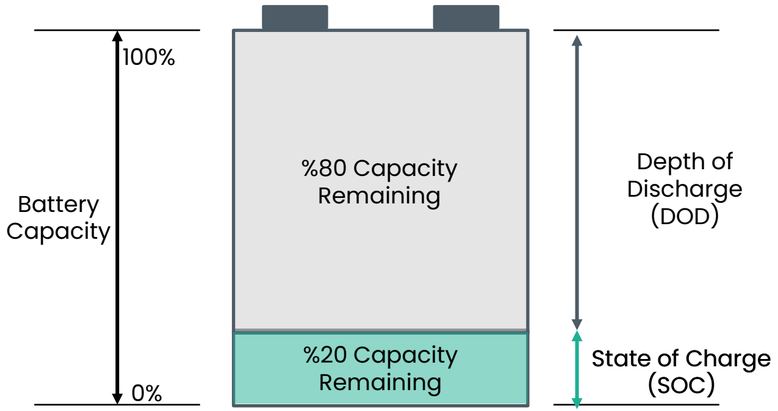
Cell | Lithium Batteries

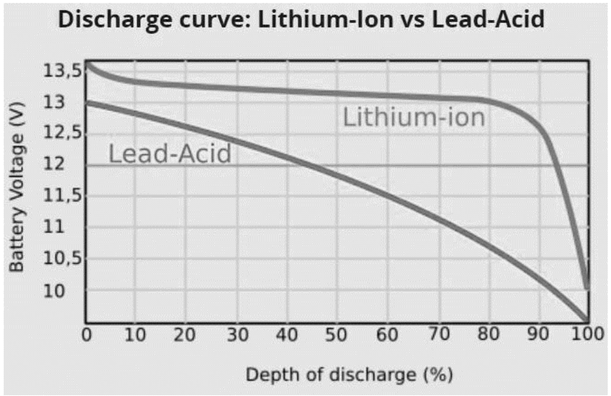
LCO (Lithium Cobalt Oxide)	LFP (Lithium Iron Phosphate)	NMC (Lithium Nickel Manganese Cobalt)
Modarete Safety	✓ Excellent Safety	Modarete Safety
Modarete Cycle Life	✓ Excellent Cycle Life	Excellent Cycle Life
Good Power	✓ Excellent Power	Good Power
Good Cost	✓ Good Cost	Good Cost
Excellent Energy	✓ Moderate Energy	Excellent Energy

Cylindrical Cell	Prismatic Cell	Pouch Cell
		



Key Parameters of Battery





Parameters

1. DOD: Depth of Discharge (%80)

2. SOC: State of Charge (%15-%95)

3. SOH: State of Health (Coloumb Counting)

4. Life Cycle: Loss of %10 BoL Capacity

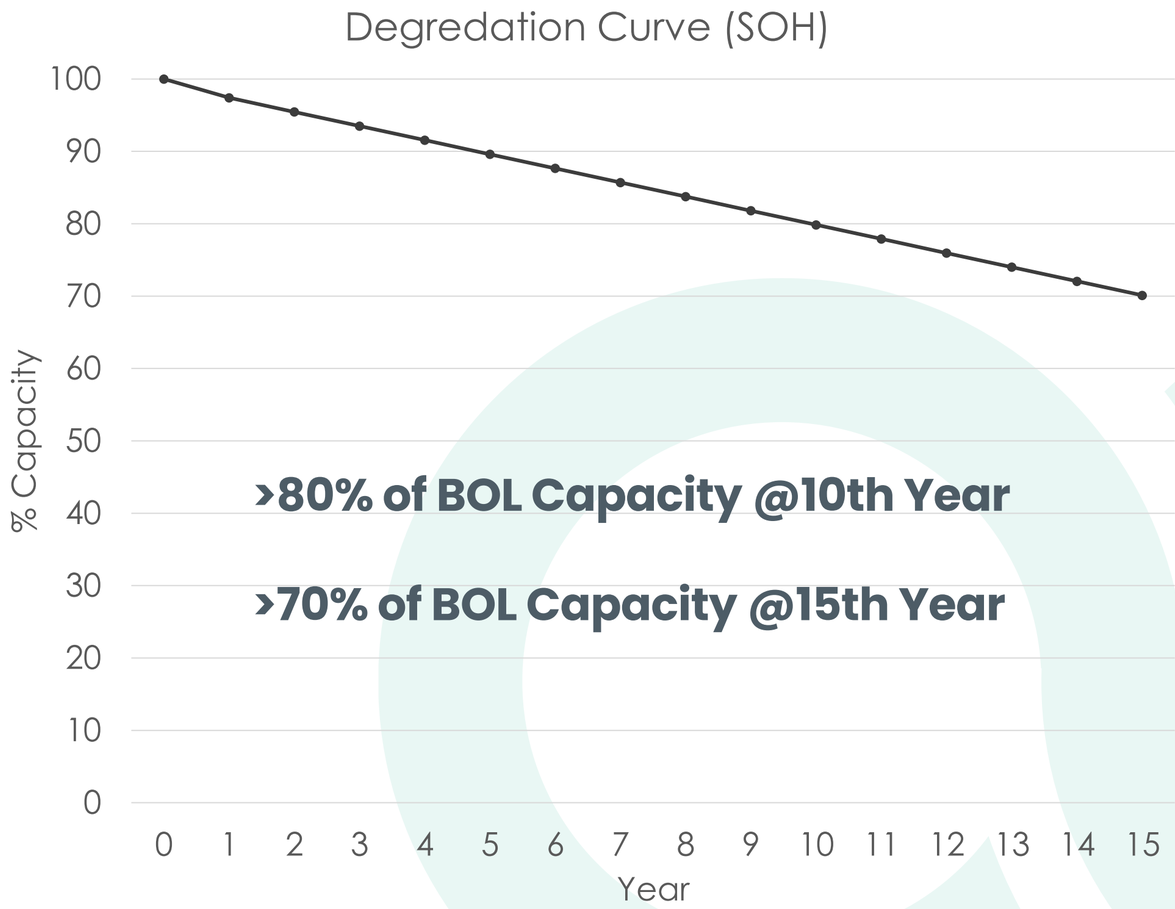
5. C Rate: Speed of Charge/Discharge

Project Requirements

1. Operating Temperature
2. Life Time
3. Charge/Discharge Cycle

Life & Performance Management of BESS

Cell	Price	~80 $/kWh
		~120 $/kWh
	Cycle Time	3600
		6000
	Performance	Low Density/Power
		High Density/Power
BMS	Charge / Discharge Rate	0.5 C / 0.5C
		1.0 C / 1.0 C
	Depth of Discharge	80%
		90%
	Thermal Control	±1°C
		±5°C
EMS	Capacity Control	Available
		Required
	Cycles / Day	1.0
		1.8
	Life Time	15 Years
		20 Years



Sample Curve for 1.8 cycle/day

Life & Performance Management of BESS

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		20 Years

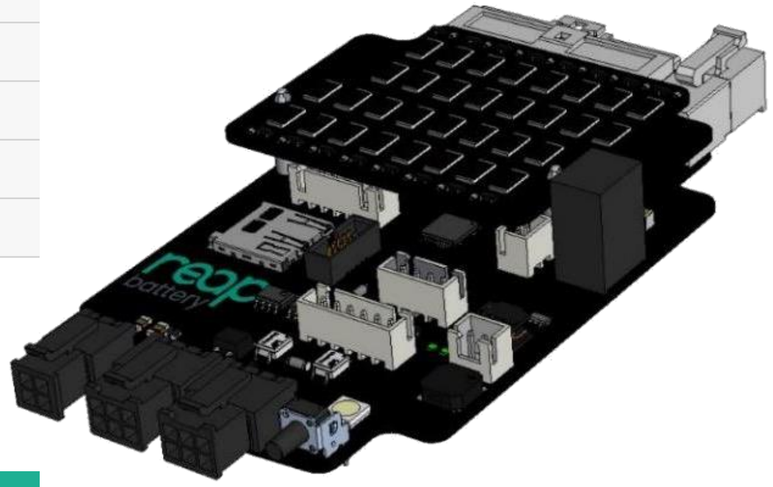
			Normal	EoL-20year	EoL-%100	Yearly
Cycle life	6000	Years	100,00	132,83	154,00	55,95
Cycle/day	1,8	1	83,81	112,06	130,23	18,80
Degredation	15	2	81,99	110,45	128,71	1,96
CRate	0,5	3	80,15	108,83	127,18	1,96
DoD	90	4	78,30	107,20	125,64	1,96
Oeff	95	5	76,42	105,56	124,10	1,96
		6	74,51	103,91	122,55	1,96
		7	72,59	102,25	121,00	1,96
		8	70,64	100,58	119,43	1,96
		9	68,66	98,90	117,86	1,96
		10	66,66	97,21	116,28	1,96
		11	64,62	95,50	114,70	1,96
		12	62,55	93,79	113,10	1,96
		13	60,44	92,05	111,50	1,96
		14	58,30	90,31	109,88	1,96
		15	56,11	88,55	108,26	1,96
		16	53,88	86,77	106,63	1,96
		17	51,59	84,98	104,99	1,96
		18	49,25	83,17	103,34	1,96
		19	46,84	81,34	101,67	1,96
		20	44,36	79,50	100,00	1,96
		EoL	51,88%	70,00%	75,95%	

Technology

REAP-BMS | In-house Developed Unique and Flexible BMS

Flexibility
12 VDC to **1500 VDC**
16 cells control in series (Slave BMS)
512 cells in series (Master BMS)
All battery parameters easily configured **(LFP, NMC,..)**
Battery model for **intelligent rate control**

Safety
Detection of error modes and warning conditions
Noise and vibration robust
-40° to +85°C operational range



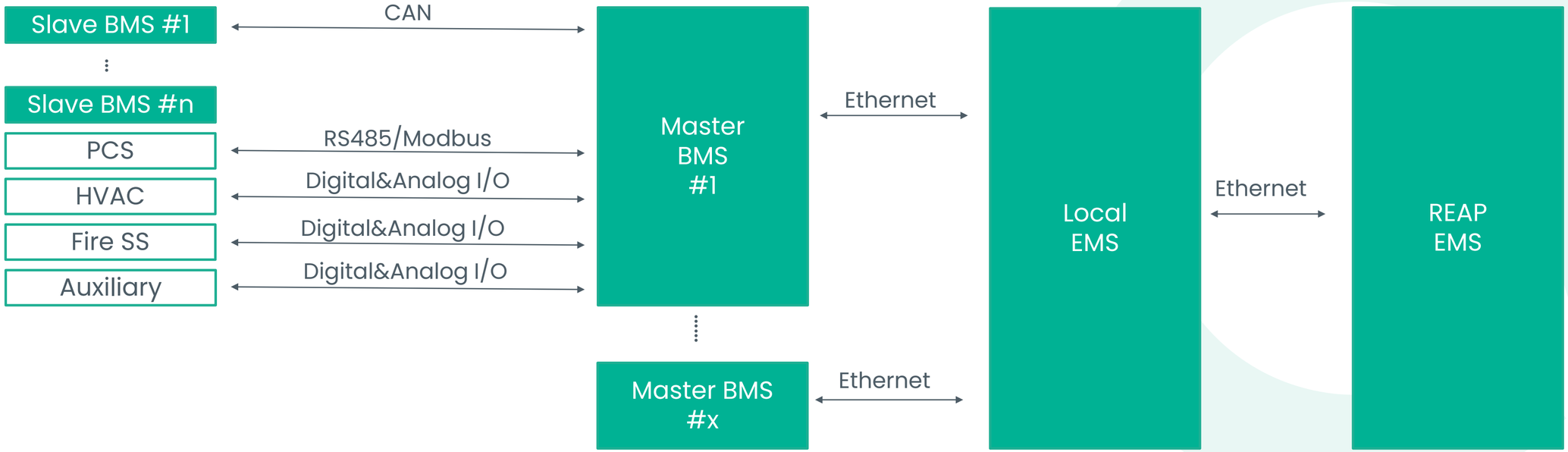
Functionality
Cell voltages 0-5V, **±1mV accuracy**
Highly **accurate SOC and SOH estimation (<1%)**
Isolation resistance calculation
Active balancing operation with a balancing current of **1000mA/cell**
Cell and pack resistance estimation
Thermal management
Advanced charger/discharger control
Data logging
CANbus, RS485 and Direct-WiFi(optional) communication interfaces.
3 contactor control outputs up-to 5A

Technology

REAP-EMS | Beyond the Limits of Energy Storage

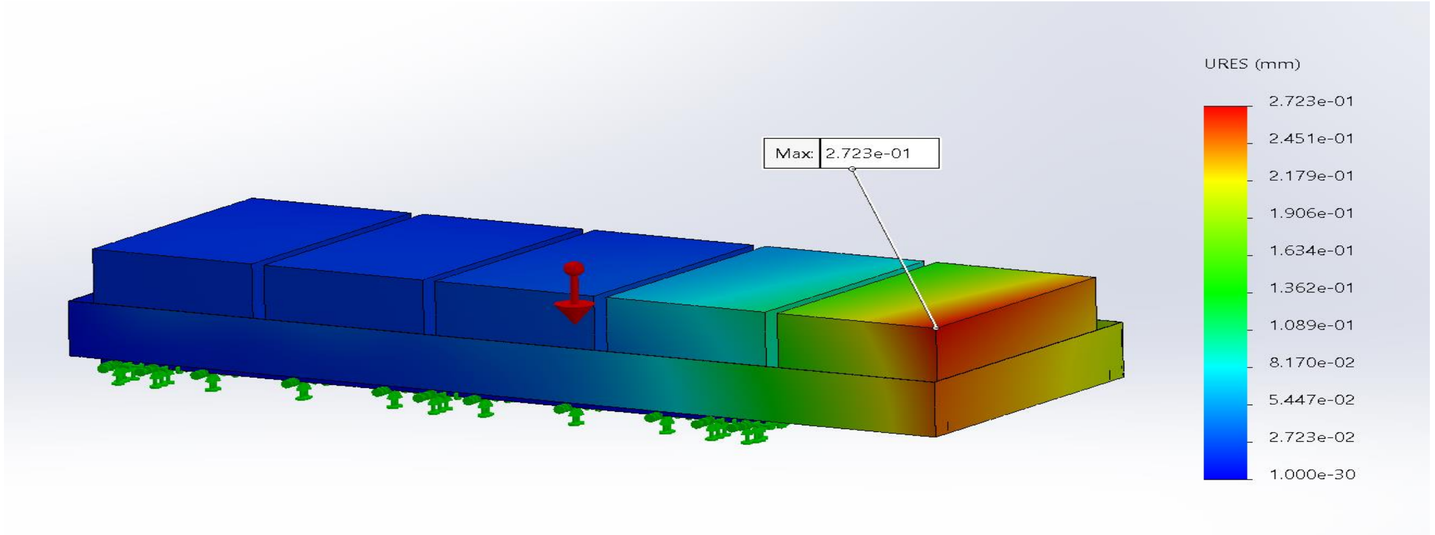
Reap-EMS is a **real-time energy intelligent platform** that provides performance monitoring and management solutions for renewables. Reap-EMS is **fully compatible with regulations in Türkiye**, communicates with power grid and renewable energy plants and with other Reap-ESSs, and reports the operation.

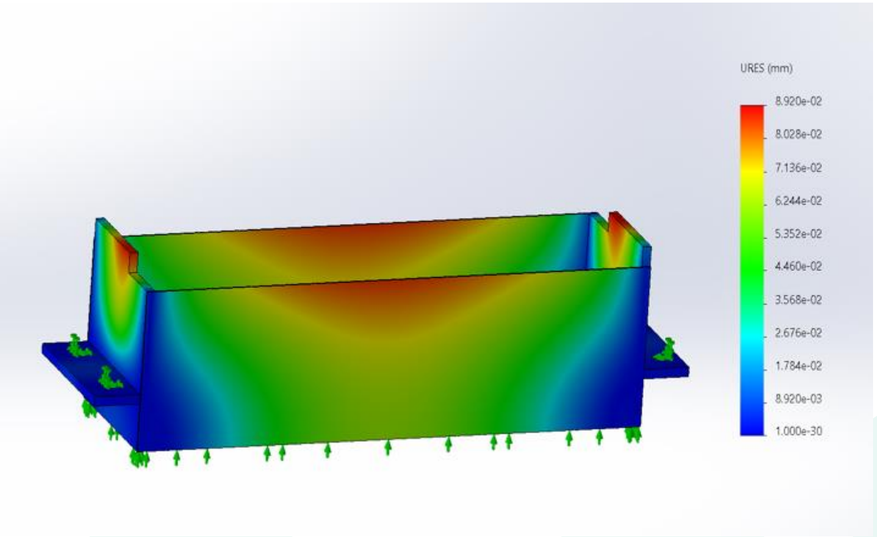
Reap-EMS monitors and controls all **batteries, power control / thermal /cybersecurity /fire systems** in the Reap-BESS, improving BMS performance. It allows you to set battery parameters such as limit voltages and temperatures, allowable charge and discharge rates or improve SoC estimation and control.

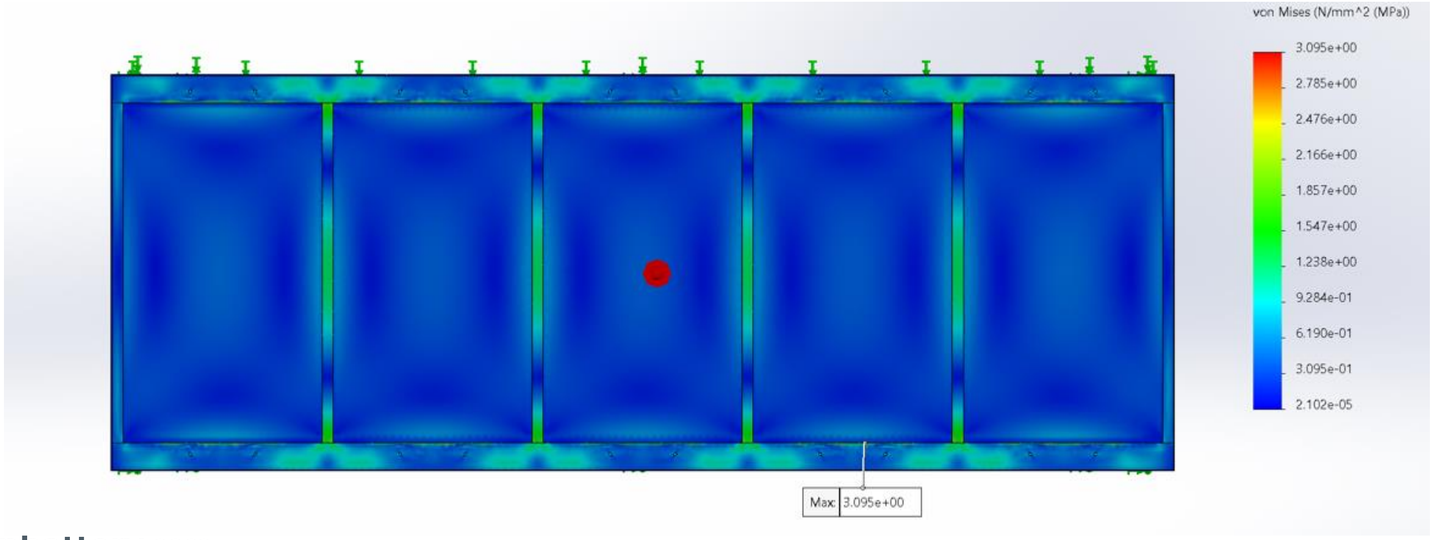


Technology

Structural Analysis







Computational Analysis

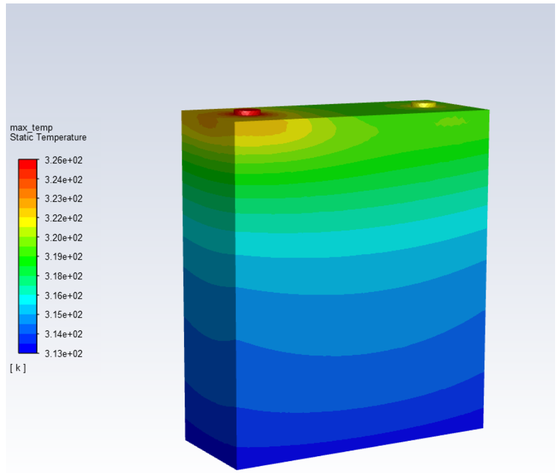
Long Term Durability

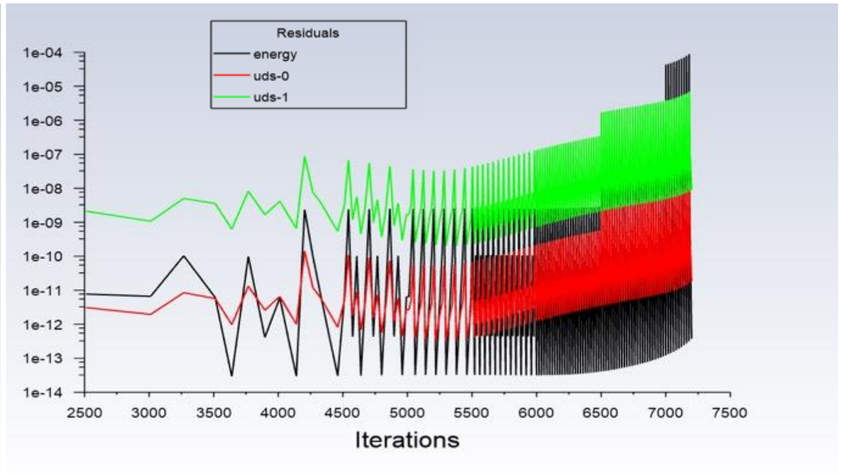
Enhanced Reliability

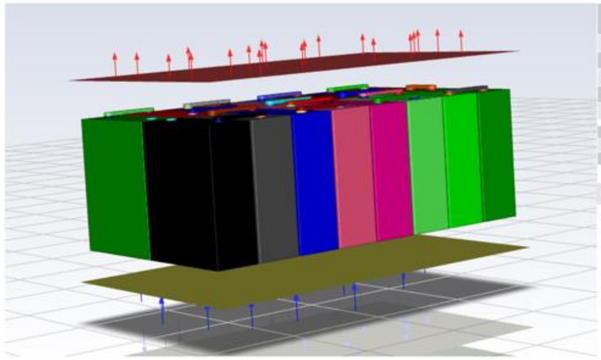
Lowest Costs

Technology

Thermal Analysis

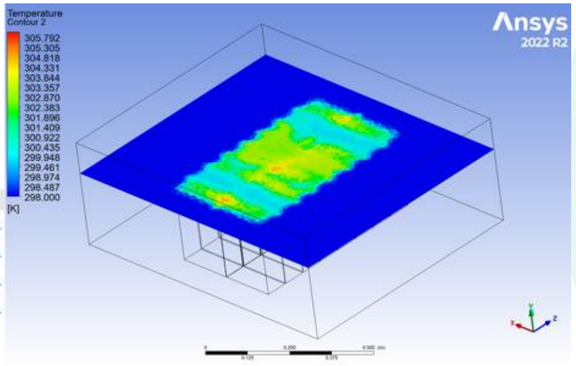






Hücreler arası mesafe	
mm	mm
4	75.65
busbar mesafeleri	
mm	mm
4	75.65
Hiz (m/s)	0.5
Diameter (m)	0.48022
Intencity	0.047774032

Fluid parameters	
Substance	Air (25 °C)
Fluid density	1.184 kg/m³
Dynamic viscosity	0.0000186 kg/(m·s)
Kinematic viscosity	0.00001571 m²/s



Operating Temperature

Specific design are made to guarantee ESS to work -5C~+80°C ambient temperature.

Cooling System

Liquid cooling or air cooling system options are available.

Max 3°C difference between cells.

Technology

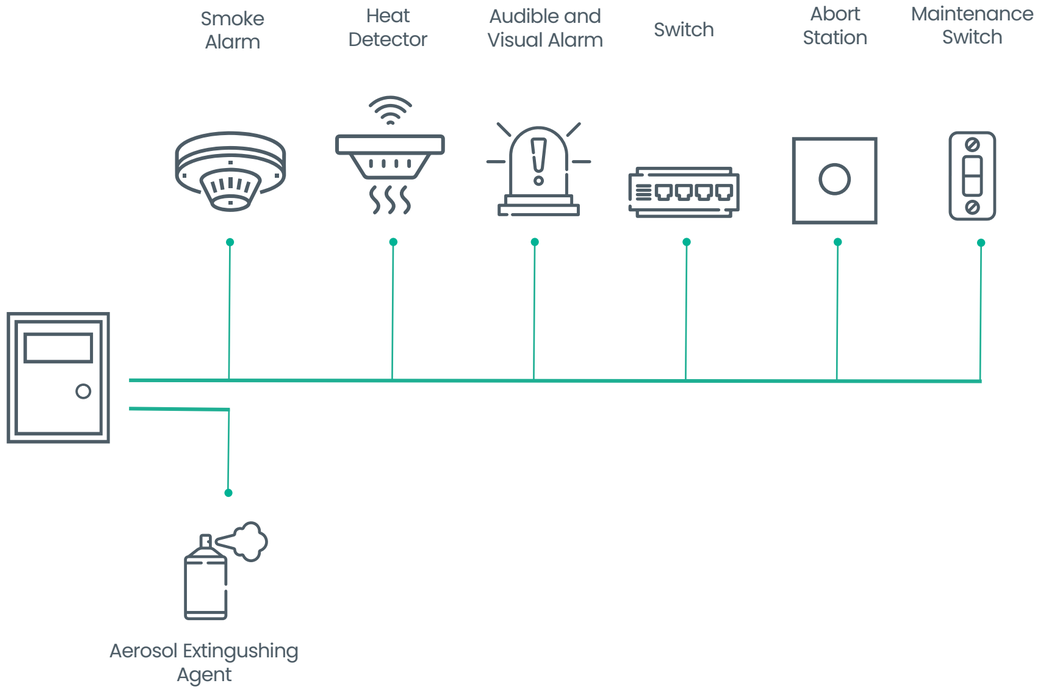
Thermal Management System

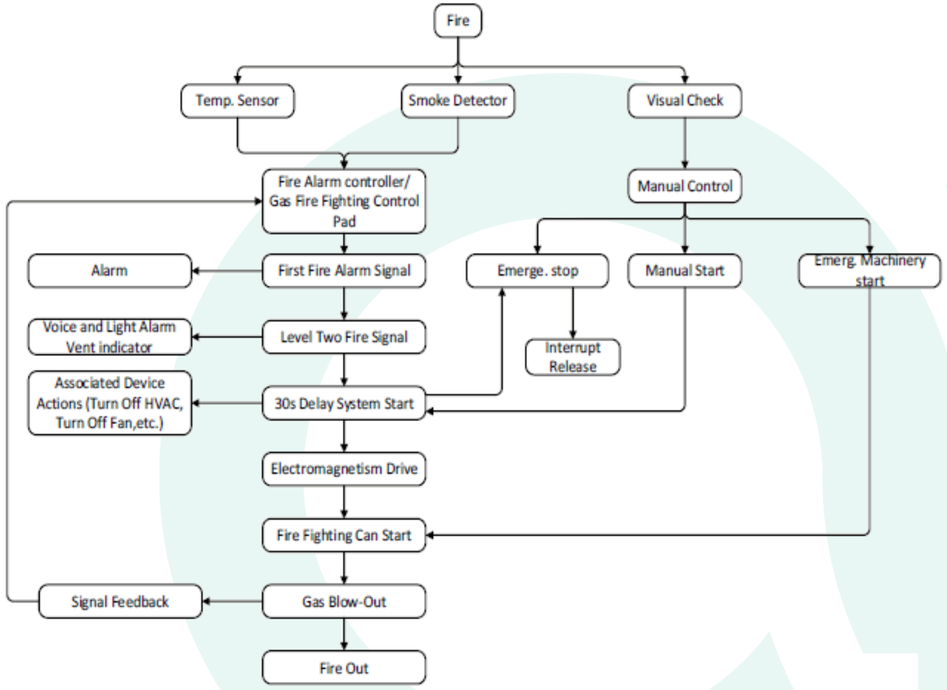
Item	Air Cooling	Liquid Cooling
Equipment	HVAC	Chiller
Cooling Material	R134A	%50 Water- %50 Glycol Mixed Liquid
Operating Temperature	-25~45C	-25~80C
Cooling Capacity	30 kW	20 kW
Heating Capacity	20 kW	15 kW

Technology

Fire Suppression System

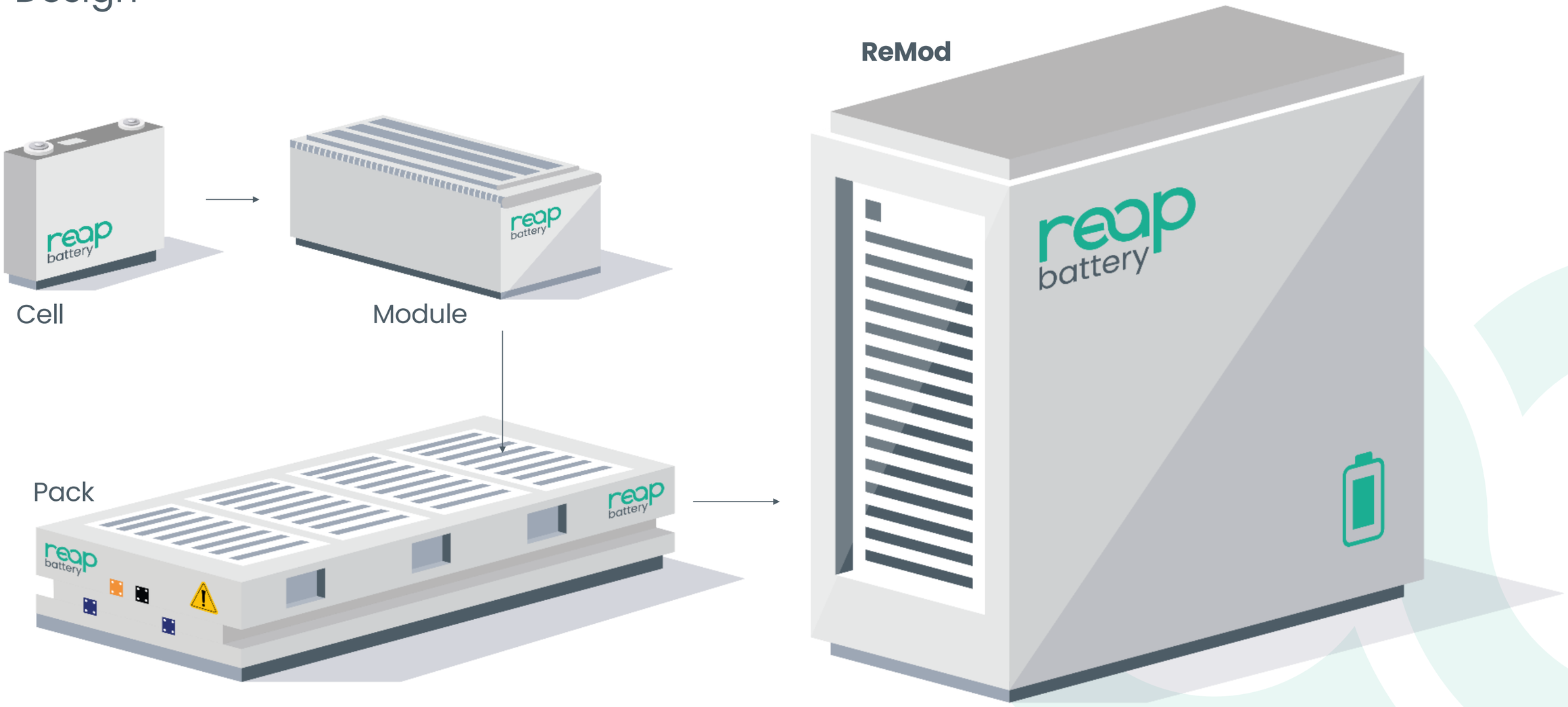
BESS fire alarm system design is based on NFPA72, NFPA70, NFPA2001, NFPA 69, NFPA 13, NEPA855 standards, both electrical safety and fire safety, to provide reliable protection.





ReMod

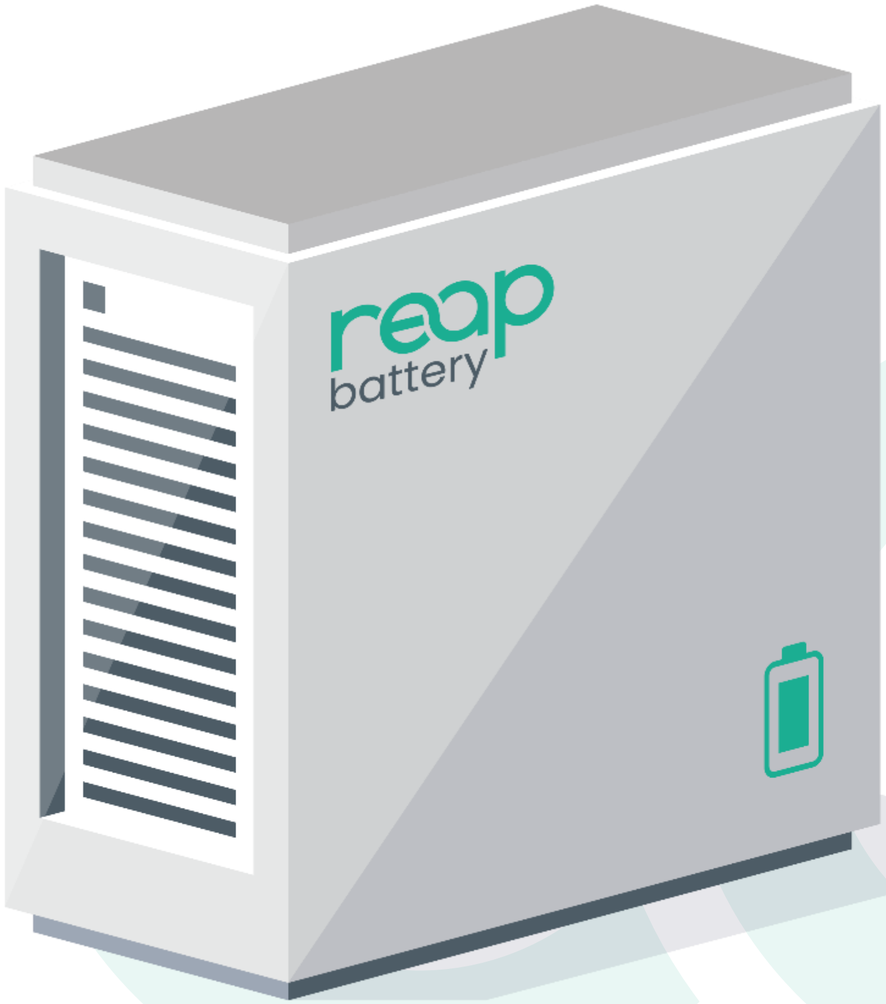
Design



ReMod

Specifications

ReMod	
Capacity	688 kWh
Nominal Voltage	1229 Vdc
Operating Voltage Range	1075-1400 Vdc
Max. Charge / Discharge Current	560 A
Nominal C Rate	0.5C / 0.5C (@25°C)
Max Continuous Rate	1C / 1C
Cell	LFP Prismatic
Cell Balancing	1000mA/cell active balance with REAP-BMS
Life (1.8cycle/day, @80% DOD, @25°C)	>80% BOL Capacity @ 10th Years >70% BOL Capacity @15th Years
Operating Ambient Temperature	-20..+55 °C
Cooling System	Liquid Cooling
Self Consumption (Standby/Operating)	1.5kW / 25kW (0.5C / 0.5C @25°C)
Communication	CAN, RS485
Dimension	W1500 x D2450 x H2590 mm
Weight	7.000 kg
Altitude	< 2000m
Certificates	CE, UN 38.3, IEC 62619, UL9540, UL 1973
Warranty	3 Years Product / 10 Years Performance Warranty
Recycling	Managing with REAP Battery Passport



Phase 1

2023 – 2025

Modular ESS
Production Facility

Phase 2

2024 – 2027

Lithium Battery
Cell Production

Phase 3

2026 – 2028

Battery Cell Second Life
and Recycling Facility

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