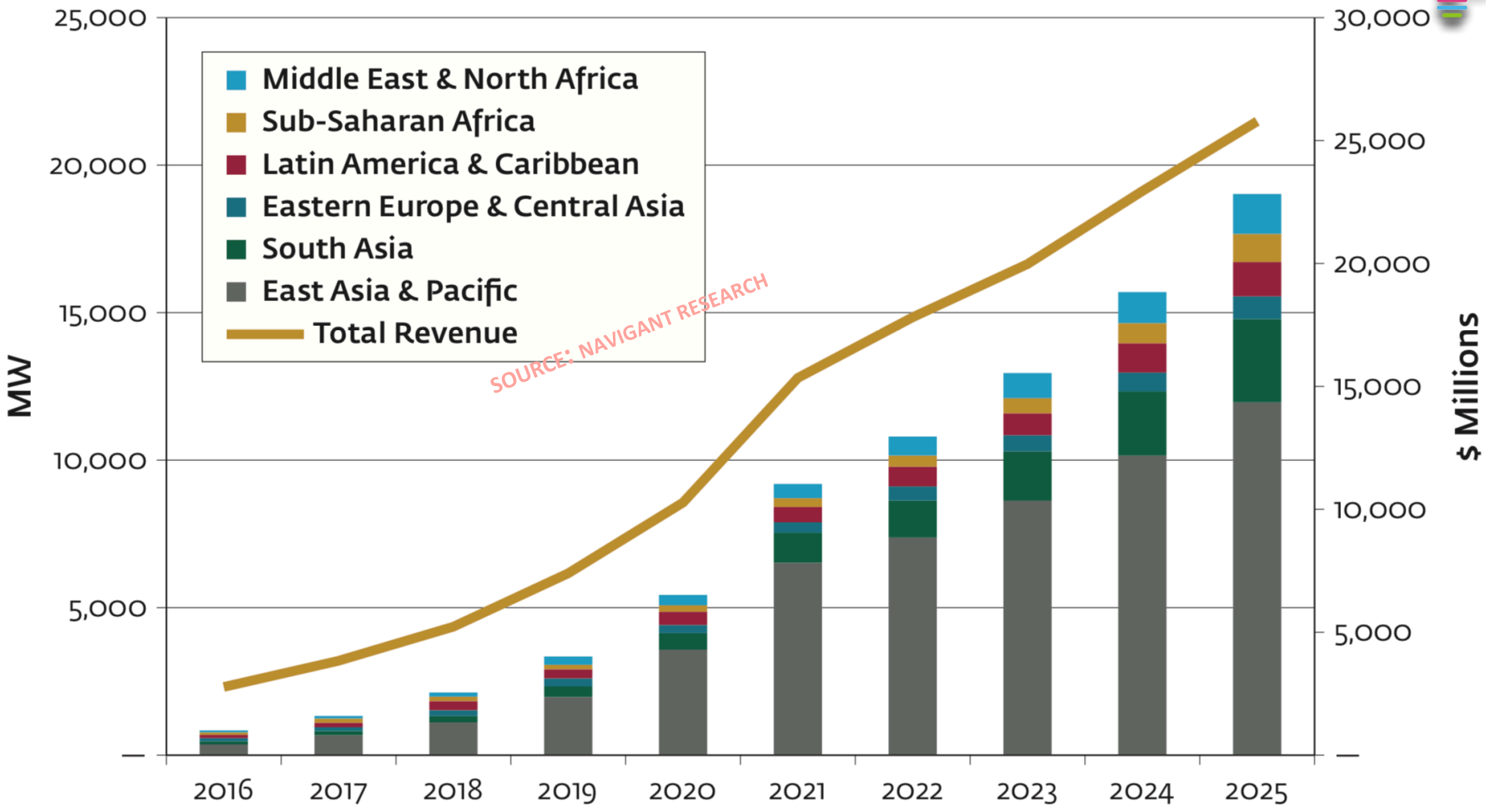

IDA
ENERGY STORAGE
based on hybrid supercapacitor

Projected energy storage revenue up to 2025

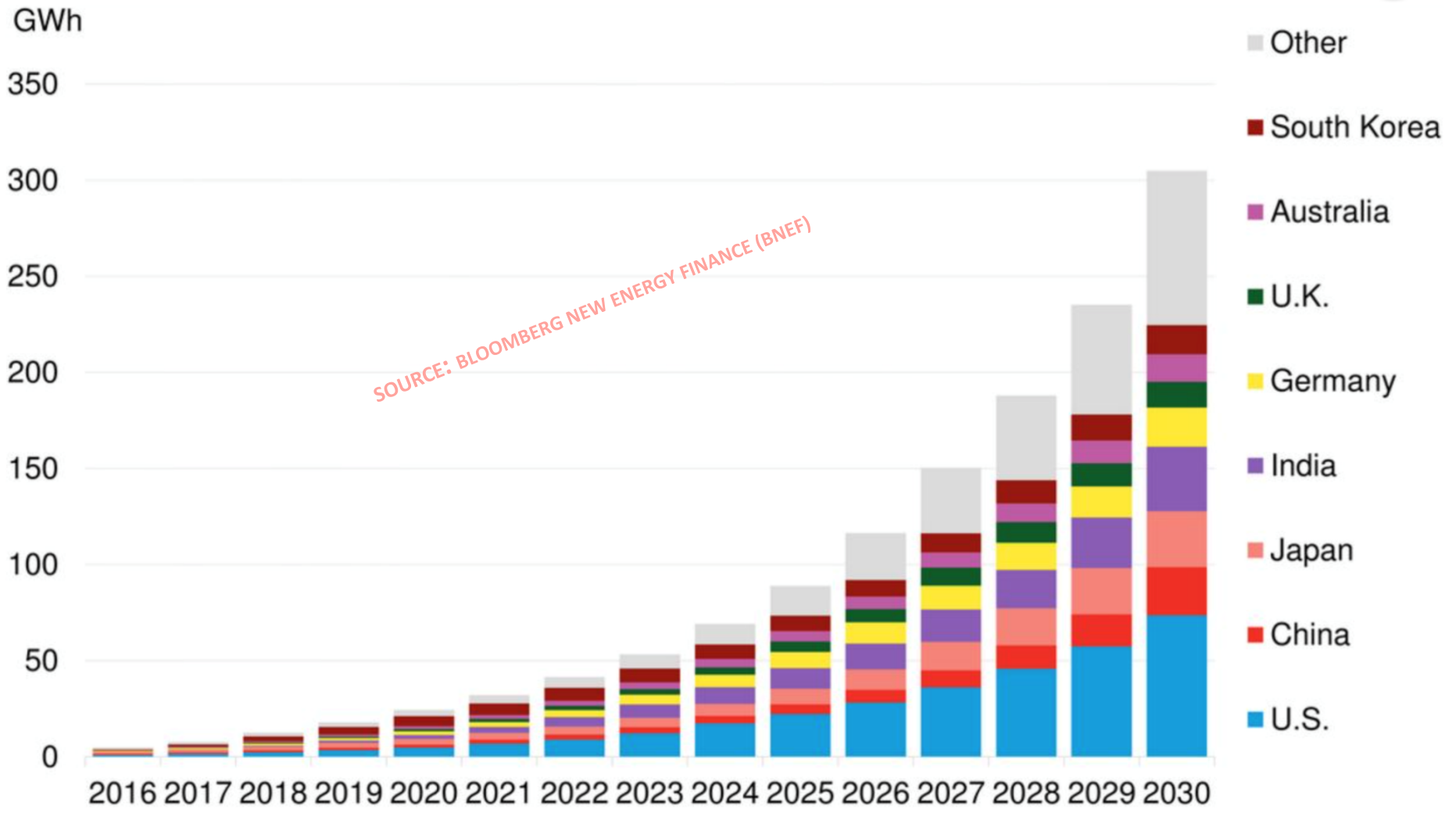


Summary

Global battery energy storage systems (BESS) market witnessed a market value of around US$3.30 Billion in 2016 and is estimated to reach over US$14 Billion by 2021, registering a compound annual growth rate (CAGR) of around 35% between 2016 and 2021. The top five countries in the global market include the US, Japan, South Korea, Germany, and China. They represented around 85% of the global total in terms of cumulative installed capacity in 2016.

SOURCE: REPORTBAYER

Energy storage market forecast



On the cost side, BNEF sees utility-scale battery systems falling from about $700 per kilowatt-hour in 2016 to less than $300 per kilowatt-hour in 2030. That's in line with other projections that see stationary storage benefiting from investments into the mass manufacturing of lithium-ion batteries for consumer electronics and electric vehicles.

SOURCE: BNEF

Comparison of storage cells

	IDA Hybrid Super Capacitor	Li-Ion cell	Lead-acid cell	Flow cell
Energy density, Wh/kg	40-50	200 - 250	40 - 60	30-40
Voltage, V	1,1	3,6	2,0	1,1 – 2,0
Product price of 1kWh, USD	65-70	200-300	100-150	500-600
Number of cycles	20000+	7000	800	10000+
Energy keeping cost of 1kWh for total cycles, USD	0,0035	0,036	0,15	0,055
Lifetime, years	15-20	10	5-7	15-20
Ambient temperature, C°	-20 +75	+10 +45	-20 +45	-20 +45
ECO-friendly	+	+/-	+/-	+/-

Main advantages

- Long operating life up to 20 years.

Equals the service life of solar panels.

- Zero-chance of fire outbreak.

Due to usage electrolyte on a water basis.

- No memory effect.

Capacity is not decreased because of incomplete previous charges.

- Friendly to deep discharges and overcharges.

Active components does not degrade from discharges or overcharges.

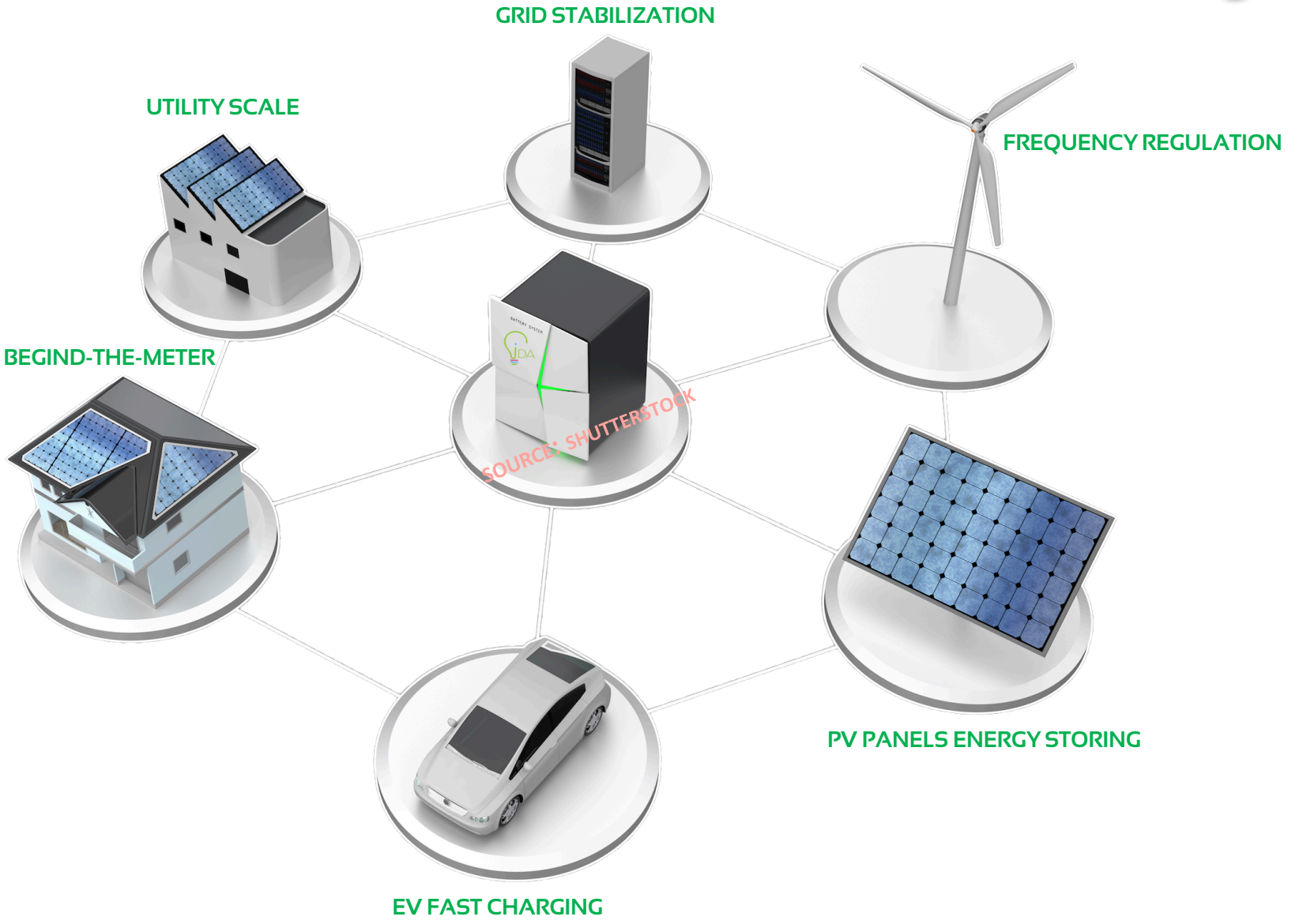
- Flexible internal architecture.

Allows using system in the mode of smoothing peaks or in the silent working mode

- Ultra low operation energy keeping costs on the world market.

Only 0.0035 USD per kWh or lower based on production of 5MWh/monthly

Battery energy storage fields of use



Storage cost breakdown

Battery

Hardware

- Inverter - Power Conversion
- Container or Housing
- Container extras (insulation/walls)
- Electrical Conduit (inside of container)
- Communication Device
- HVAC
- Meter (revenue grade)
- Fire Detection
- Fire Suppression
- Labor
- AC Main Panel
- DC disconnect
- Isolation Transformer
- AUX Power (lighting)

Engineering, Procurement, Construction (EPC)

- Control System/SCADA
- Site Preparation
- Loading & Drive from OEM site
- Lifting & Hoisting (by crane on site)
- PE stamped calculations/drawings
- OEM testing and commissioning
- Electrical BOS outside of container (conduit, wiring, DC cable)
- Electrical Labor
- Structural BOS (fencing)
- EPC Overhead & Profit

Development / Soft Costs

- Customer Acquisition
- Developer Overhead & Profit
- Interconnection

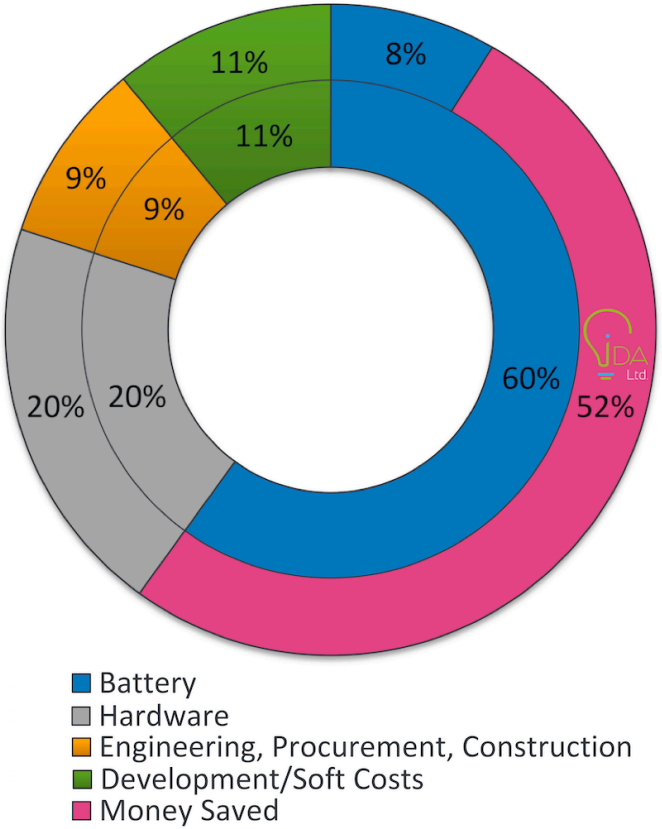
Project Cost Breakout

500kW/1000kWh commercial scale containerized li-ion battery system

Total Project Cost = $883,427

Possible Project Cost With IDA Storage ~ $423,371

Savings ~ $460,056



https://www.nrel.gov/docs/fy17osti/67235.pdf

Developed by Ran Fu & Timothy Remo

Data as of 09/30/2016 as part of NREL's Bottom-up Cost Model under DOE SuNLaMP agreement number 29839.

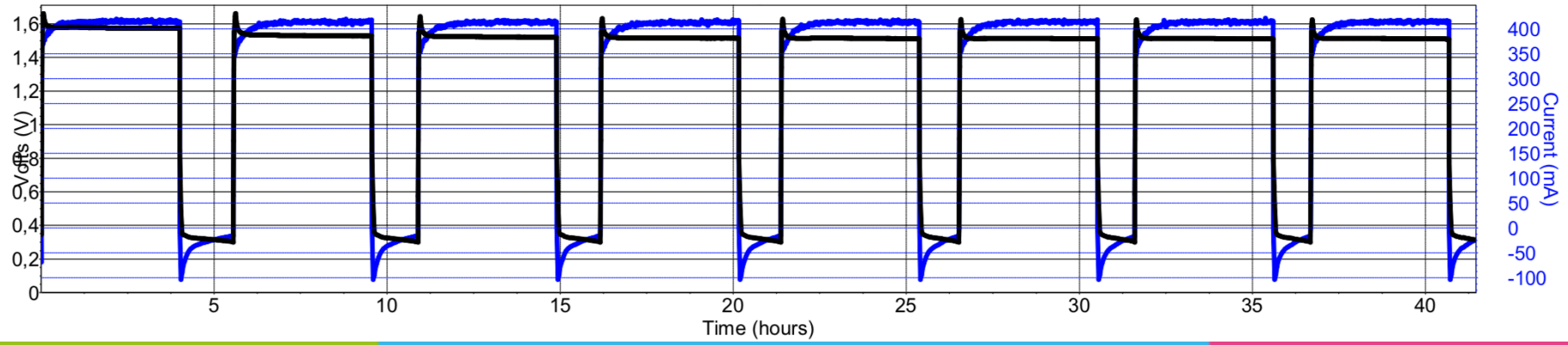
Product information sheet #1

Product:
IDA Hybrid Super Capacitor (HSupCap)

Specifications:
Rated capacity:
Actual capacity: min max mid
Nominal Voltage:
Charging:
Temperature: charge discharge storage
Energy density: volumetric gravimetric

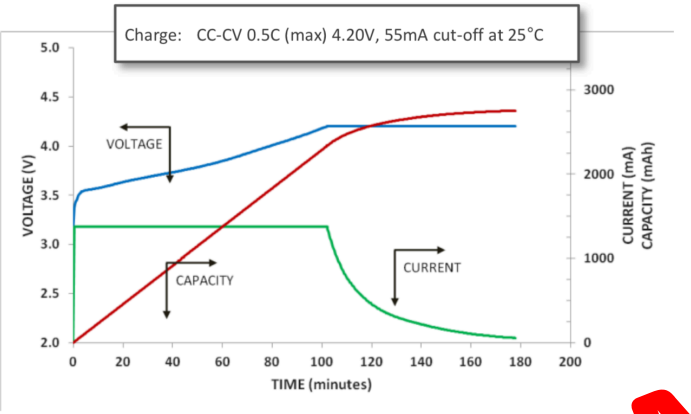
Component	Material	Formula
Positive electrode		
Negative electrode		
Electrolyte		

EXAMPLE

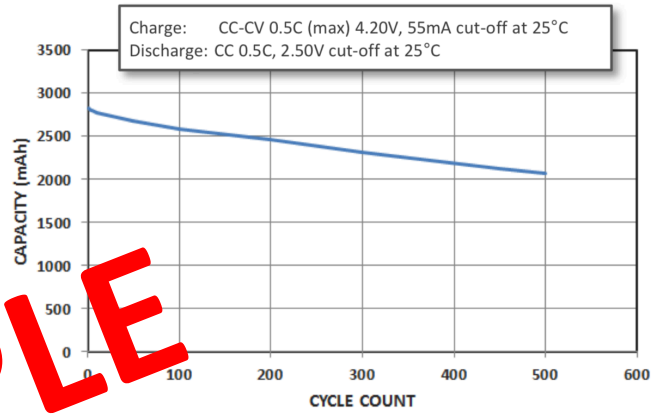


Product information sheet #2

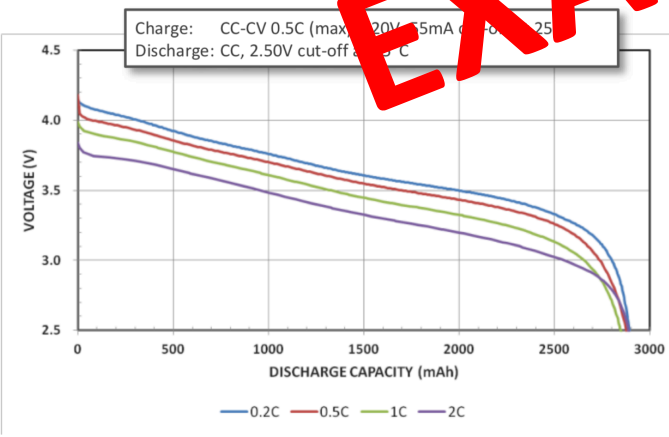
Charge Characteristics



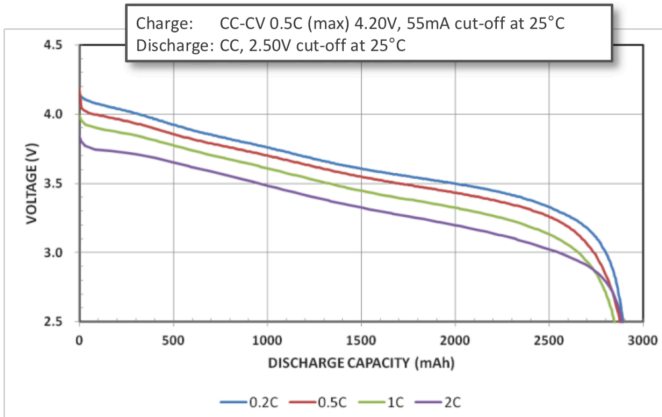
Cycle Life Characteristics



Discharge Characteristics (by rate of discharge)



Discharge Characteristics (by rate of discharge)



Energy project team

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Senior Constructor, Ph. D

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- O. Chuyko Institute of Surface Chemistry
- National Technical University of Ukraine "Sykorsky Kiev Polytechnic Institute"

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Thanks for your attention

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