

National Battery Research Institute

Prof.Dr.rer.nat.Evvy Kartini

Founder of National Battery Research Institute (NBRI)

Commissioner PT Infiniti Enegi Indonesia

Professor at National Research and Innovation Agency (BRIN)



Prof. Evvy Kartini

Founder of National Battery
Research Institute



Prof. Alan J Drew

Co-Founder of National Battery
Research Institute

About NBRI

NBRI is independent institute for electrochemical energy storage research and skill development. NBRI has legally established in 07th December 2020 as Center Excellence Innovation on Battery and Renewable Energy (Yayasan Pusat Unggulan Inovasi Baterai dan Energi Terbarukan).

NBRI establishment was supported by the Global Challenge Research Fund (GCRF), UK, through the cooperation with QMUL

Partnership



PHOTO SESSION

PHOTO SESSION



Strengthening Battery Ecosystem Through Partnership

Sahid Hotel, BSD, 26 July 2022

Spotlight Activities

2021-2022



NATIONAL RESEARCH PRIORITY

NBRI has successfully delivered research project on developing battery technology from locally mineral resources



PT KOMATSU INDONESIA ELECTRIFICATION

For supporting energy transition, NBRI assists PT. Komatsu Indonesia to conduct electrification on their industrial ecosystem



ESPOUSING NATIONAL & INTERNATIONAL BATTERY STANDARDIZATION

NBRI signs the Memorandum of Understanding (MoU) with Underwriters Laboratories (UL) Solutions of Indonesia



SKKNI ON BATTERY PACK

As a working group leader, NBRI along with Ministry of Manpower has ratified a National Work Competency Standard (SKKNI) on Battery Pack



CLIMATE CHALLENGE WORKSHOP

NBRI in collaboration with Queen Mary University of London has delivered research prize for researcher to solve climate change issue that was funded by British Council



CLIMBING UP THE INDONESIA NICKEL VALUE CHAIN

NBRI signs the Memorandum of Understanding (MoU) with Association of Indonesia Nickel Miners (APNI)



Fastmarkets : Asian Battery Materials Conference 2023

Singapore 1-3 May 2023



Asean Battery Consortium, Battery Electric Vehicle Technology Conference

Nusa Dua, Bali, 9 May 2023

National Battery Research Institute

Nickel is the **key**
factor for the future.



Prof.Dr.rer.nat Evvy Kartini
Founder of NBRI

UPSTREAM



Raw Material Production

MIDSTREAM

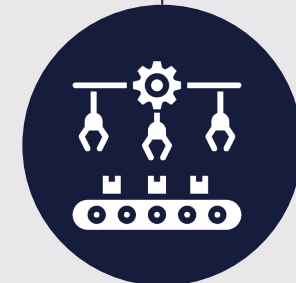


Material Processing



Cell Manufacturing

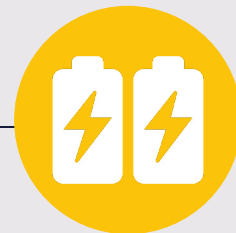
DOWNSTREAM



Pack Manufacturing



Electric Vehicle



Stationary Storage



National Defense



Aviation



End of Life Recycling and Reuse



Battery Supply Chain Industry

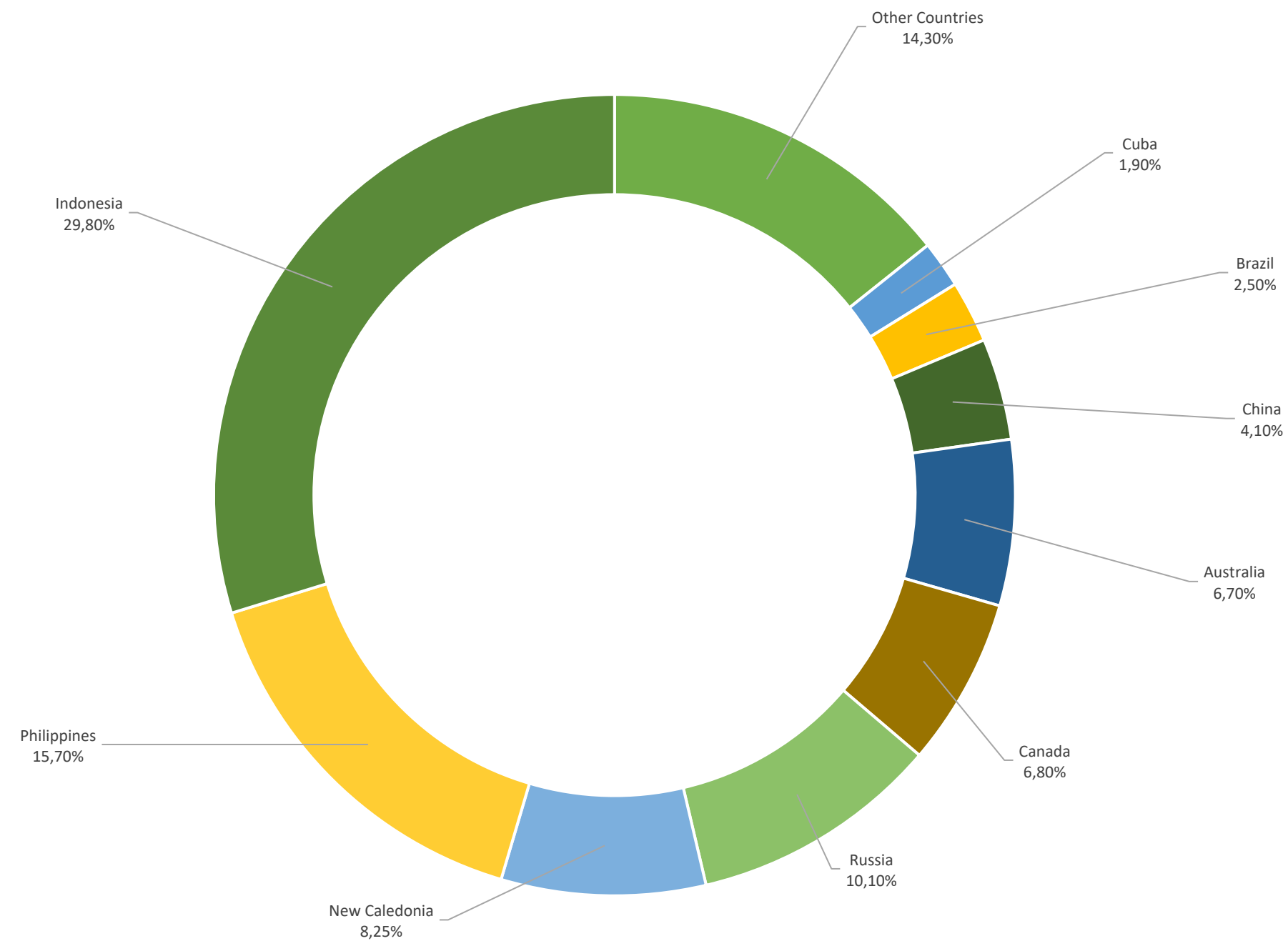
From Upstream to Downstream

UPSTREAM:

If You Want **Indonesia's**
Nickel, You Must
Process It **There**



Distribution of mine production of nickel worldwide in 2019, by Country



Global mine production of nickel
2.7 million metric tons

UPSTREAM:

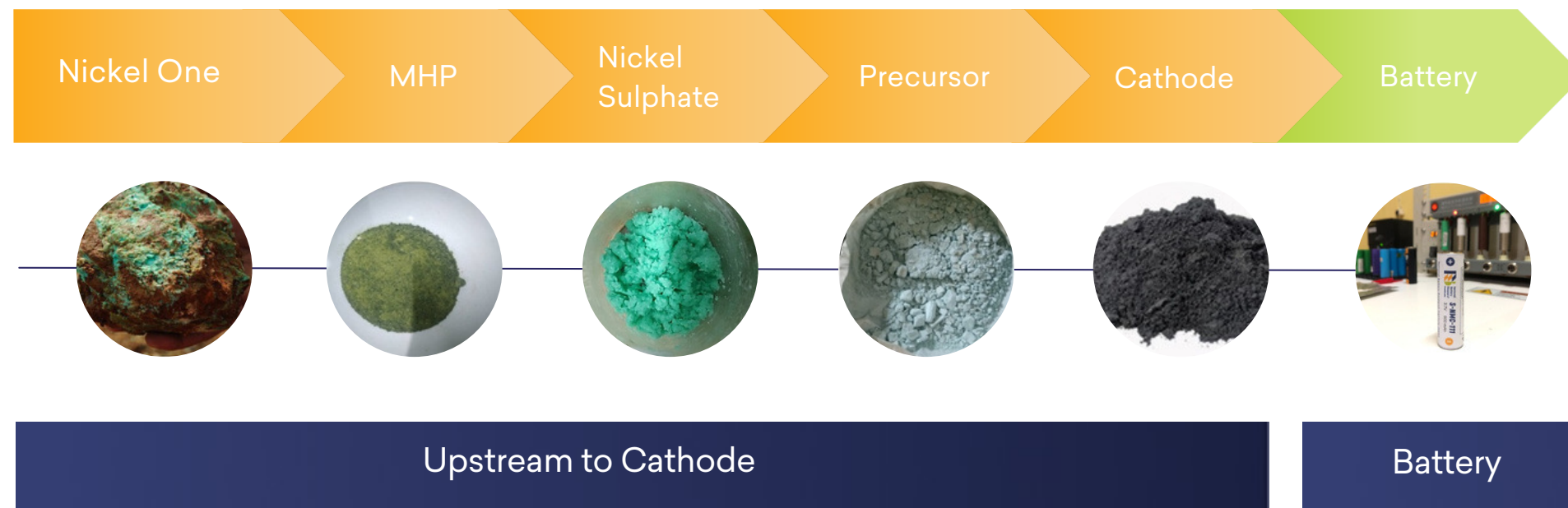
Mineral to Cathode



Prof.Dr.rer.nat Evvy Kartini
Founder of NBRI

Research Development and Innovation

Levelling Up Nickel Ore



Our Services



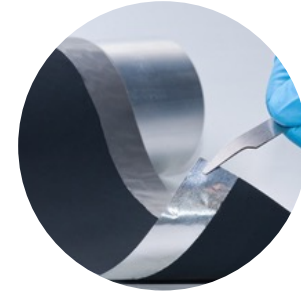
Mineral extraction

Ore extraction for battery materials



Custom Battery Materials Development

Precursor, cathode & anode active materials



Electrode Sheet Development

Electrode Sheet Development



Battery Cell Fabrication

Coin & cylinder cell assembly



Battery Pack Assembly

Development of innovative battery packs with BMS



Direct Consultation

Consultation regarding business model, etc.

2
PATENTS

42
CONSULTATIONS

12
PROJECTS

46
PUBLICATIONS

PROSES PENGOLAHAN NIKEL JADI BATERAI LISTRIK



Nickel Ore
MHP
Nickel Sulphate
Precursor
Cathode
Battery



	Upstream to Cathode					Battery
	Nickel Ore	MHP	NiSO ₄	Precursor	Cathode	Battery Cell
Increased added value (1000 USD/ton Ni)	1.1 to 1.7	up to 10	up to 14	25 to 30	45 to 55	90 to 110
Value-added relative to the ore price	-		30 to 40 times			90 to 150 times

MINING ZONE | MAAF, NIKEL SAJA BELUM CUKUP BUAT RI JADI RAJA BATERAI LISTRIK GLOBAL

IHSG 0,29%
 TEKNOLOGI 1,10%
 GBP/IDR 0,13%

1.625 ▲ 30 (1,86%) BARITO PACIFIC 890 ▲ 25 (2,91%) BUMI SERPONG DAMAI !
 10 (0,25%) ENERGI 2.098,14 ▼ 11,30 (0,54%) BAHANBAKU 1.260,50 ▼ 2,93 (0,23%)

15:43
WIB



Mining Zone on CNBC Indonesia

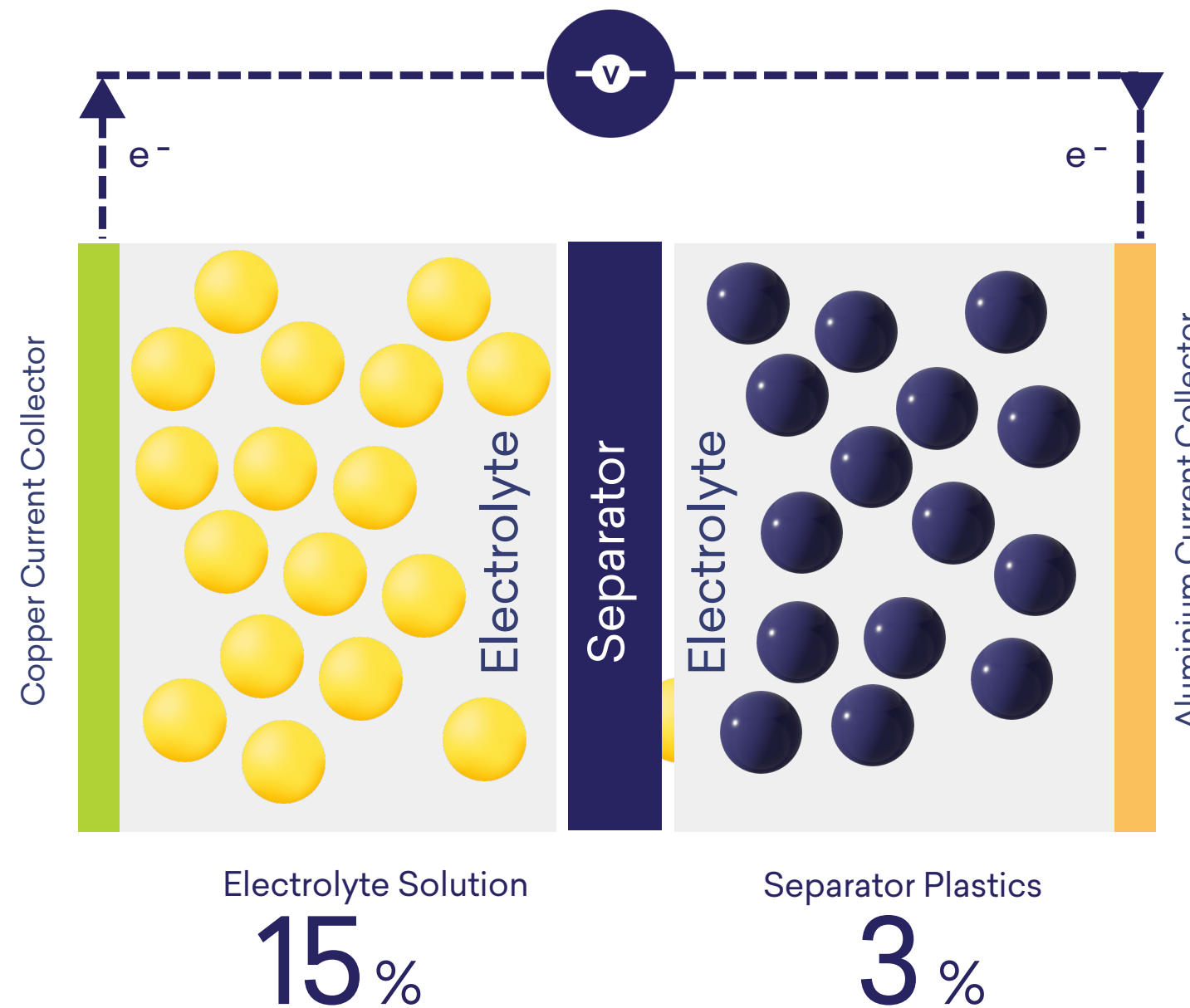
Studio CNBC, April 2023

Inside a Li-Ion Battery

All the components of a Li-ion battery have value and can be recovered and reused.

Anode
e.g. graphite
22%

Copper
17%



Active Carbon
Material

e.g. lithium cobalt oxide,
lithium nickel,
cobalt aluminum oxide

31%

Aluminium

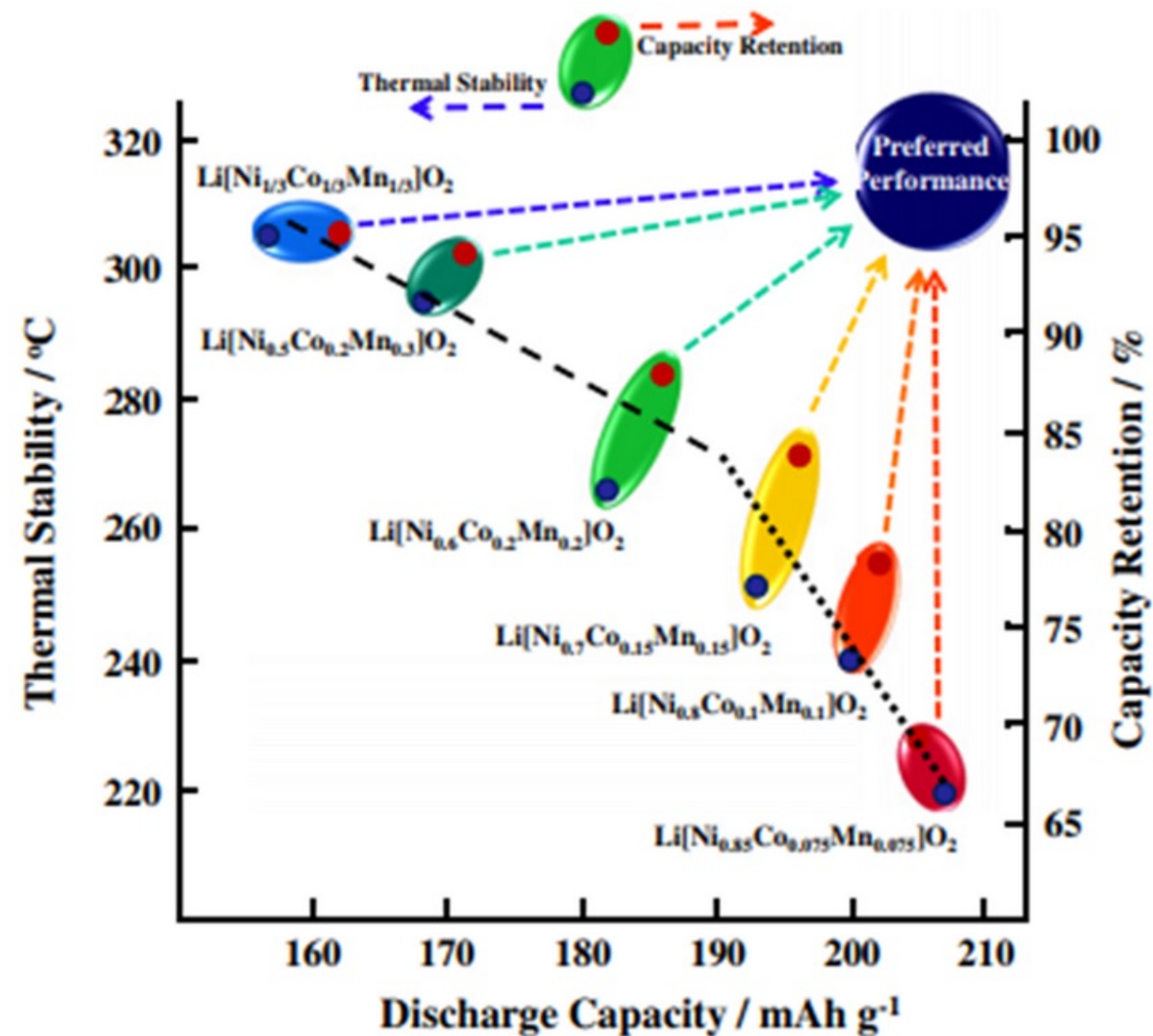
8%

Carbon Black
and Binder

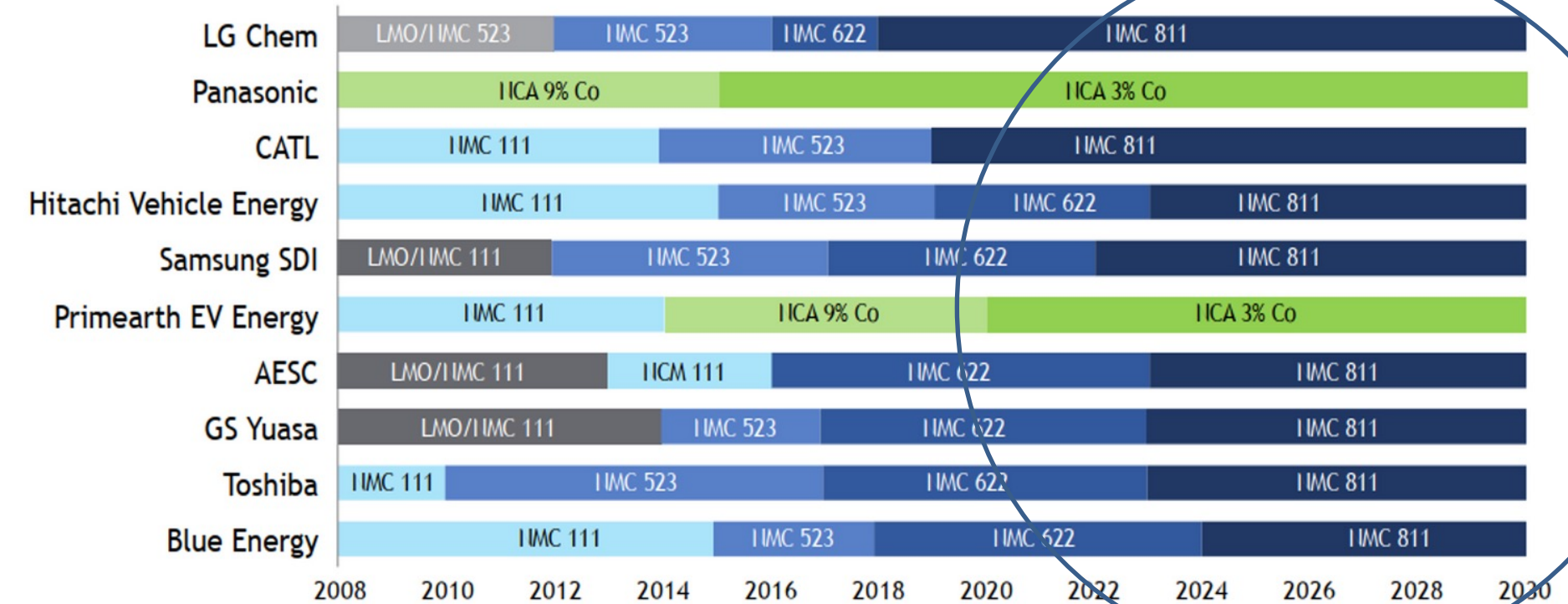
4%

Source: Argonne National Laboratory

Increasing Nickel content inside Lithium Ion Battery



Cathode Chemistries by selected manufacturers



Sumber: Electric vehicle trends and implications for nickel (Roskill), team analysis

MIDSTREAM:

Battery **Manufacture**, Indonesia's Forecast

1 #

Global Nickel Production

Critical components of battery, bold position in upstream mineral resources.

60%

Nickel High Demand

In the future, will use Lithium-ion battery with high rich nickel NMC622 & NMC811 , whereas Nickel as the main component for cathode 60-80%. This increases the volume demand of nickel

35%

Battery Demand

35% Battery Demand from the EV total cost, battery is one of the main components representing 12-25% of the total demand

10.8_M

Electric Vehicle Market

Indonesia, huge domestic market potential

2W: 8.8 million potential units in 2025

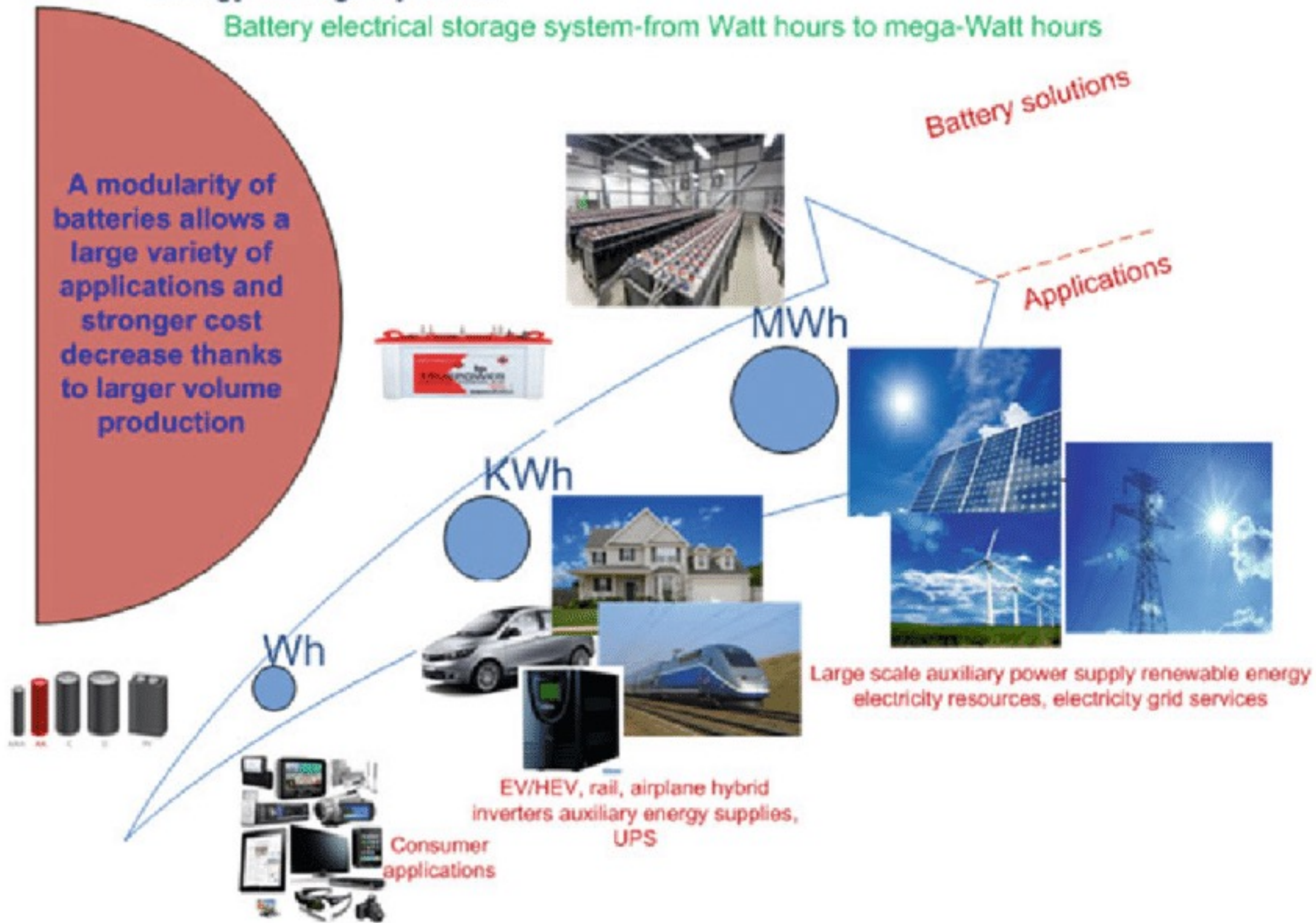
4W: 2 million potential units in 2045

DOWNSTREAM:
Battery Application
in Indonesia

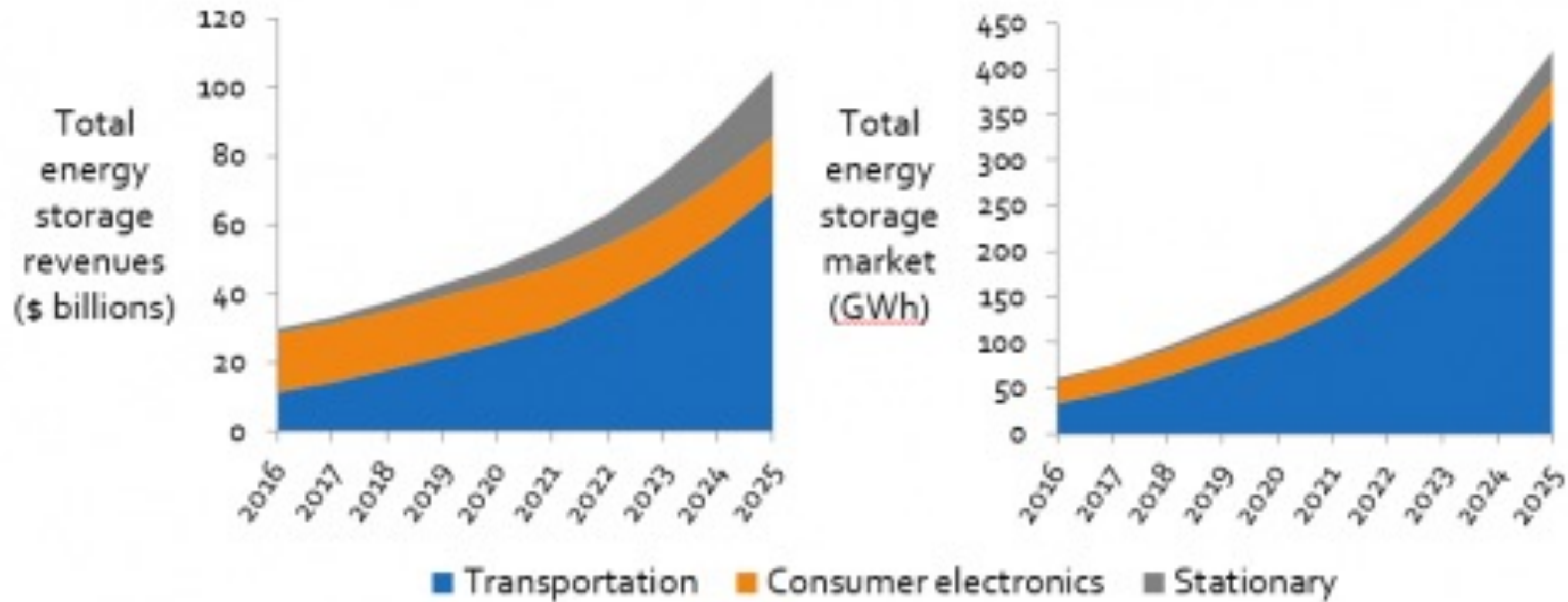


Energy storage systems

Battery electrical storage system-from Watt hours to mega-Watt hours

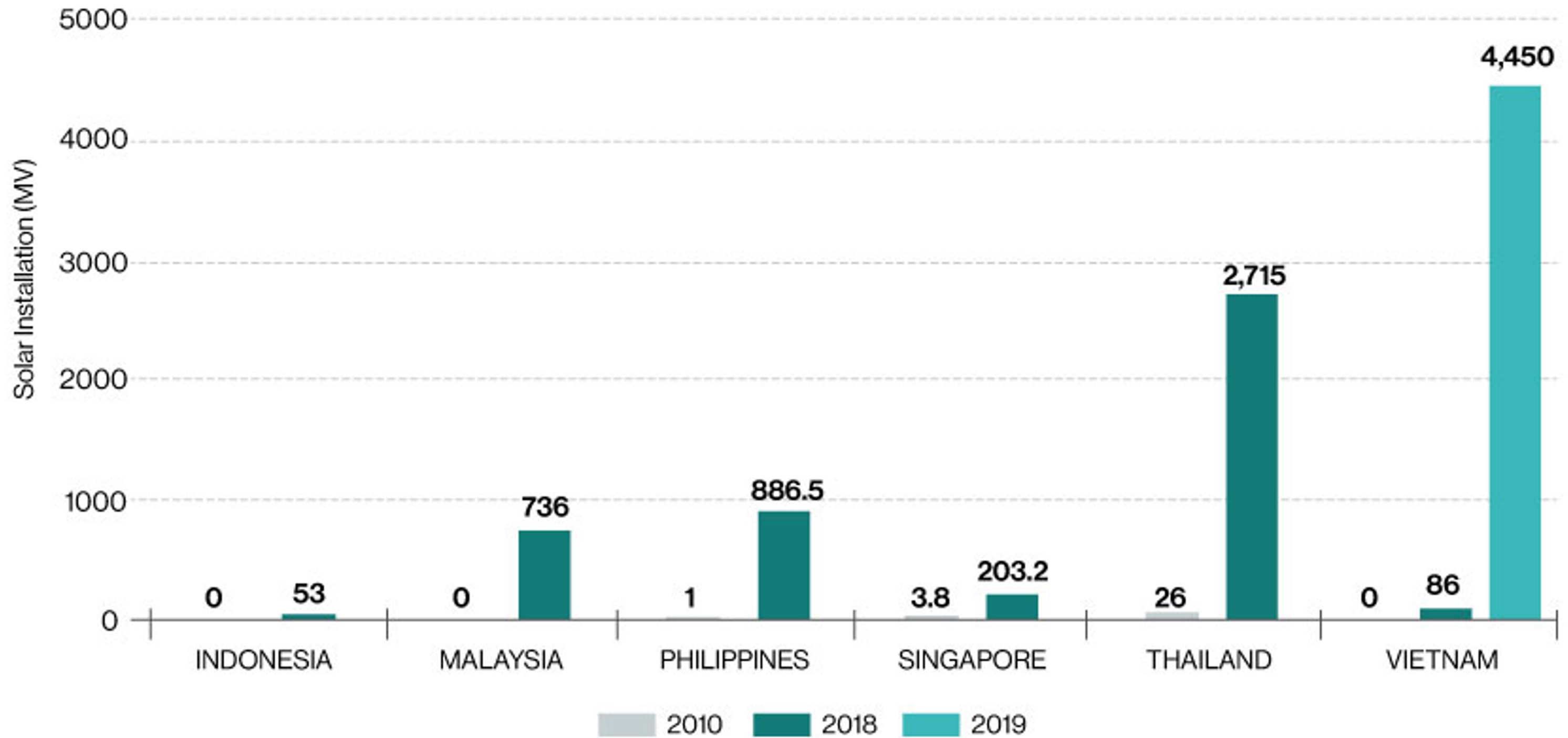


Energy Storage Market Will Surpass \$100 Billion by 2025



Source: Lux Research Report "Quantifying Growth Opportunities in the \$105 Billion Energy Storage Market"

SOLAR INSTALLATION PROGRESS IN ASEAN



Source: ASEAN Centre for Energy

Indonesia has a huge renewable energy potential.

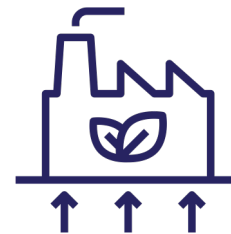
Indonesia has a huge energy potential with a total of installed capacity potential of 400 GW



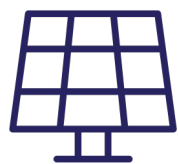
Wind Energy
0.15 GW out of
60 GW



Hydro Energy
6.1 GW out of
75 GW



GeoThermal
2.1 GW out of
23 GW



Solar Energy
0.15 GW out of
207 GW



Bio Energy
1.8 GW out of
32 GW



Hambatan Perkembangan PLTS Atap di Indonesia

“Pembatasan Pemasangan PLTS 10-15% dari daya yang terpasang oleh PLN”



Nomor : 16322/AGA.00.01/C01080500/2022 17 Maret 2022
Lampiran : 1 Lembar
Sifat : Segera
Hal : Penyampaian Strategi sementara layanan Terhadap Permohonan pelanggan PLTS Atap Kepada Yth. *) terlampir

Menindaklanjuti semakin banyaknya permohonan pelanggan untuk memasang PLTS Atap, sedangkan petunjuk detail teknis masih dalam proses penyusunan, bersama ini disampaikan strategi sementara layanan terhadap permohonan pelanggan untuk memasang PLTS Atap sebagai berikut :

1. Secara umum kapasitasnya dibatasi antara 10-15% dari daya tersambung. Untuk pelanggan dengan daya besar (TM&TT) agar dilakukan evaluasi lebih detail, khususnya kajian pengaruh teknis terhadap sistem.
2. Untuk perbandingan ekspor-impor menggunakan PERMEN ESDM No 49 Tahun 2018 yaitu 1 berbanding 0,65.
3. Untuk permohonan dari pelanggan daya besar, agar segera diberikan respon dengan melakukan kunjungan, sehingga pelanggan memahami kondisi neraca daya PLN dan proses yang sedang dilakukan PLN terkait harmonisasi pelaksanaan Permen ESDM no 26 tahun 2021.
4. Bagi pelanggan yang memerlukan, agar ditawarkan REC (renewable energy certificate), yang merupakan program Net Zero Emission dari PLN yang diakui secara Internasional. Harga REC yang dijual oleh PLN sebesar 35.000 rupiah per MWh.

Demikian disampaikan atas perhatiannya diucapkan terima kasih.

EXECUTIVE VICE PRESIDENT RETAIL
REGIONAL JAWA, MADURA DAN BALI,



ABDUL FARID

Tembusan:
- EVP RJD PLN

REVISI PERATURAN MENTERI ESDM NOMOR 26 TAHUN 2021

Tentang Pembangkit Listrik Tenaga Surya Atap yang Terhubung pada Jaringan Tenaga Listrik Pemegang Izin Usaha Penyediaan Tenaga Listrik Untuk Kepentingan Umum

SUBSTANSI POKOK PERUBAHAN PERMEN PLTS ATAP

Memberikan pengaturan dan insentif yang lebih baik bagi masyarakat yang akan memasang PLTS Atap



Kapasitas PLTS Atap

Kapasitas yang semula paling tinggi 100% dari daya langganan menjadi tidak ada batasan kapasitas per pelanggan sepanjang masih tersedia kuota pengembangan PLTS Atap



Ekspor Listrik

Ekspor listrik yang semula sebagai pengurang tagihan menjadi tidak dihitung sebagai pengurang tagihan



Biaya Kapasitas

Biaya kapasitas yang semula diberlakukan untuk Pelanggan golongan industri menjadi tidak ada

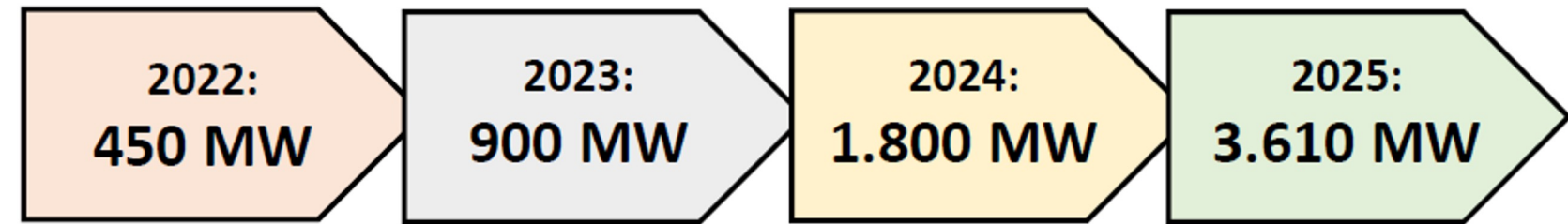
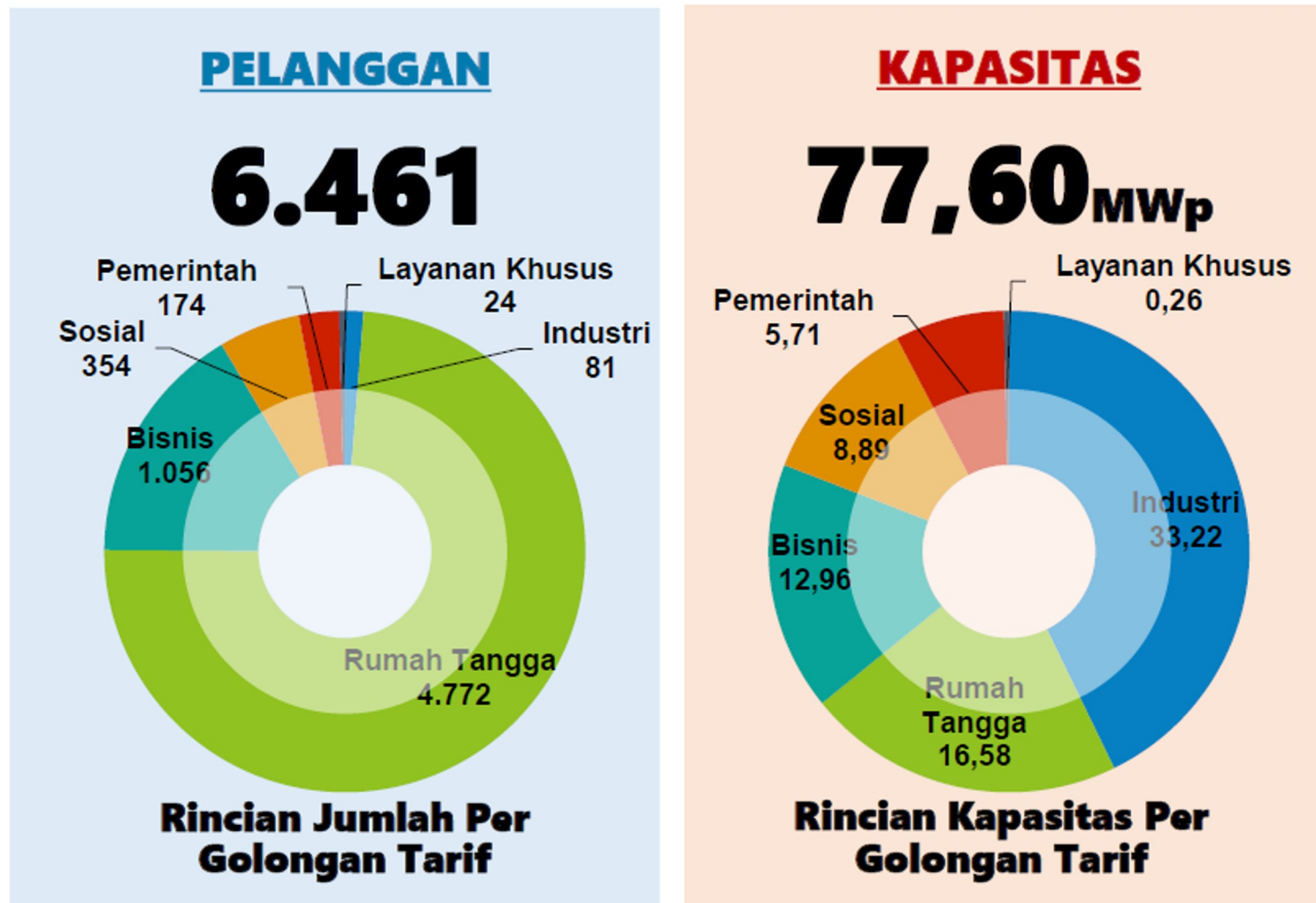


Peralihan

Bagi pelanggan eksisting selanjutnya akan mengikuti Permen baru setelah berakhirnya kontrak (tercapainya *payback period* paling lama 10 tahun)

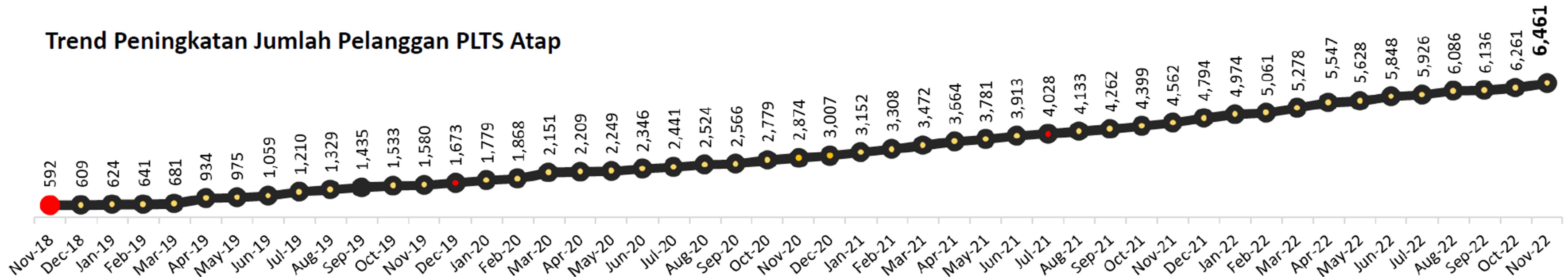
ROADMAP DAN CAPAIAN PLTS ATAP

Capaian PLTS Atap s.d November 2022



- Kementerian ESDM menargetkan pengembangan PLTS sebesar 3,61 GW s.d. tahun 2025
- Berdasarkan capaian bulan **November 2022**, jumlah pelanggan PLTS Atap mencapai **6.461 Pelanggan** dengan total kapasitas mencapai **77,60 MWp**
- Sepanjang tahun 2022 kenaikan rata rata per bulan sebesar 2,4 MW dan 138 pelanggan
- Mayoritas pelanggan berasal dari golongan rumah tangga yaitu 4.772 pelanggan. Namun total kapasitas paling tinggi berasal dari pelanggan industri yaitu 33,2 MWp

Trend Peningkatan Jumlah Pelanggan PLTS Atap



Sumber : Iswayudi Hendra, (2023), Sambutan & Paparan Substansi Utama Revisi Permen ESDM No 26 tahun 2021 Tentang Sistem PLTS Atap Yang Terhubung Dengan Jaringan Pemegang IUPTLU



INFIEN Smart Green Home

Dapat mengurangi kebutuhan listrik PLN hingga 50%.
On Site Renewable Energy.
Solar Panel on grid/hybrid.
Sistem IoT yang terintegrasi.

Energy Storage System



Solar Panel



Hybrid



OffGrid



Home Storage/ESS/BESS



Solar/Wind Energy System



Telecom&Base Station



UPS/EPS



Bank Backup



Hospital/School Building
Power Backup

Li Ion cells are being used for a variety of applications, due largely to their high energy density and ability to undergo a number of full power charging cycles. However, battery technologies, in general, can provide energy for only a few hours, and vary with regard to the time required to recharge battery systems.

ESS Battery Rack System



High Voltage ESS 30v-300v server rack
battery For Communication Base Station
Backup Telecom Battery Suppliers



high-voltage lithium battery energy storage system has a wide
range of performance and application advantages

NMC Battery for EV



EV Battery Pack using NMC Cylinder Cell

Battery Application

Electrification at Komatsu Indonesia



Kapal Basarnas





SMART BATTERY



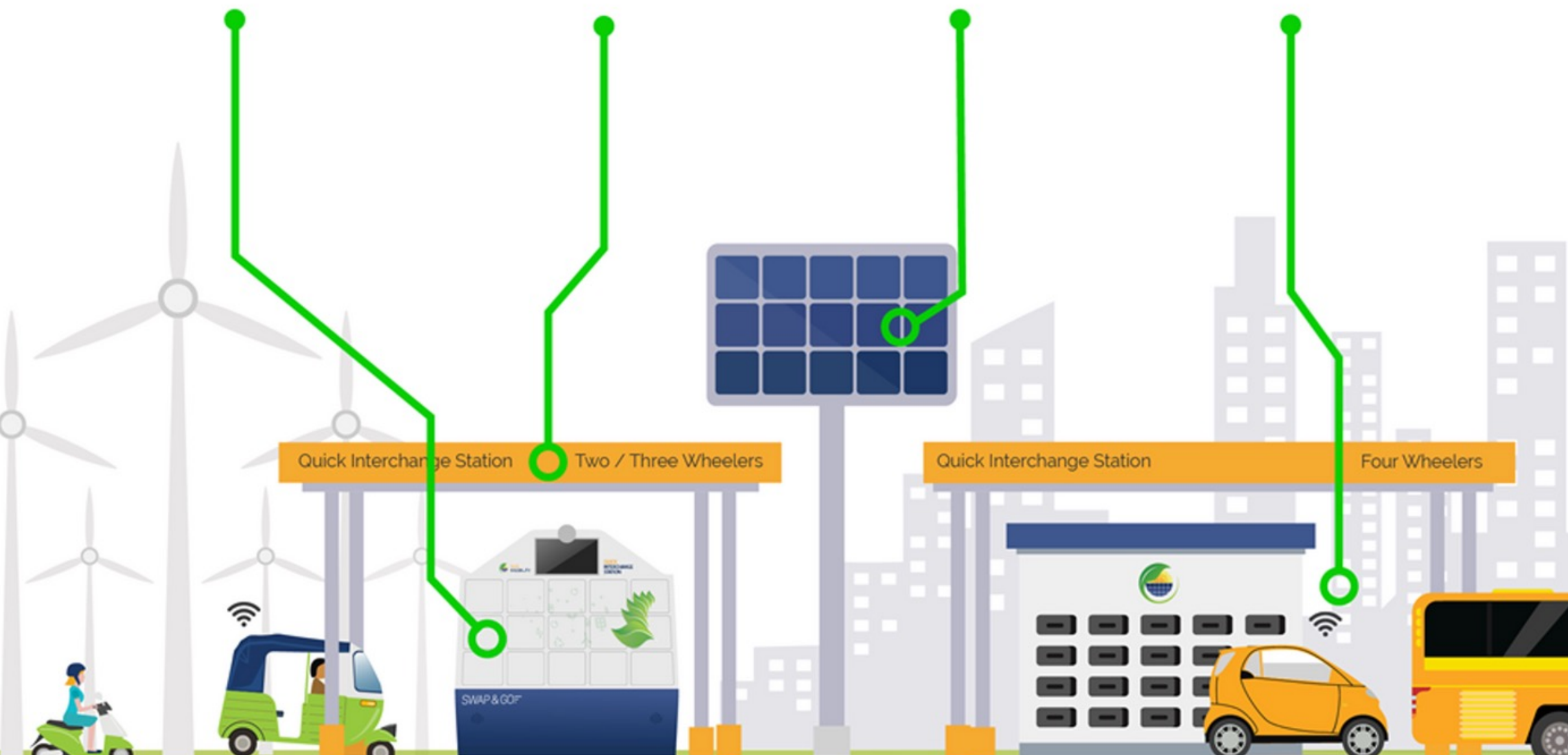
QUICK INTERCHANGE STATION



RENEWABLE ENERGY

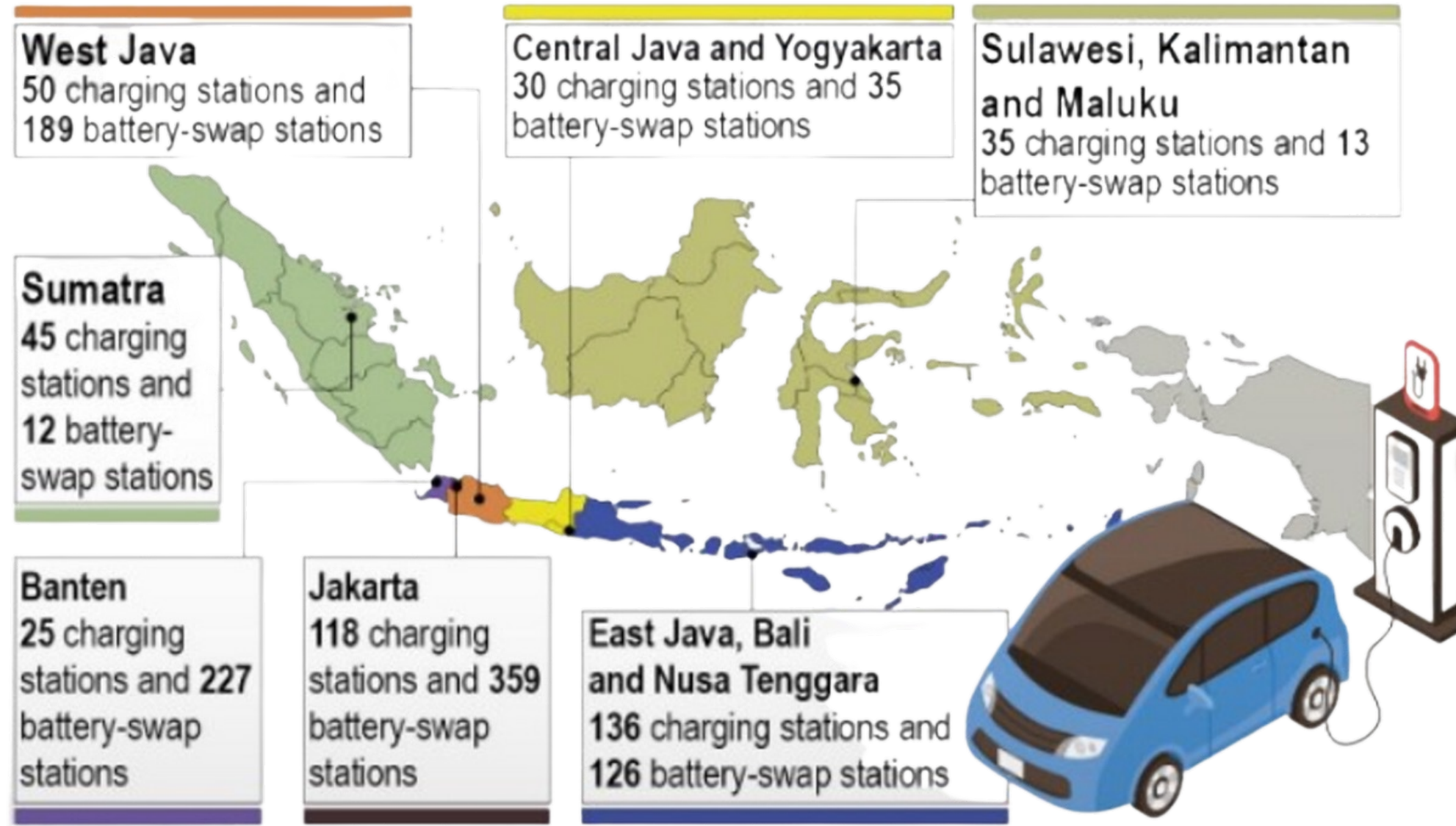


SMART NETWORK



Study of Battery Swap in Indonesia

Battery swapping (or switching) station is a place at which a vehicle's discharged battery or battery pack can be immediately swapped for a fully charged one, eliminating the delay involved in waiting for the vehicle's battery to charge.



Current Domestic Condition

EV Charging Points in Indonesia

There were 430 charging stations in 328 locations and 961 battery swap stations in 961 locations.

There are 13 brands that have been identified, but not **STANDARDISED YET.**



Source: Energy and Mineral Resources Ministry

Battery Swapping Facilities



Brand

SWAP

SGB

OYIKA

GOGORO

Dimension

180 x 64.4 x 74.9

180 x 60 x 100

180 x 60 x 70

N/A

Battery Spot

8

12

8

30

Location

Ciater, TangSel

SiCepat, TangSel

OYIKA, Alfamart

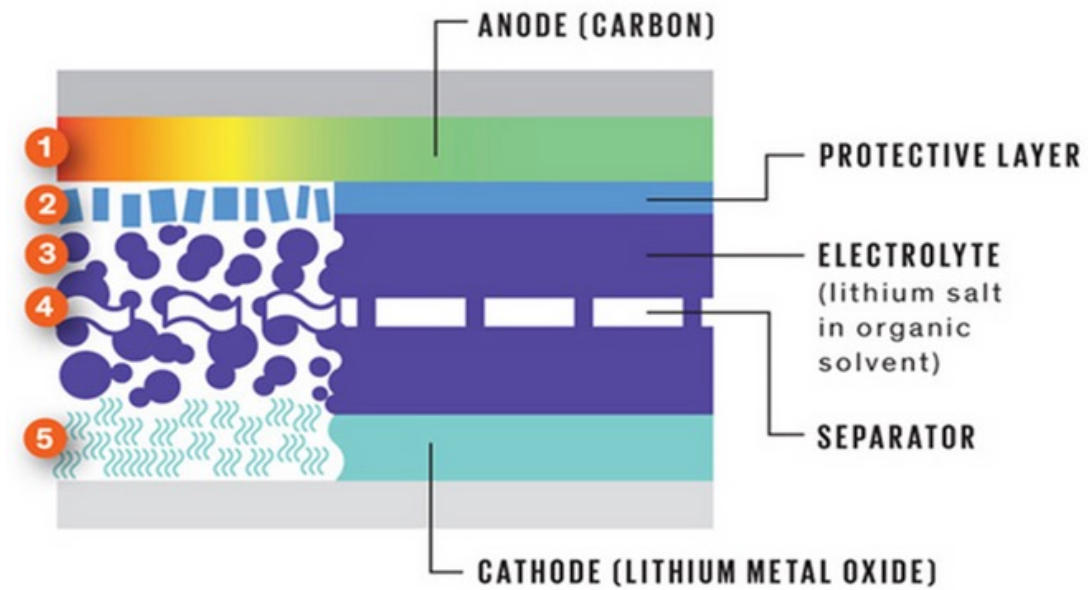
SPBU, Gandaria

Battery Cell & Pack Testing & Standardization

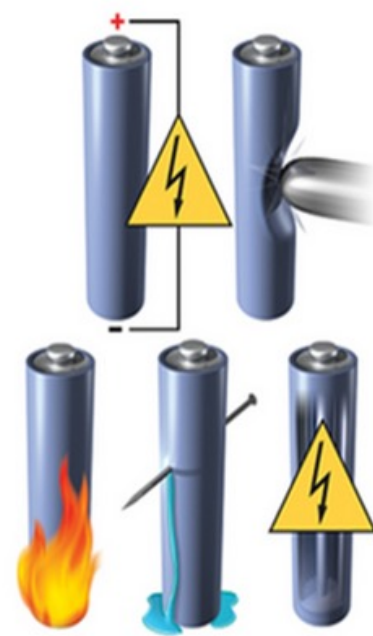
Battery Testing at NBRI



Thermal Runaway in Lithium Ion Battery



- Heating Starts
- Protective layer breaks down
- Electrolyte breaks down into flammable gases.
- Separator melts, possibly causing a short circuit.
- Cathode breaks down, generating oxygen



Cell Failure



Thermal Runaway



Propagation

Requirement for Rechargeable Electrical Energy Storage System (RESS) regarding Safety Standard UNR 136 & UNR 100

Vibration

Thermal shock and cycling

Drop test

Mechanical shock

External short circuit protection

Overcharge protection

Over-discharge protection

Over-temperature protection

No Evidence of:

- Electrolyte leakage;
- Rupture (applicable to high voltage REESS(s) only);
- Fire;
- Explosion.

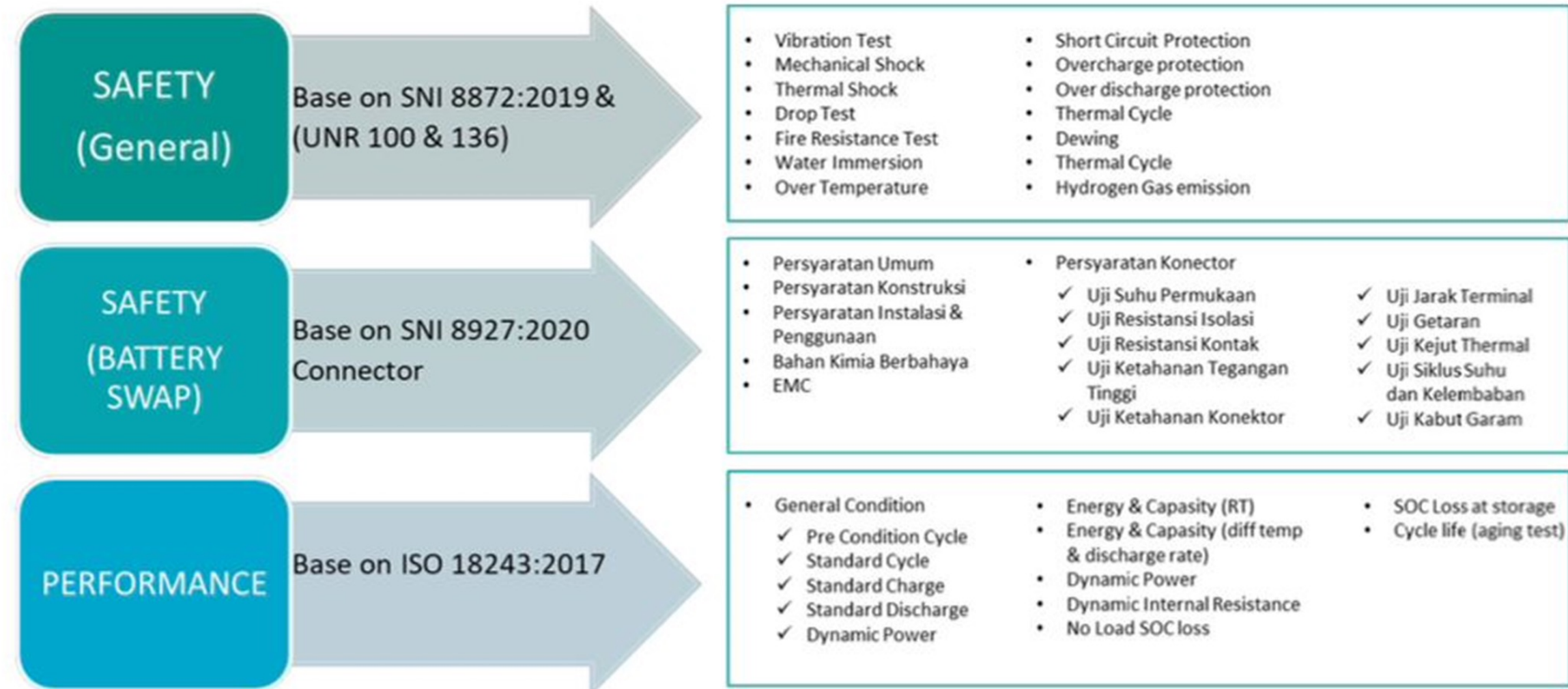
Evidence of electrolyte leakage shall be verified by visual inspection (No disassembling)

Fire Resistance

shall exhibit no evidence of explosion

LITHIUM ION BATTERY PACK TEST

Following are the standard testing of Lithium Ion Battery



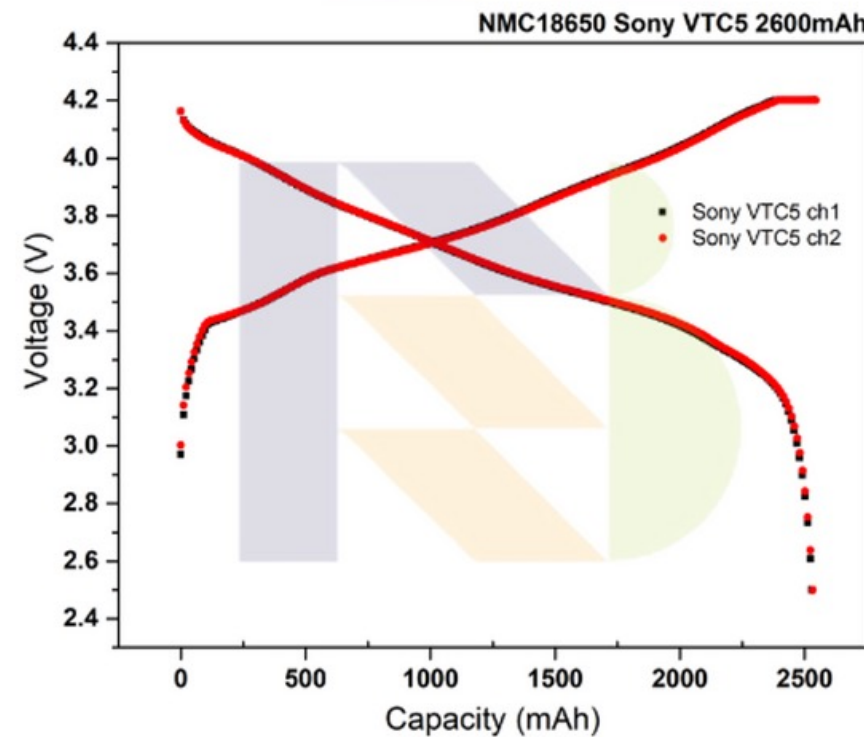
1. REESS SAFETY (SNI 8872:2019 AND UNR 100 & 136)

shall exhibit no evidence of explosion

Standard Charge

Discharge rate	<ul style="list-style-type: none">• Shall be defined by Manufacturer• If not specified, discharge it with 1C current
Discharge limit	Specified by the manufacturer
Rest period after discharge	Minimum 30 minutes.
Standard charge	<ul style="list-style-type: none">• Shall be defined by Manufacturer• If not specified, discharge it with C/3 current

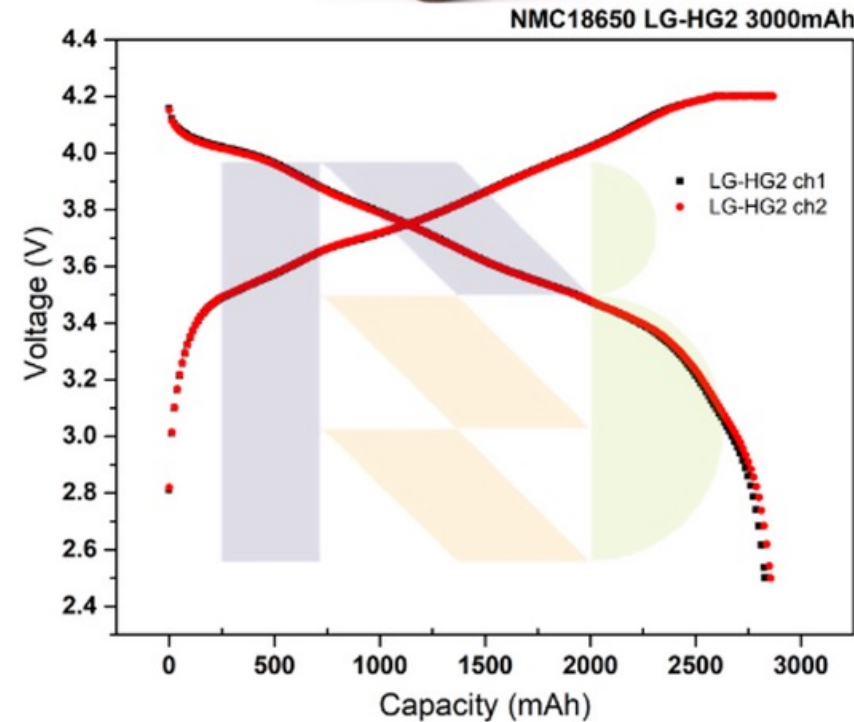
Commercial Battery Performance



Sony VTC5 3.7V

Rated Capacity : 2600 mAh

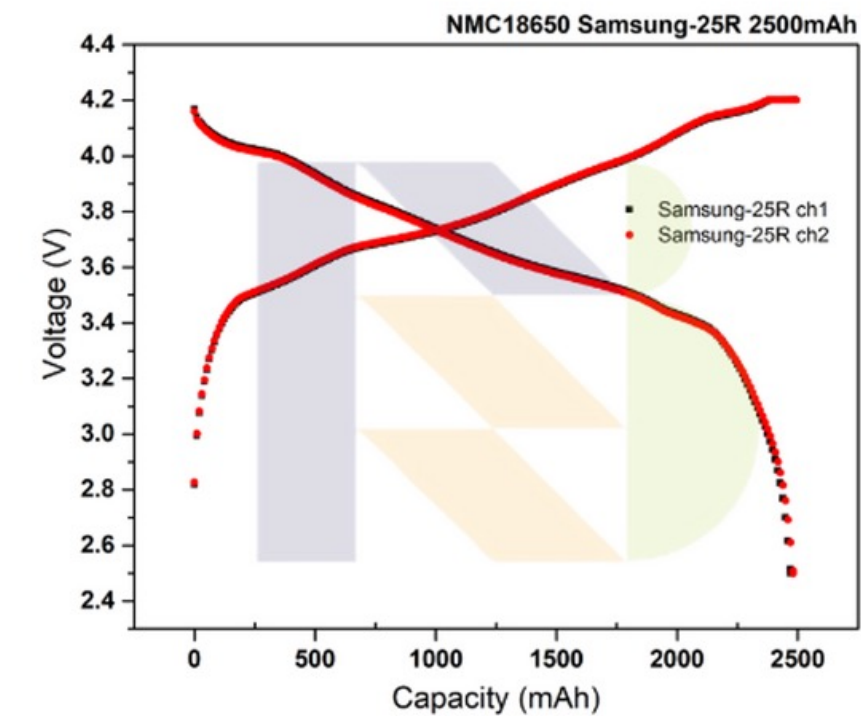
Real Capacity : **2530 mAh**



LG HG2 3.7V

Rated Capacity : 3000 mAh

Real Capacity : **2830 mAh**



Samsung 25R 3.7V

Rated Capacity : 2600 mAh

Real Capacity : **2470 mAh**

Battery Pack Performance



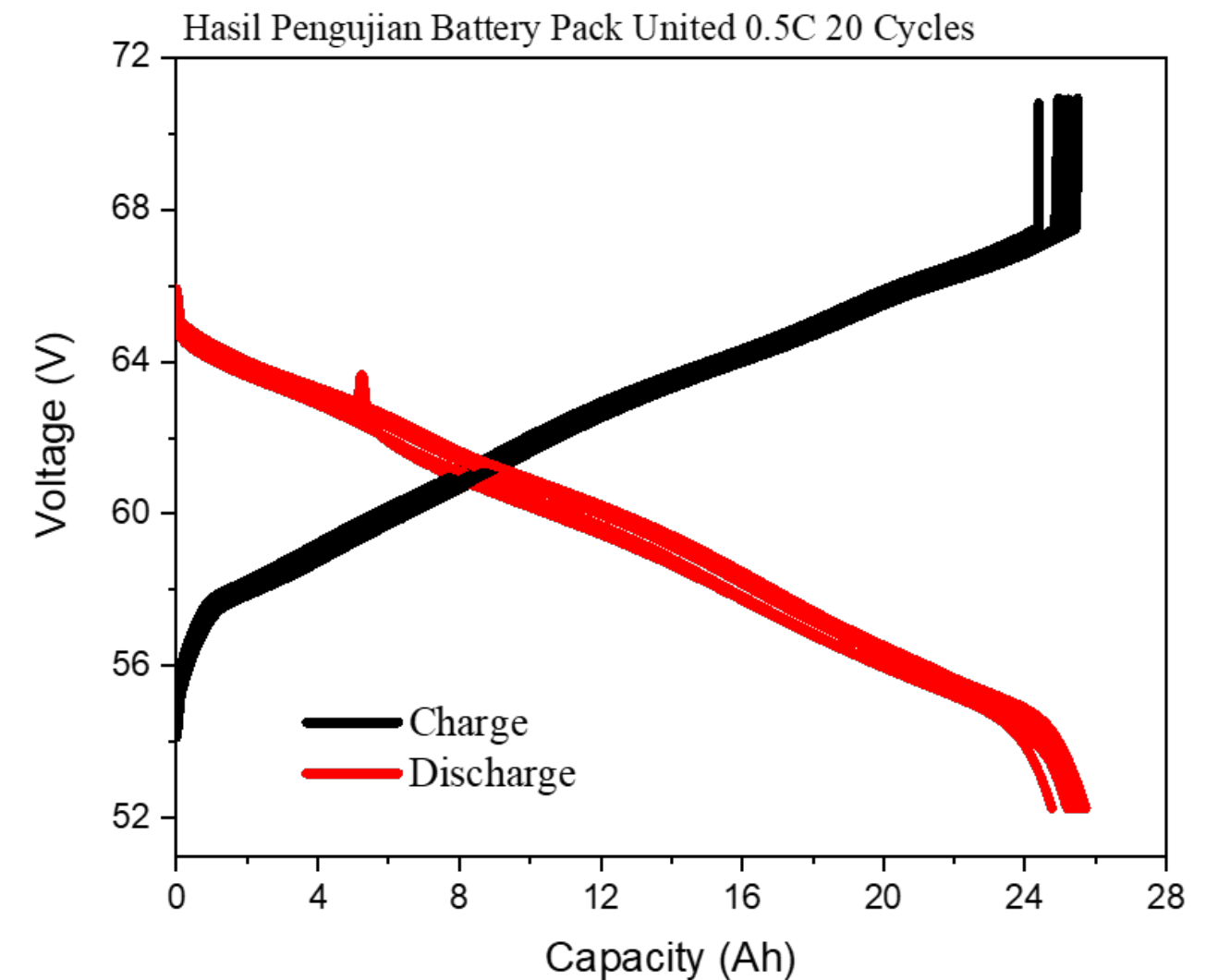
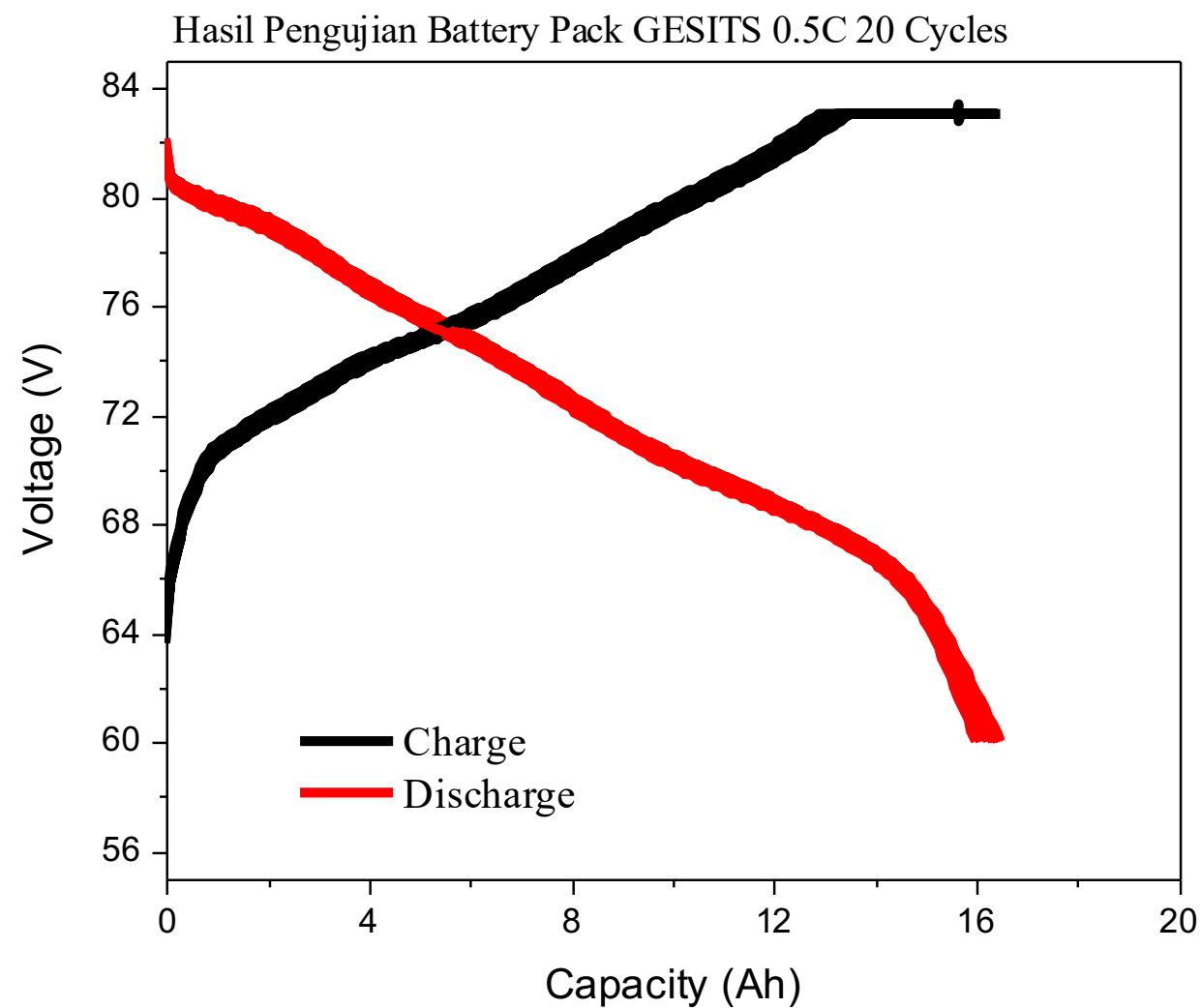
Gesits

Dimension : 373 x 220 x 150 mm
Voltage & Ampere : 72 V & 20 Ah
Cell Material: NMC



United

Dimension : 198 x 165 x 280 mm
Voltage & Ampere : 60 V & 28 Ah
Cell Material: NMC

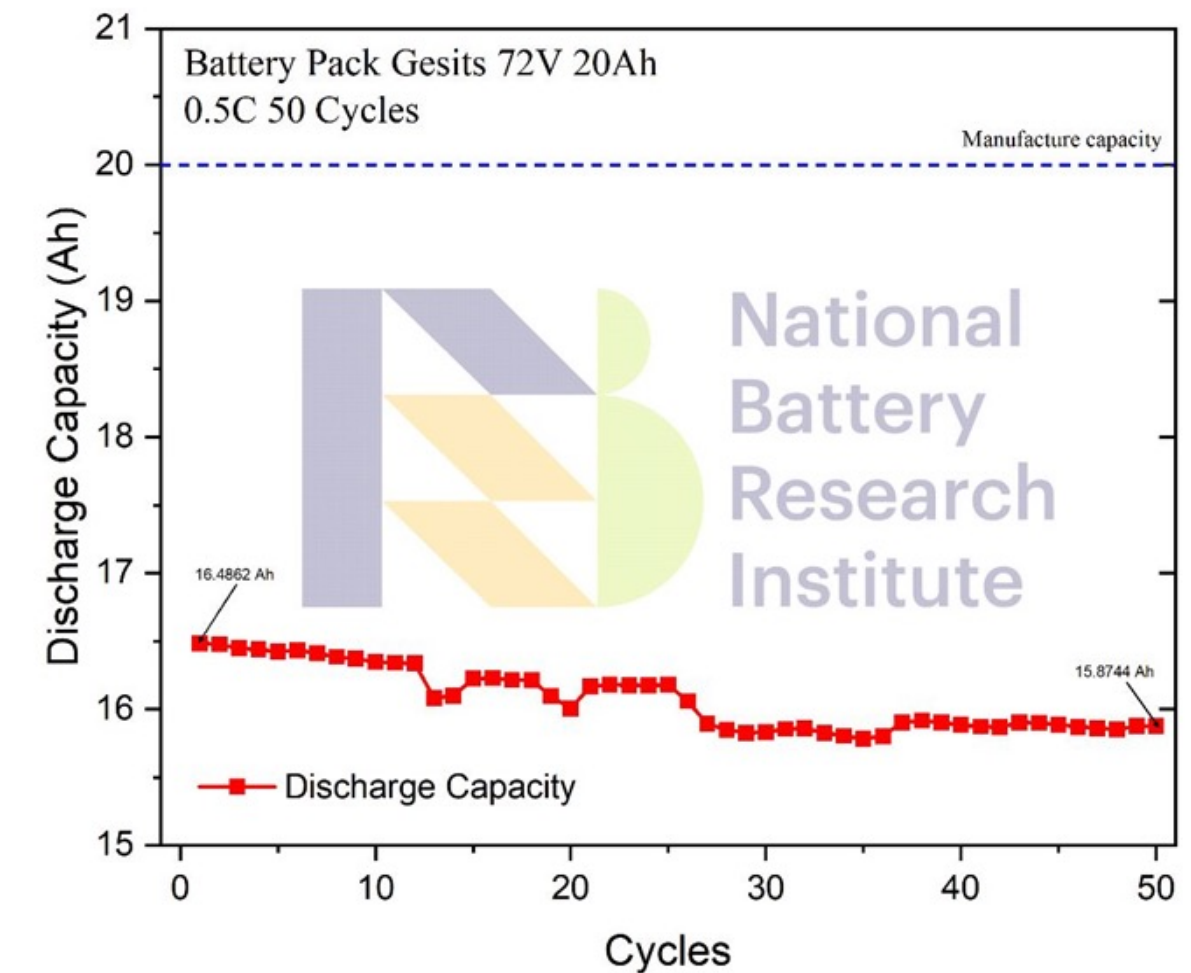
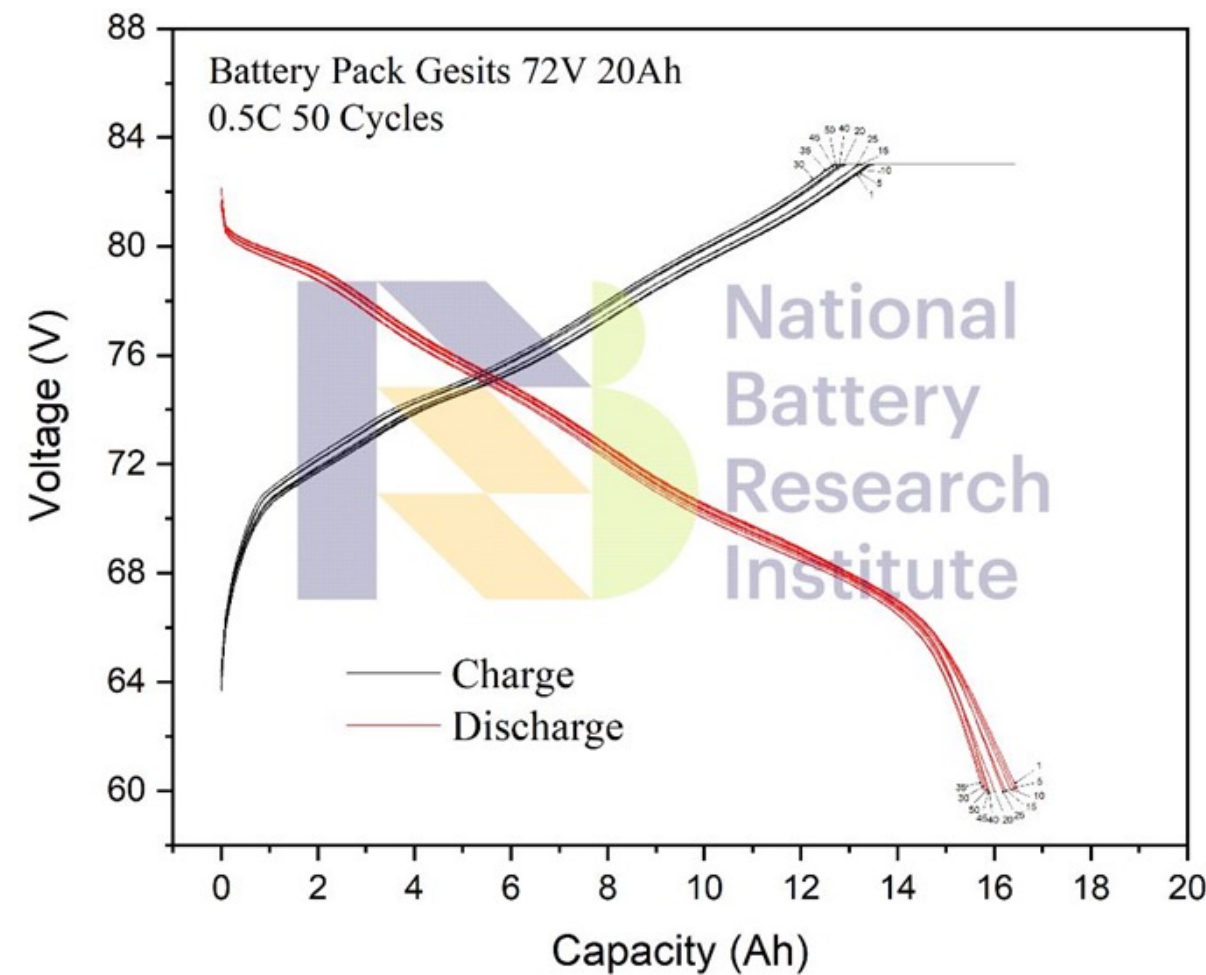
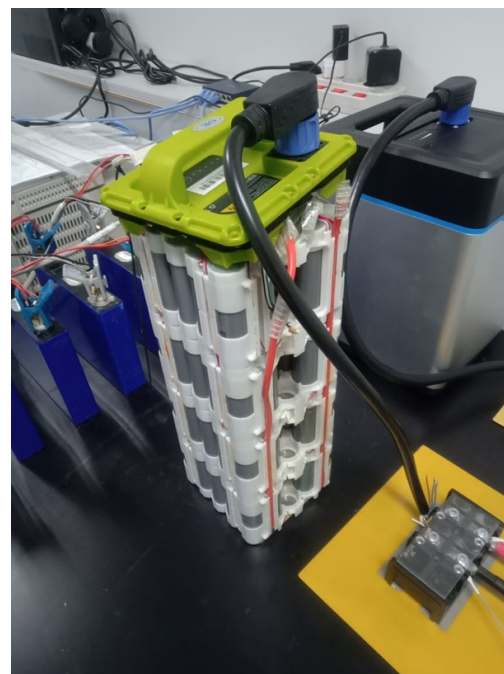


Commercial Battery Pack Performance

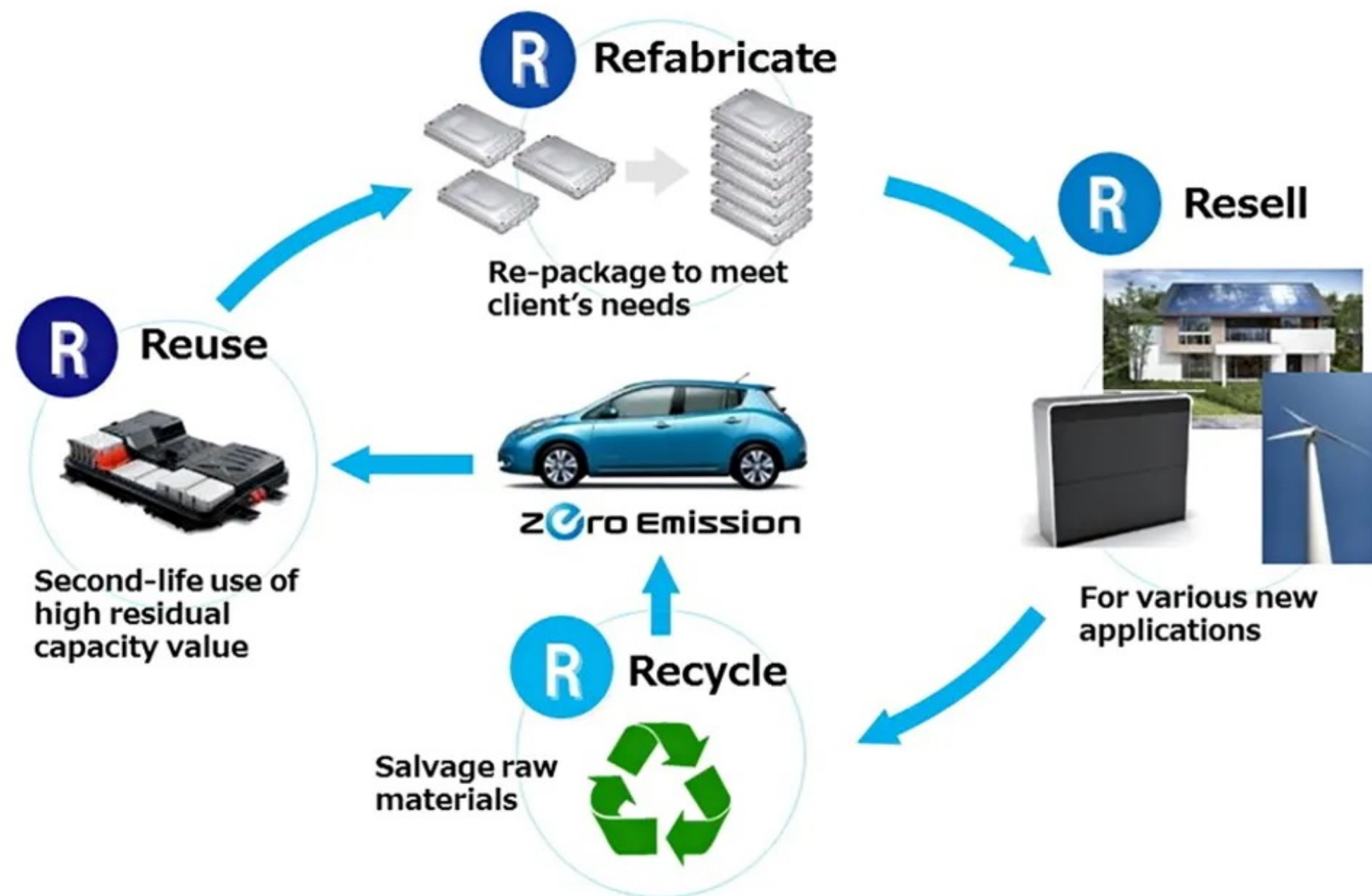


GESITS

Dimension : 373 x 220 x 150 mm
Voltage & Ampere : 72 V & 20 Ah
Cell Material: NMC



Grid Reuse of EV Batteries & Recycling LIB



Finding ways to increase the recycling and reuse of Li Ion battery components would seem to be an option, given the potential cost and difficulty of obtaining the lithium and cobalt used in battery manufacture.

However, since it has been estimated that Li Ion battery packs in EVs may retain about 70% of their storage capacity at the end of the battery's service life to a vehicle, the potential for a second use in home energy storage may exist (especially for solar PV storage systems).⁶⁶ Therefore, reuse in electric grid applications may present a larger opportunity

Industrial Presentation & Collaborations



ASEAN EV
JI-Expo
25 May 2023



1st ASEAN BEVTC
Bali, Indonesia
9-11 May 2023



PT. Hyundai Kefico
battery
standardization for
2W-EV. 6 June 2023

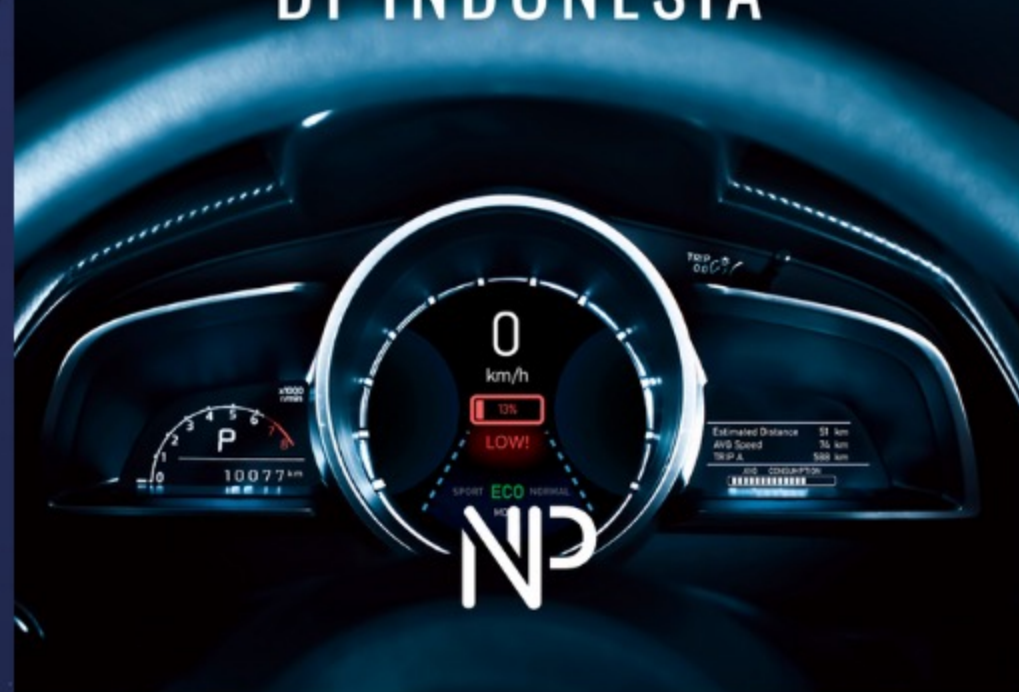


2023 International
Energy Storage
Symposium,
ITB 8-9 June 2023



EVVY KARTINI
MUHAMMAD FIRMANSYAH
MOH. WAHYU SYAFI'UL MUBAROK

STUDI POTENSI PASAR BATERAI & KENDARAAN LISTRIK RODA DUA DI INDONESIA



Studi **Potensi Pasar** Baterai dan Kendaraan Listrik Roda Dua di Indonesia

Buku ini merupakan ulasan dan analisis dari hasil studi potensi pasar baterai & kendaraan listrik roda dua di Indonesia. Tidak hanya aspek pasar dan ekonomi, buku ini juga turut membahas aspek global & domestik, peraturan & infrastruktur pendukung, hingga tren pertumbuhan komoditas kendaraan listrik roda dua berbasis baterai di Indonesia. Turut dilakukan analisis terkait jenis baterai yang digunakan oleh para pemain di industri tersebut.

Skills Development, Education, Training and Certification

Education and Training

2022



International Battery School

24-25 MAY 2022

Facilitating participant to have a basic understanding about battery technology and its current issue



International Workshop on Material and Advanced Characterizations

24-25 NOVEMBER 2022

Organizing international workshop on material and its characterization for students, researchers, and industries



International Workshop on Solar PV Technology

2-3 AUGUST 2022

Two days intensive workshop on Solar PV technology for providing an insight both theoretical and practical



Training of Trainers

14-15 DECEMBER 2022

Two days intensive training for trainers to obtain useful knowledge about battery technology from upstream to downstream

Training of Trainers

2022

BATTERY TECHNOLOGY
FROM UPSTREAM TO
DOWNSTREAM

Grand Sahid Jaya
14-15 December 2022



TOT: Battery Technology from Upstream to Downstream

Grand Sahid Jaya, 14-15 December 2022

Participants: Mining Industries



TOT : Battery for Renewable Energy

For Polytechnic Lecturers



International Battery School 2023: Battery for EV and its conversion

For Polytechnic Lecturers

Presented by



INTERNATIONAL BATTERY SUMMIT

Battery as a Core Technology for
Accelerating Clean Energy Transition

Jakarta, 01-02 August 2023

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THE FIRST INTERNATIONAL BATTERY SUMMIT

JAKARTA, INDONESIA

Supported by





IBS

2023 INTERNATIONAL
BATTERY SUMMIT

Battery as a Core Technology
for Accelerating Clean Energy Transition

Jakarta, 1-2 August 2023



Grand Sahid Hotel,
Jakarta, Indonesia



1-2

August
2023