



US-ASEAN Energy & Innovation Forum 2021

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Douglas Duncan
28th October 2021



Douglas Duncan
Senior Manager, Strategic Development
Durapower Group

About me:

- Early career as electrical engineer developing automotive NiMH battery systems for Cobasys in Detroit USA
- Business development of battery systems for heavy duty vehicles and stationary back-up power in the USA
- Sales and Strategic roles in Asia for Wayne, General Electric and Diebold Nixdorf, focused on the energy segment
- Today leading Strategic Development at Durapower Group
- BS EE from Rice University and MBA from INSEAD
- Passionate about our transition to clean energies, e-mobility and more sustainable lifestyles

WHO WE ARE

Established in 2009, Durapower offers a closed-loop, end-to-end energy storage solution for the electric mobility and renewable energy ecosystem. The company is focused on research and design of Lithium-ion battery (LIB) materials, battery cell manufacturing, and integration of battery systems, delivering state-of-the-art energy storage solutions for electric vehicles and renewable energy globally.

With professionals in the automotive and renewable industry of more than 15 years of experience and a wholly-owned battery cell manufacturing facility, Durapower is a tier-one supplier to vehicle manufacturers and has its battery systems integrated into thousands of Electric Vehicles (EVs), Hybrid Electric Vehicles (HEVs) and Plug-In Hybrid Electric Vehicles (PHEVs). The company has achieved a remarkable safety track record over the years, covering hundreds of million kilometers of operational mileage and deployed various scales stationary storage solutions for on and off Grid applications. Headquartered in Singapore and with subsidiaries in China, Europe, and Thailand, Durapower works closely with government agencies, blue-chip customers, and partners to deliver our solutions to over 20 countries and 45 cities globally.



OUR GLOBAL MARKET PRESENCE



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**22 Countries,
47 Cities & Growing**

SUPPORTED WITH A GLOBAL RESEARCH STRATEGY



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Materials

Battery Cells

Battery Systems

Nickel Manganese Cobalt (**NMC**)

- High power and energy performance
- Ideal and commercially proven for e-mobility



Lithium Iron Phosphate (**LFP**)

- Low initial cost and stable material
- Well suited for stationary applications – slow charge requirements

Lithium Manganese Iron Phosphate (**LMFP**)

- Very stable material
- Super high safety applications

Titanium Dioxide (**TiO₂**)

- Ultra-fast charge, ultra-long life
- Hot climate applications

New Gen chemistries under R&D:

- Solid State
- High Nickel content
- Silicon anode
- Lithium Metal

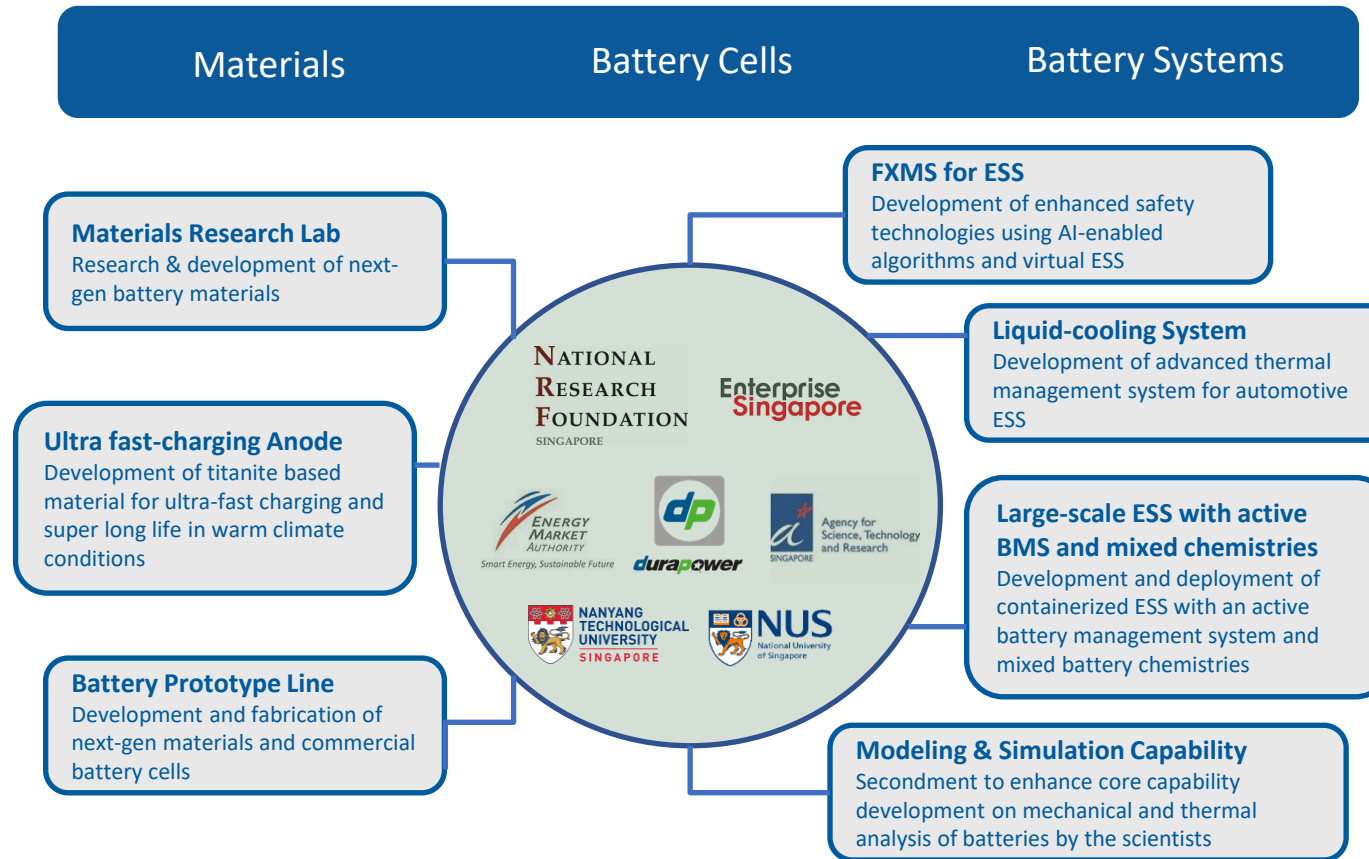
Non Flammable Electrolytes

- Ionic liquids
- High performance and increased safety

DEVELOPING IP IN SINGAPORE AND GLOBALLY



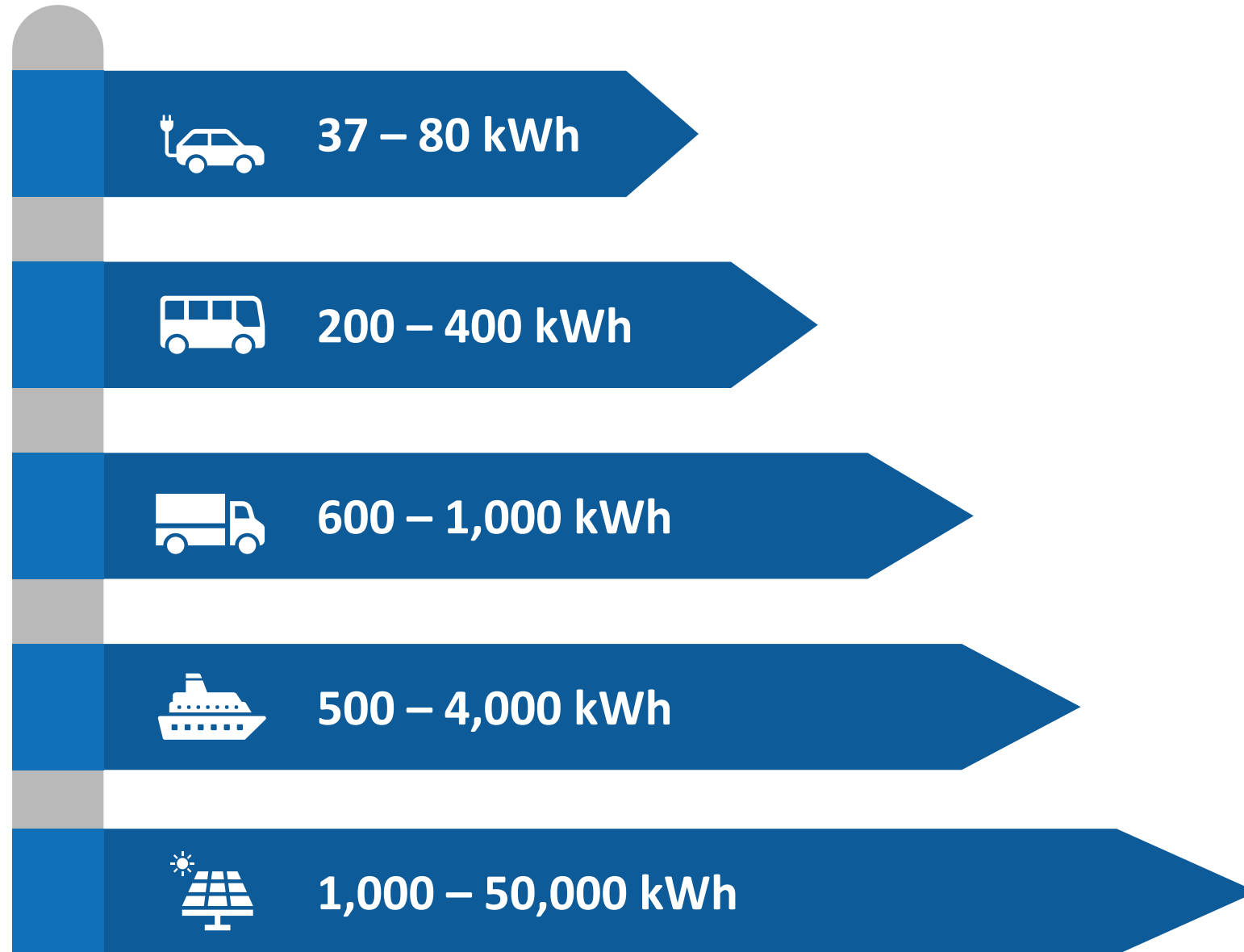
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FOCUS ON LARGE BATTERY SYSTEMS



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Source: IDTechEx, DP Customer

OUR MARKET SEGMENTS



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**E-Mobility
Platforms**



**Specialty
Platforms**



**Marine
Platforms**



**Stationary
Applications**



BUSES AND COMMERCIAL VEHICLES



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- A **decade of experience** in supplying $\geq 1,000$ e-bus battery systems
- Harsh around-the-clock operations (300km/day)
- Opportunistic **fast charging** (10-20 mins) or overnight depot charging
- **Roof-mounted** batteries to maximise space



AGV and RTG – HARBOUR OPERATIONS



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HYBRID ELECTRIC VESSELS



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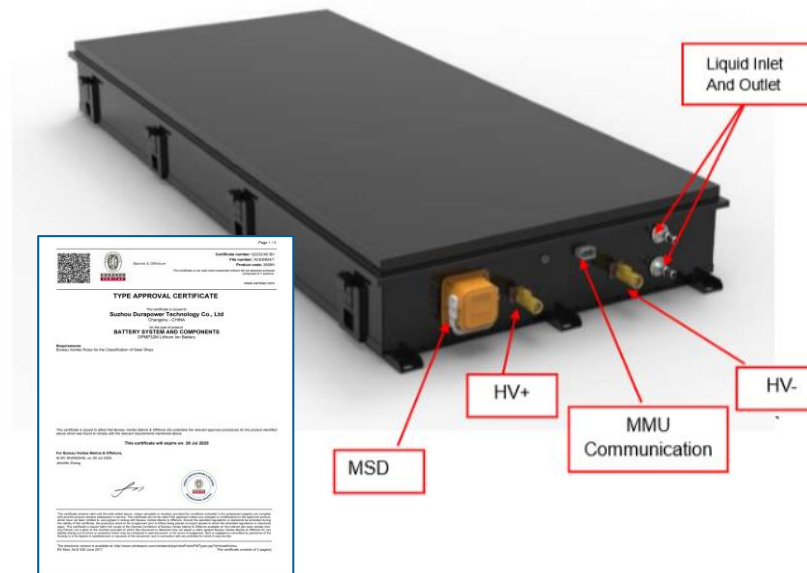
Partners to Develop Singapore's First Hybrid Electric Marine Launch



BY THE MARITIME EXECUTIVE 02-11-2020 05:42:21

BH Global Corporation Limited is pleased to announce that BOS Offshore & Marine, a 90 percent owned subsidiary of the Group, has entered into a MOU with strategic project partners Penguin International Limited, Danfoss, Durapower Technology (Singapore) and Bureau Veritas Marine (Singapore) (BV) for the joint design, development and construction of Singapore's first plug-in hybrid electric fast launch.

The scope of cooperation includes integrating hybrid electric solutions, testing and certification. The know-how generated will support Singapore's push towards the adoption of hybrid electric propulsion systems for its maritime industry.



FULL ELECTRIC VESSELS



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NEWS TRANSPORTATION

FIRST ELECTRIC FERRY LAUNCHED TO REDUCE POLLUTION

By Xinhua News Agency - August 6, 2020 1:30 pm



Image: BANPU



EV CHARGERS UNITS

TR25 Certified models:

- Post eVolve Smart T (2x 22kW)
- Post eVolve Smart C63 One (43 kW)
- Wallbox eVolve Smart T One (22kW)



SOLUTIONS FOR EV CHARGING

EV Chargers

*A product portfolio
to cover all needs*



eHome



eNext



eNext Park



eVolve series



Raption 50 kW



Raption 150 kW



MICROGRID AND OFF-GRID



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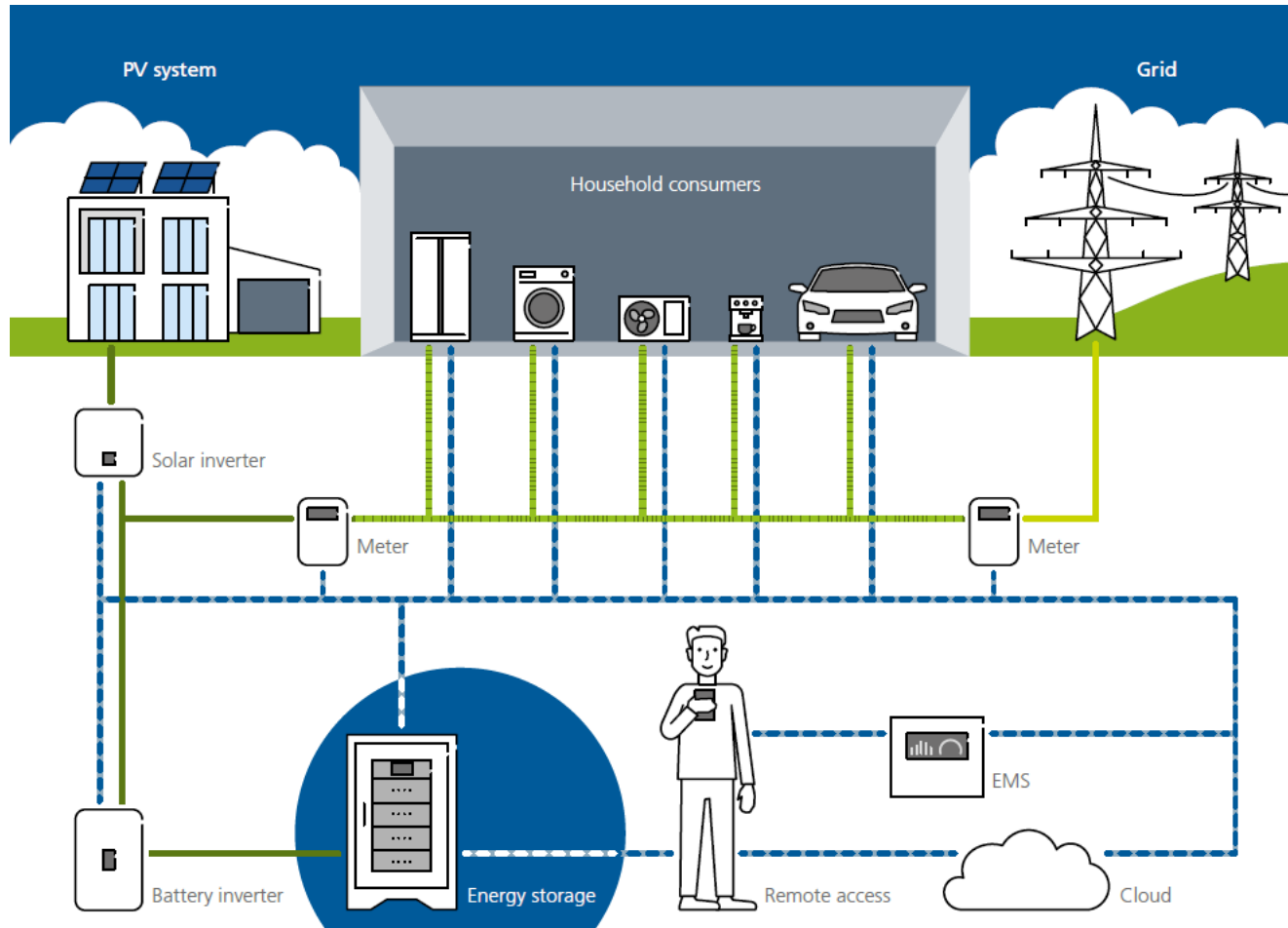


- ❑ Complements **renewable** energies
- ❑ Decrease reliance on Diesel Gensets
- ❑ Low maintenance supports **remote** applications
- ❑ Designed for operation in various **environmental conditions**

LAUNCH OF RESIDENTIAL ESS: HomeHub



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HomeHub – simply more freedom:
Storing energy and using it on demand.

Perfect design

HomeHub was developed in Europe. The main focus was on top performance as well as design and flexibility.

Indoors and outdoors

The HomeHub features a robust and elegant stainless-steel housing and can be used indoors as well as outdoors.

Glass door

A glass door enables you to view all the operating modes of the system at a glance.

Intelligent controller

The intelligent controller manages the memory modules and thereby ensures a long service life and perfect performance of the HomeHub.

Modularity

You can start with a small system and add additional modules as your requirements grow.

Cloud based

The control unit in the energy management system is the heart of the HomeHub. No matter where you are, you can monitor and control your HomeHub with a smartphone or tablet computer.

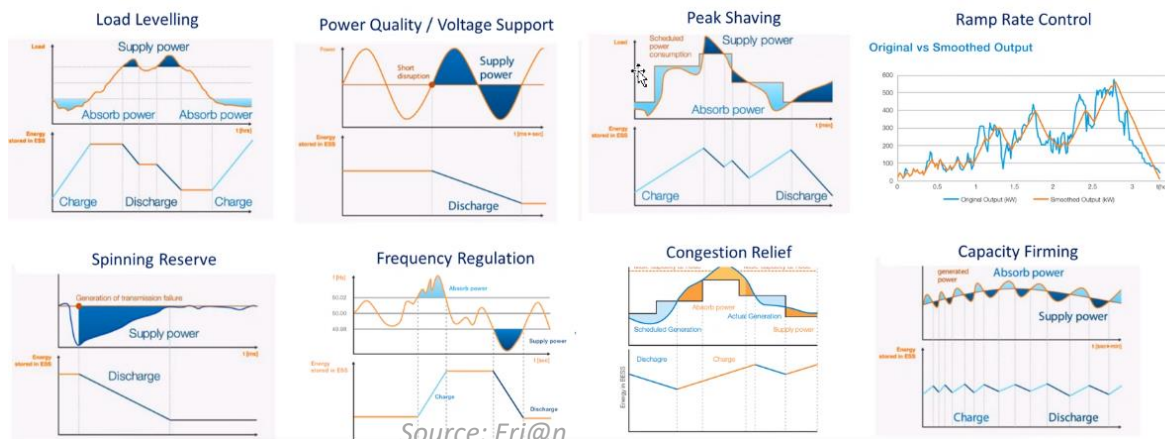
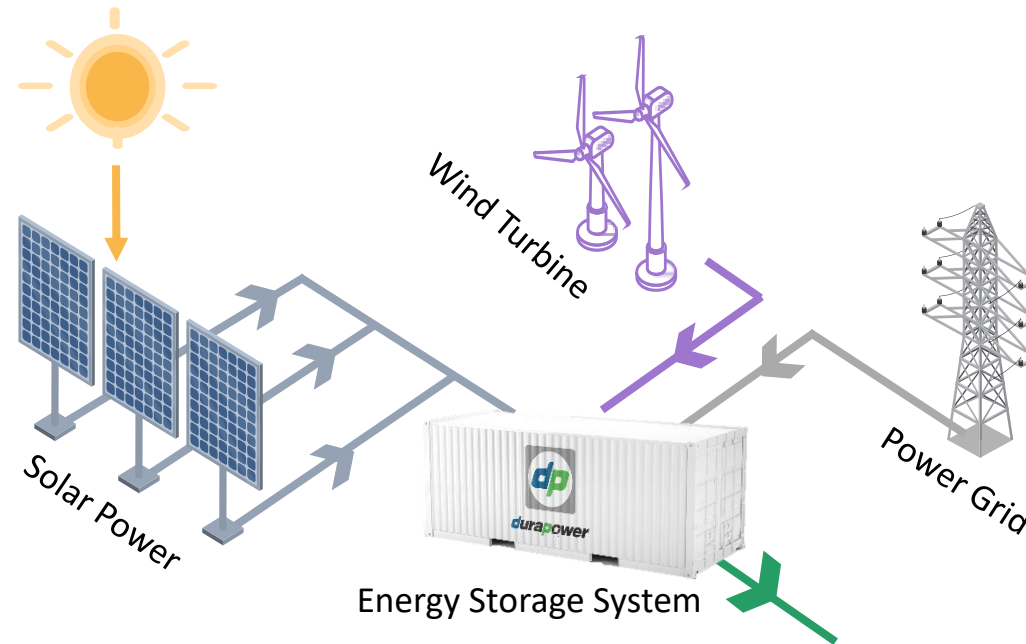


C&I, ON-GRID AND UTILITY-SCALE



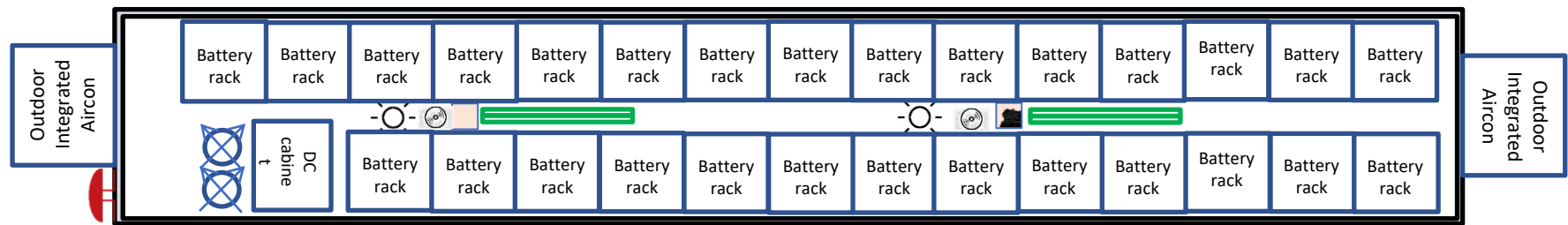
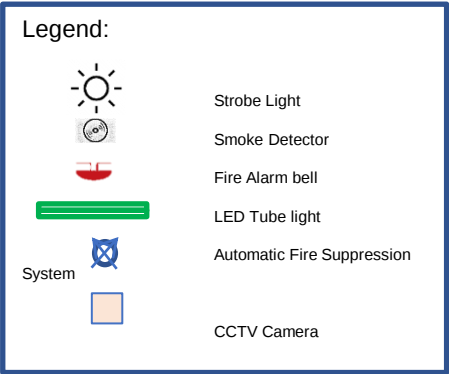
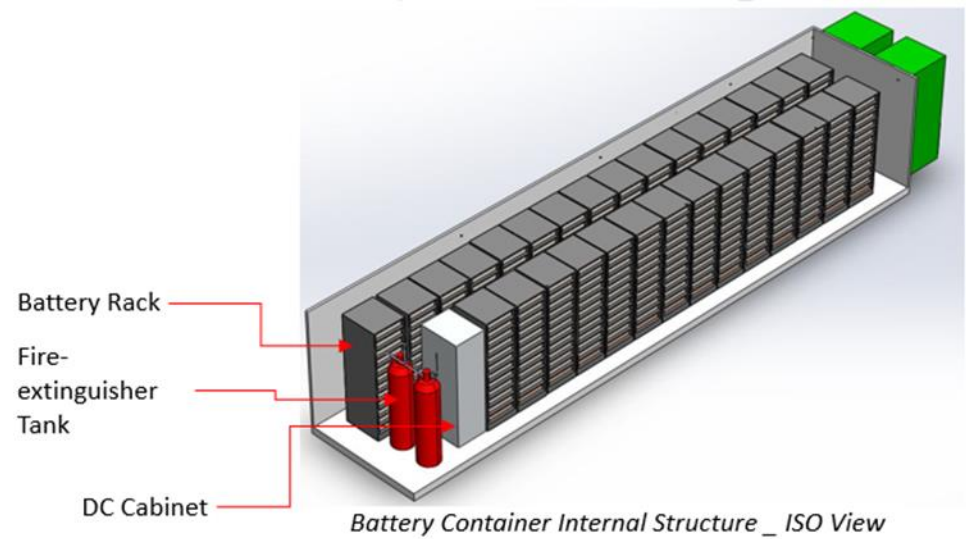
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- ❑ Enables **Distributed Energy Resources**
- ❑ Supports intelligent **Energy Management System**
- ❑ Variety of value-creating operational modes
- ❑ Reduces peak generation
- ❑ Reduce reliance on demand pricing



Source: Eri@n

HIGH ENERGY ESS – 3.3MWh - LFP



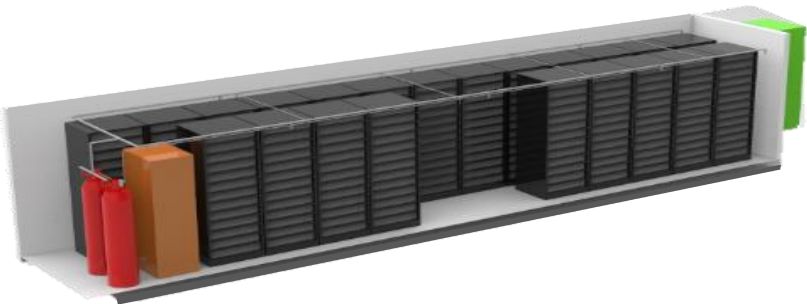
HIGH POWER CESS - NMC



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	25 Ah	30 Ah	50 Ah
Racks (kWh)	70	100	150
20ft Container (MWh)	0.9	1.5	1.7
40ft Container (MWh)	1.9	2.9	3.5
System Voltage (V)	600 - 900		
Discharge C rate*	2C Continuous 2.5C peak	1C Continuous 1.5C peak	0.8C Continuous 1C peak

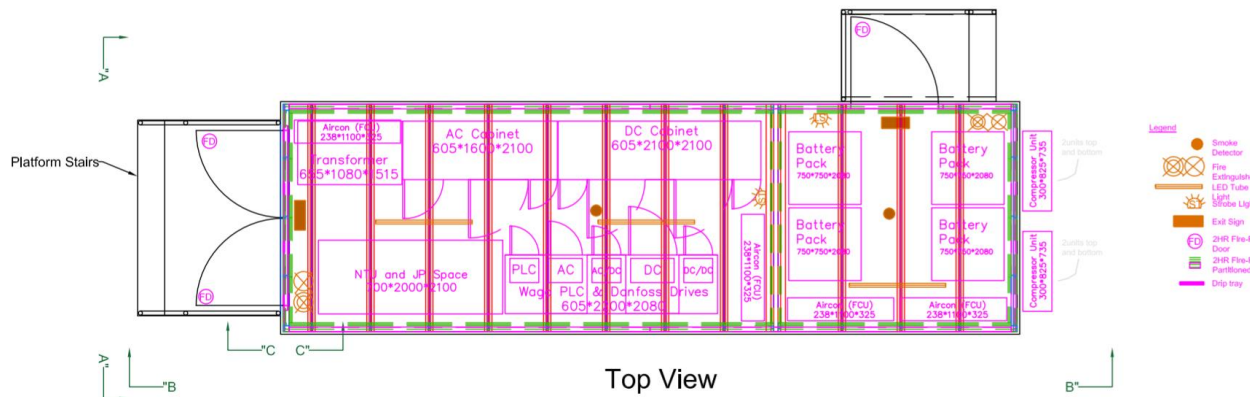
**Parameters are provided as reference and specifications might change as per operational conditions.*



NTU JURONG PORT PROJECT



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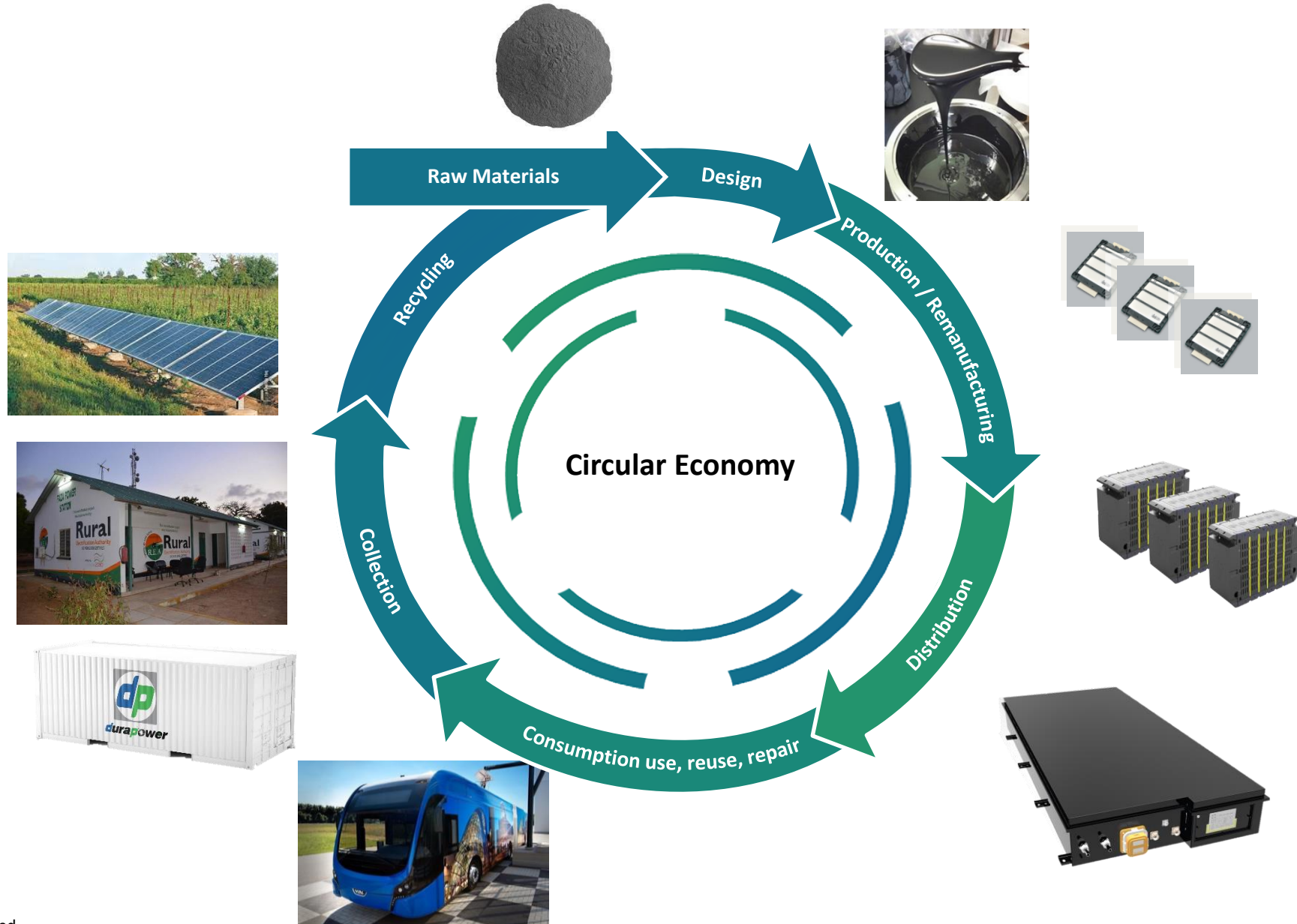
Specifications

- VPP application
- Energy: 300kWh
- Status: Nov 2019

VALUE CHAIN AND CIRCULAR ECONOMY



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2nd LIFE REDEPLOYMENT



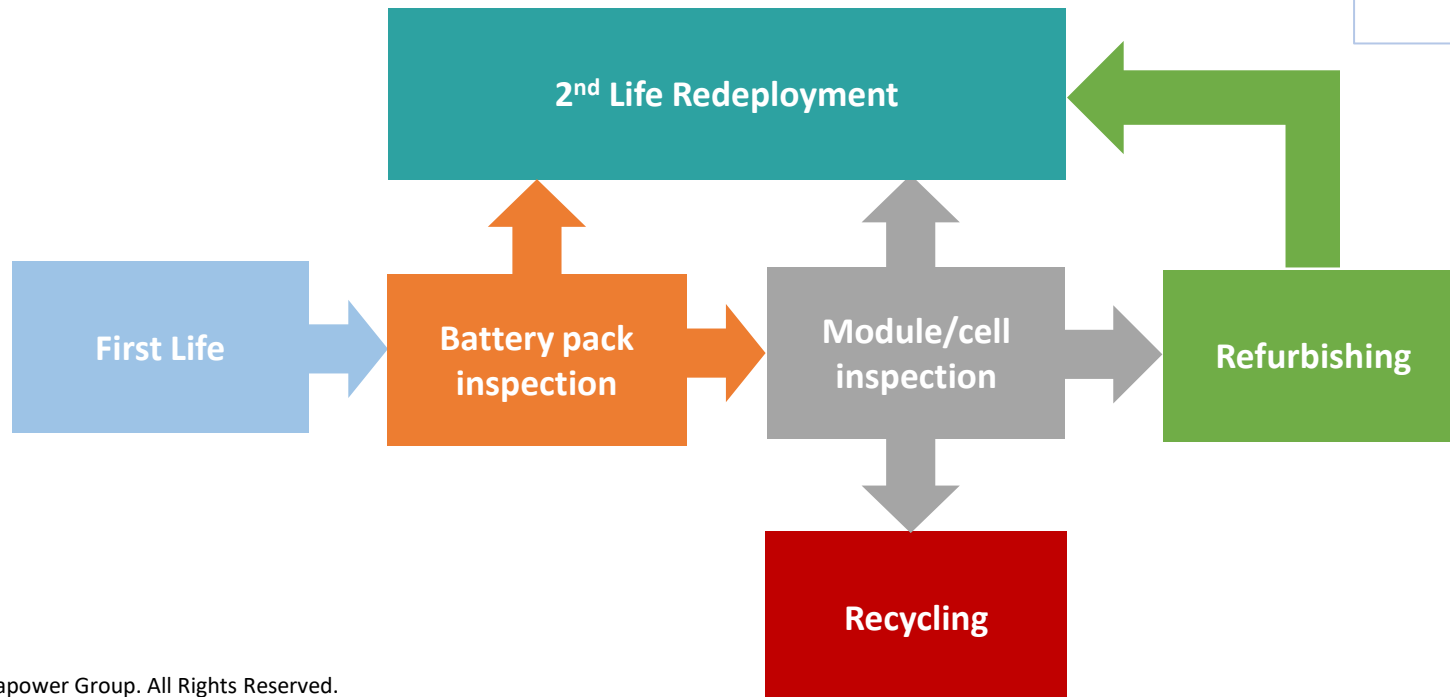
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End of Life evaluation:

- ☑ Visual inspection
- ☑ BMS data
- ☑ State of Health determination
- ☑ Internal Resistance

Requirement for new application:

- ☑ Low criticality mission
- ☑ No space constraint
- ☑ Ease of access and maintenance



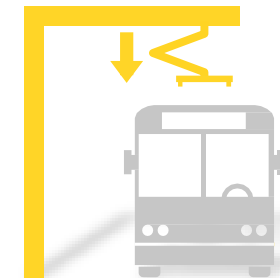
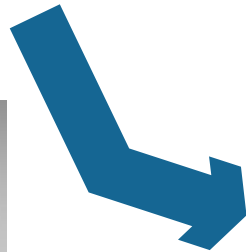
2nd LIFE USE CASE FOR EV CHARGING



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- dp Location: Europe
- dp End of Life bus packs
- dp Energy: 500kWh
- dp Peak Shaving for Bus FAST DC Chargers
- dp Benefits:
 - lower TCO
 - Deferred station upgrade

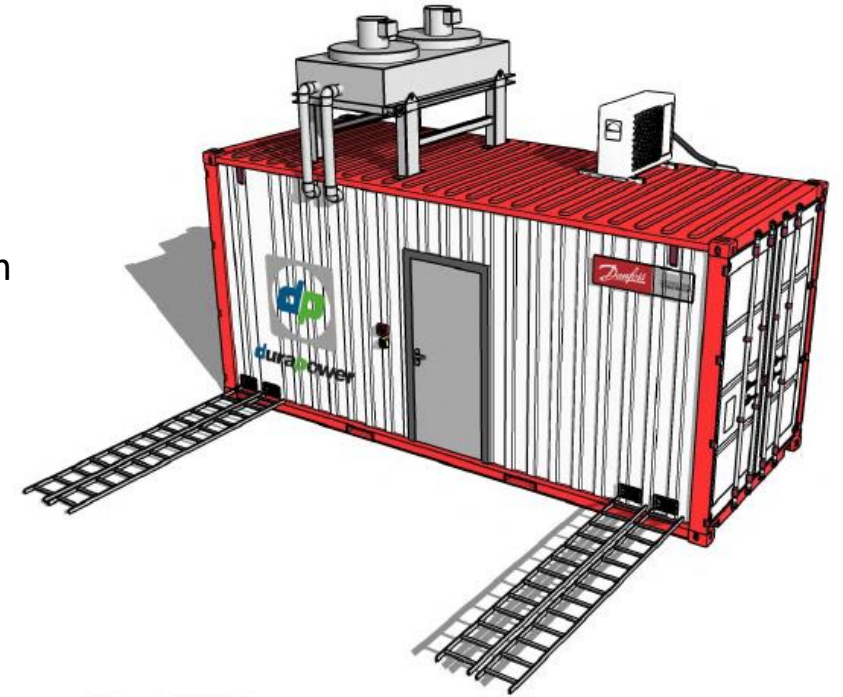


2nd LIFE USE CASE FOR GRID SUPPORT



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- ❑ EMA PSA Grant Call
- ❑ Demonstrator application for AGV Battery pack redeployment
- ❑ 2 MWh Container ESS
- ❑ Power quality and grid services
- ❑ Benefits
 - ❑ Increased value of asset
 - ❑ Potential new revenue stream



THANK YOU



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