『Energy Storage Academy』

BESS Safety Considerations in South Korea

Dr. Yu Tack, Kim

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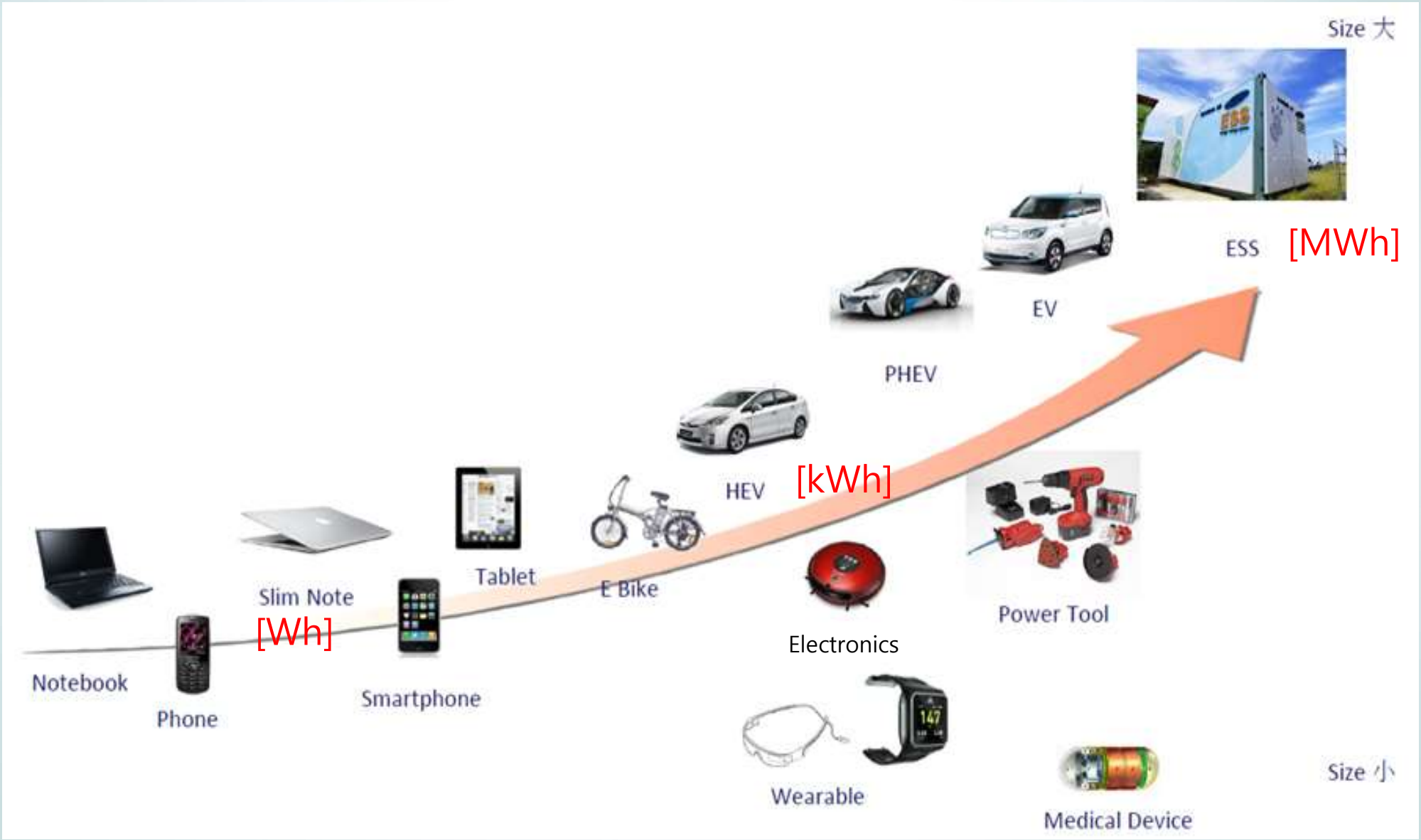
Battery application expansion "IT → EV → ESS"

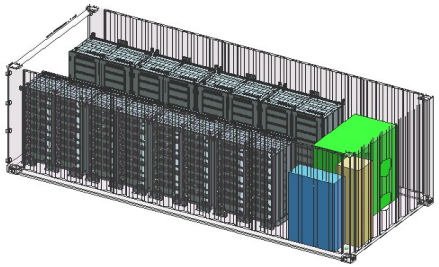


1 Introduction

Grid Storage Solution

Energy Management System

Grid Battery System (GBS)

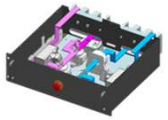


Power Conversion System


Cell


Module


BMS

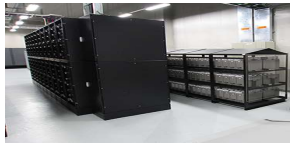

J/B


Battery Rack

STANDARD SOLUTIONS

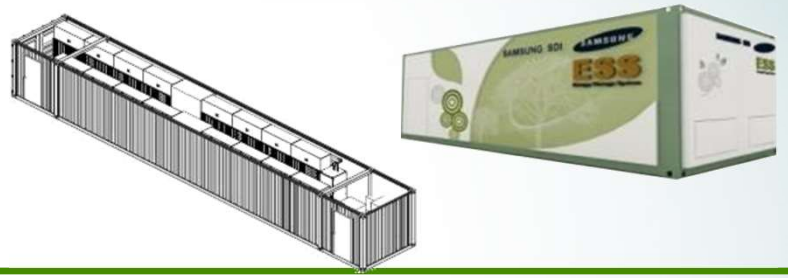
CUSTOM SOLUTIONS


Container Type


Temporary Building Type

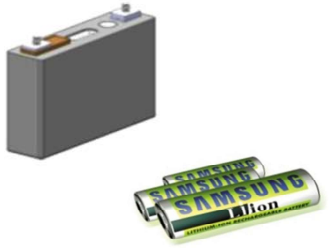
1 Introduction

MW LIB-ESS

Specificatrion			1MWh Container
Lithium Ion Battery System	Power	1MW ~ 12MW	
	Energy	3MWh	
	Configuration	256S 18P	
	Voltage	768~1049.6V	

Basic component

Cell



- Large Lithium Battery

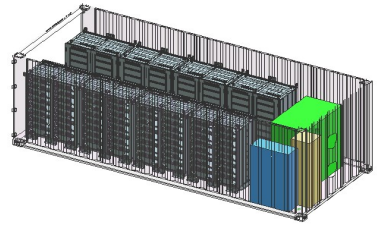
BMS

- BMS Management
- Voltage, Temp. Current

Module / Tray / Rack

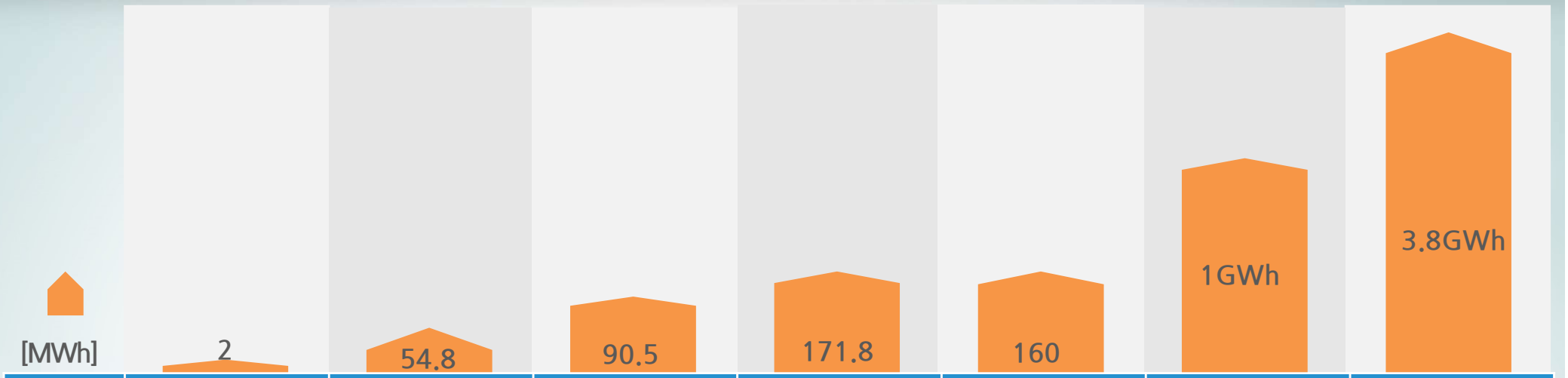
- Modular Extend Design
- Reliability & Robust

Containerization



- HVAC
- Fire Suppression System

2 ESS Policy and Technology in Korea



Year	2012	2013	2014	2015	2016	2017	2018
Total	2	56.8	147.3	319.2	479.2	1,479,2	4,500~5,500

ESS Subsides Program '13 ~ '17 (Smart Grid, Korea Energy Agency)

Renewable energy + ESS (Korea Energy Agency)

Frequency Regulation ESS '14~ (KEPCO)

Wind Turbine with ESS(REC +) '15~ (Korea Energy Agency)

Transformation ESS '16~ (KEPCO)

New Energy industry for Province (KEA)

ESS Emergency Power

Public Building '17~

PV +ESS REC+ '17 ~

Speciial Tariff

From Subsidies, Incentive program to Regulation

Compensate for **operation Capacity** of Battery (Charge & Discharge)

3 ESS installation vs Fire list

	~'14	'15	'16	'17	'18	'19	'20.July	Total
No. Site	71	118	72	258	973	476	405	2,373
Capacity(MWh)	70	73	191	707	3,756	1,799	1,987	8,583

No.	Data	Application	Conditions	Category
1	17.08	KEPCO Lab	Sea Side	Installation
2	18.05	FR	Industry	Maintenance
3	18.06	Wind	Mountain	Maintenance
4	18.06	PV	Sea Side	Rest after Charge
5	18.07	PV	Sea Side	Rest after Charge
6	18.07	Wind	Mountain	Rest after Charge
7	18.07	Demand	Industry	Installation
8	18.09	PV	Mountain	Rest after Charge
9	18.09	PV	Sea Side	Installation
10	18.09	PV	Commercial	Charge
11	18.10	FR	Industry	Maintenance
12	18.11	PV	Mountain	Rest after Charge
13	18.11	PV	Mountain	Rest after Charge
14	18.11	PV	Mountain	Rest after Charge
15	18.11	PV	Mountain	Rest after Charge
16	18.12	Demand	Mountain	Rest after Charge
17	18.12	PV	Mountain	Rest after Charge
18	19.01	Demand	Industry	Rest after Charge
19	19.01	PV	Mountain	Charge
20	19.01	PV	Mountain	Rest after Charge
21	19.01	Demand	Industry	Rest after Charge
22	19.05	PV	Mountain	Rest after Charge
23	19.02	PV	Mountain	Rest after Charge
24	19.05	PV	Farmland	-
25	19.08	Wind	Mountain	-
26	19.09	PV	Farmland	-
27	19.09	PV	Mountain	-
28	19.10	PV	Mountain	-

1 Investigation

1st Government investigation report (‘19)

Cause of fire accident	Safety measures	
Inadequate battery protection system	Manufacture standard	▪ [KS] ESS system safety international standard introduced (world's first) ▪ [KC] Certification of main parts such as battery and PCS ▪ [Group Standard] Prepare detailed standards such as
Insufficient operating environment management	Installation standard	▪ Mandatory electrical protection facility ▪ Emergency stop and monitoring system in case of emergency ▪ Prepare ESS work procedure for each organization
Careless installation	Operation management standard	▪ Strict management of temperature, humidity, dust, etc. ▪ Shorten legal inspection cycle (4 years → 1 ~ 2 years) ▪ Establishment of penal regulations for unauthorized changes to facilities
Inadequate ESS integrated control protection system	Fire fighting standard	Common Application ▪ Designation of Specific Fire Objects ▪ Establish fire safety standards specific to ESS

1st Government investigation report ('19)

Common safety measures (1,490 sites)

(All workplaces) Common application measures

- Electrical fault protection device, Battery overcharge protection
- Emergency stop device installation, Operation environment management

Additional supplementary measures

(Indoor retention) Common + firewall installation

- Firewall installation (shielded by fireproof structure)
- Secure the separation distance from other facilities

Firefighting special investigation

(Facilities expected to damage human life) NFA special investigation

- Complex building, department store, sports ground
- Facility with high risk → Measures such as relocation in outdoor and suspension of use

Implementation Status Check

Task Team comprised of KESCO etc.

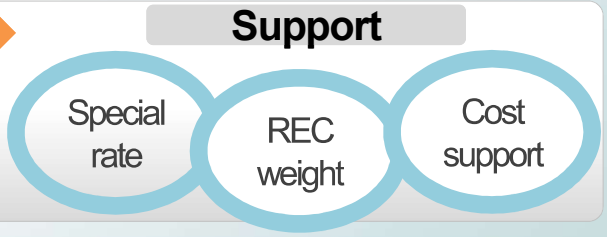
- Complementary Action Consulting + Confirmation and Inspection
- Resume operation after checking safety measures

Government support

Support for operators implementing the shutdown advisory

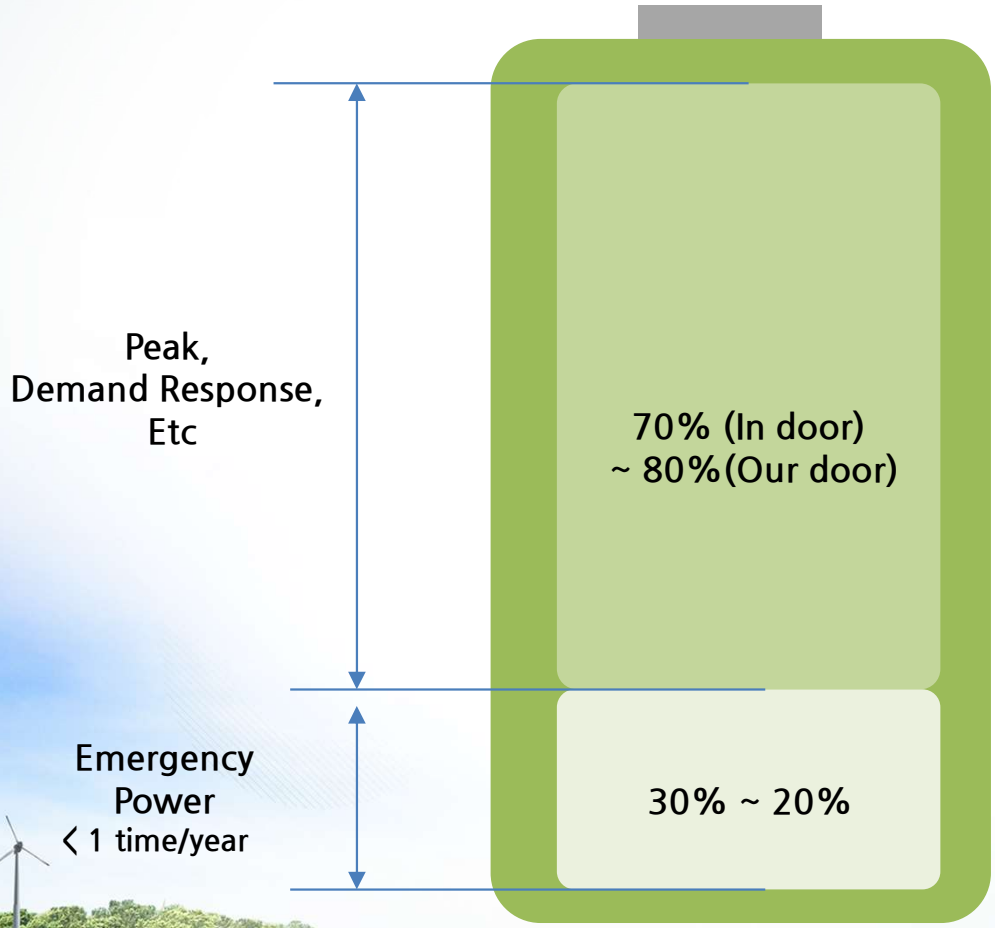
- Carry over of special electricity rate discount
- REC additional weighting

Support the cost of safety measures such as firewall installation



2 Safety Solution

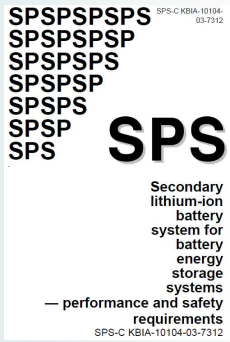
2nd Government investigation report (‘20)



KBIA Standards for ESS

Classification	Battery	Module	Tray, Rack(System)	BMS
International Standard	IEC 62133 IEC 62619 & 62620('17)	IEC 62619 & 62620('17)	IEC 63056('20.03)	
Association Standard	KBIA10104-01, 2 ('12, 15)	KBIA10104-01, 2('12. '15) KBIA10104-03('19)	KBIA10104-01, 2('12, 15) KBIA10104-03('19)	SPS-C KBIA-30104-01-7345('20)

Battery Management system for battery energy storage systems — performance and safety requirements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Secondary lithium-ion battery system for battery energy storage systems — performance and safety requirements
SPS-C KBIA-10104-03-7312

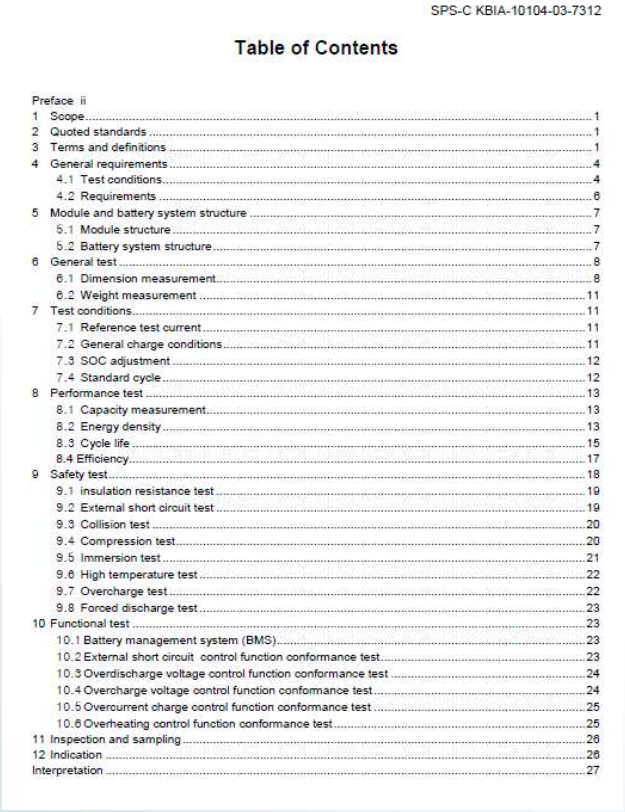

SPS-C KBIA-10104-03-7312

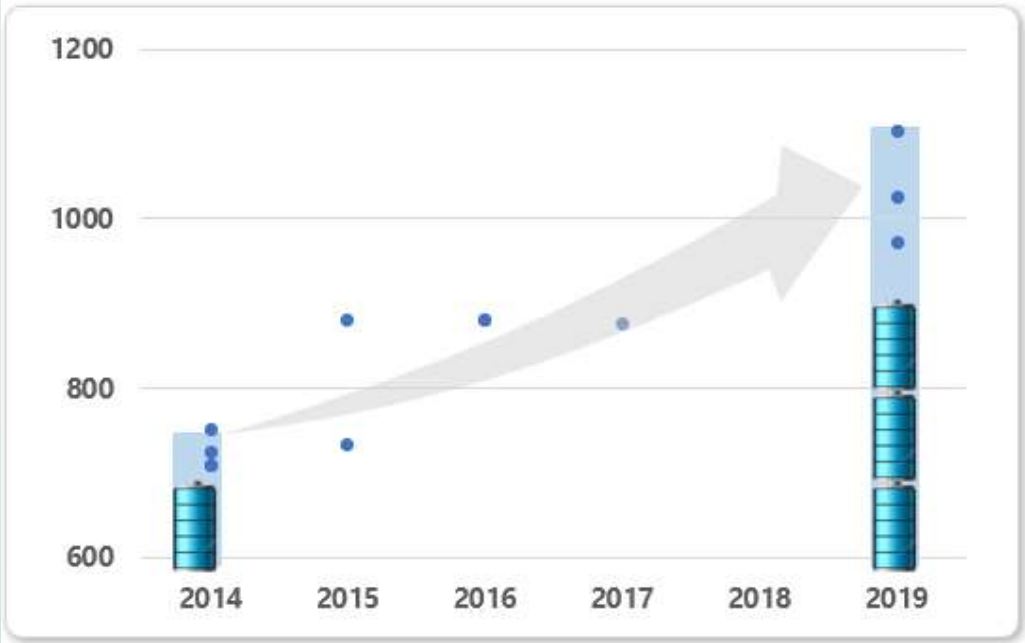
Table of Contents

Type	Test	시험 구성 단위		
		BCU	Rack[a]	Rack
Safety	7.1 operation	O		
	7.2 shock	O		
	7.3 Impedance	O		
	7.4 Internal resistance	O		
	7.5 isolated capability			O
	7.6 isolated resistance			O
function	8.1 Voltage measuring	O	O	O
	8.2 Connected Switching device	O	O	O
	8.3 Cable (BMS, High voltage)	O	O	O
	8.4 Measuring (Voltage, Current., temp.)	O	O	O
	8.5 Overcharge voltage	O	O	O
	8.6 Overcharge current	O	O	O
	8.7 high temp.	O	O	O
	8.8 Low temp.	O	O	O
	8.9 Over discharge	O	O	O
	8.10 Communication failure	O	O	O
EMC	9.2.1 home, commercial area			O
	9.2.2 Industry conditions			O
	9.31 Surge protection			O
	9.3.2 RF field test			O
Environment	10.1 High temp.	O		
	10.2 Low temp.	O		
	10.3 High temp. storage	O		
	10.4 Low tep. storage	O		

1 Battery vs ESS

BESS Voltage & Capacity

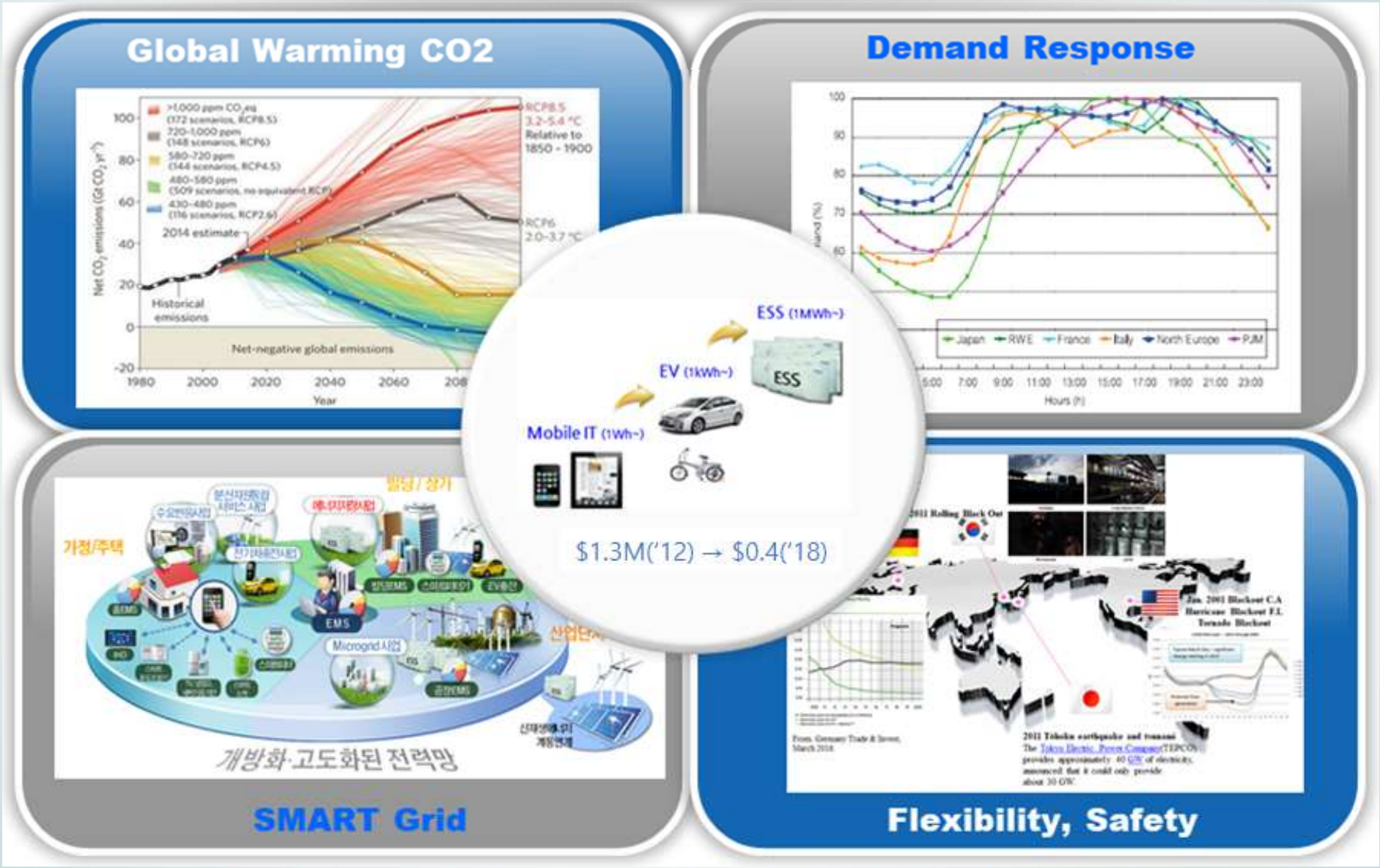
ESS System Voltage (V)



ESS System Power (kWh)

High Voltage System after 2018

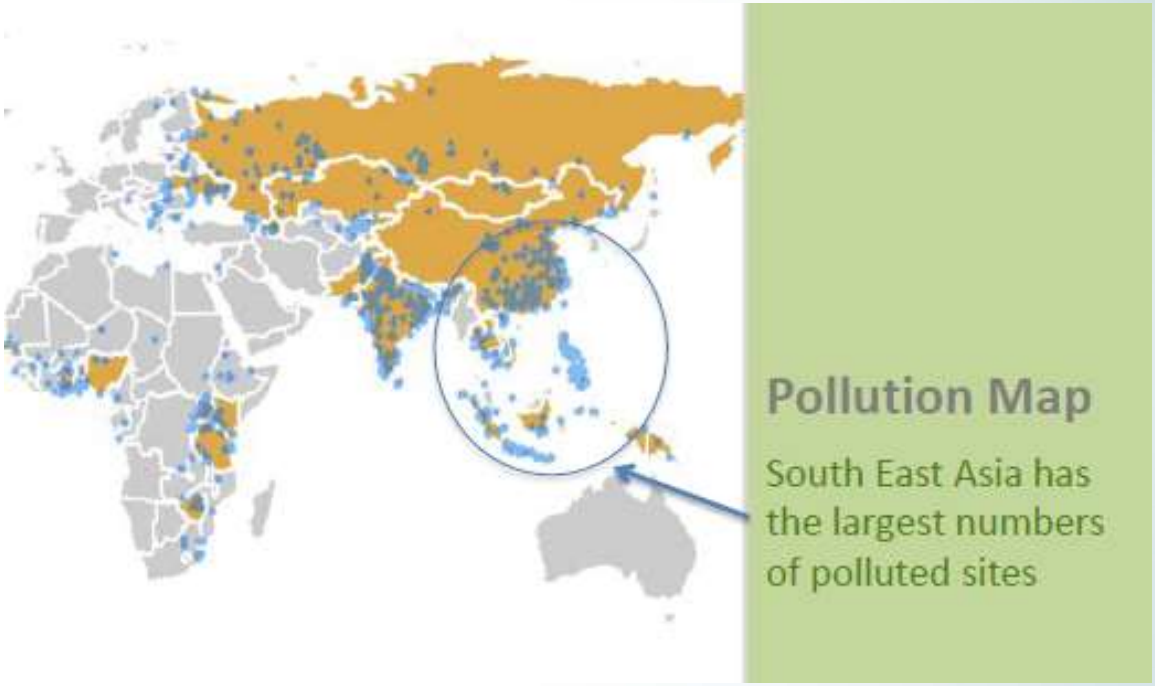
1. Global Warming, 2. Energy Efficiency, 3. Smart grid, 4. Grid Flexibility & Safety, 5. BESS Economics



3 For Client Countries

'The World's worst pollution problems from Eco-global Inc.

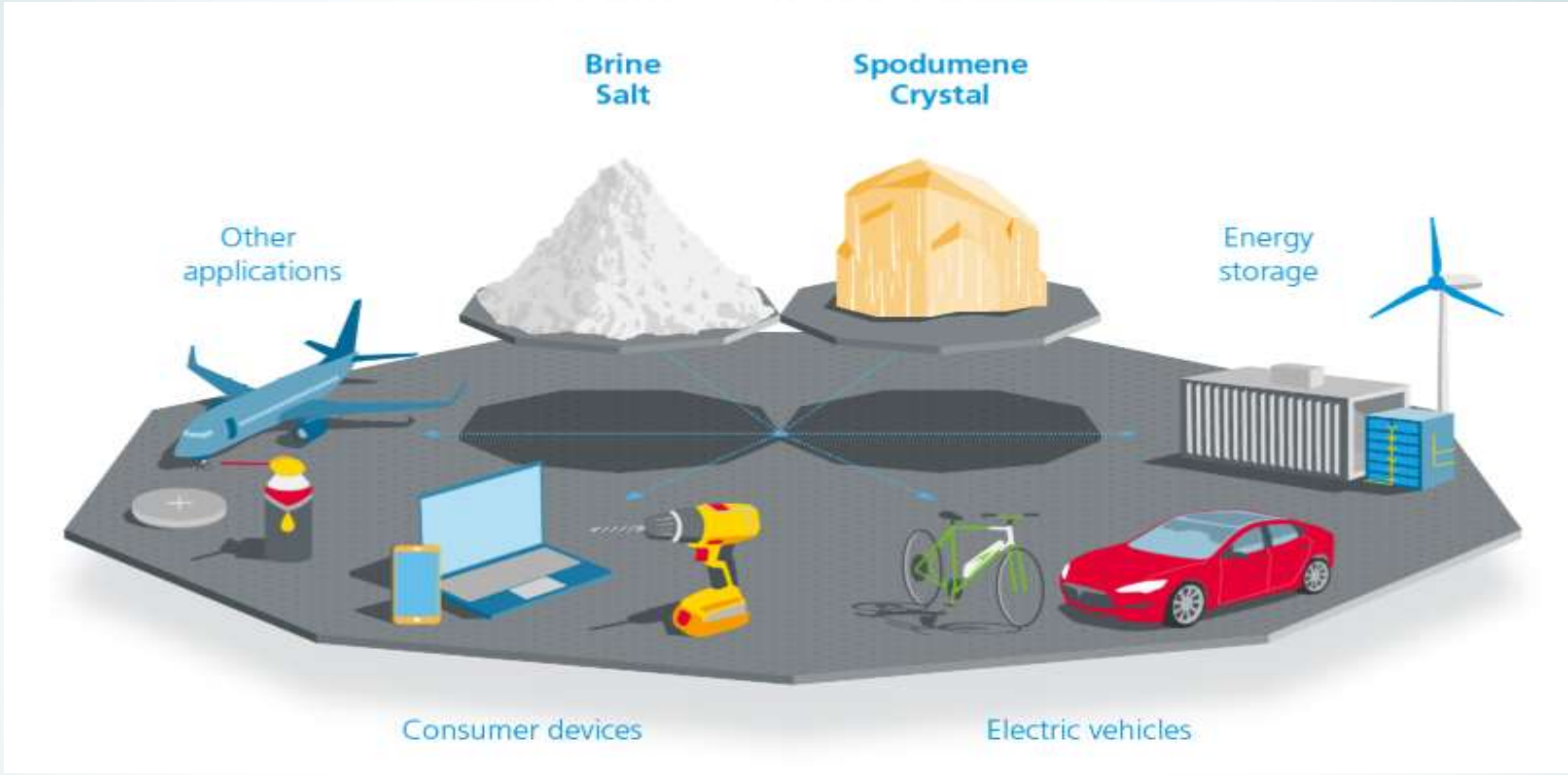
Lead waste and Lead smelting



South East Asia has the largest numbers of polluted sites

Interested in Lithium Battery for Energy Storage system, Sustainable and Maintenance free system

3 For Client Countries



3 For Client Countries

Sustainability system of Battery

① Collection

Usable Capacity 70~80%

② Reuse, Re-fabrication

③ Recycle

Recycle

Reuse, Re-Fabrication
ESS
E-mobility
E-boat
UPS
Solar Street light

Recycle
LIB
PCB
Socket, cable
Case, Plastic
Switch

Thank You !!!!!

KBIA Korea Battery Industry Association

KORBA Battery R&D Association of Korea