

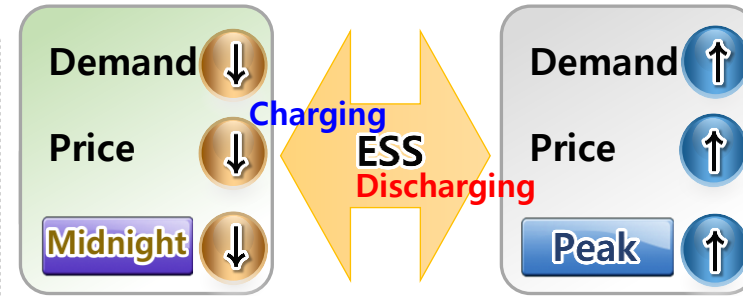
Introduction to ESS

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1 Definition and Use

Definition

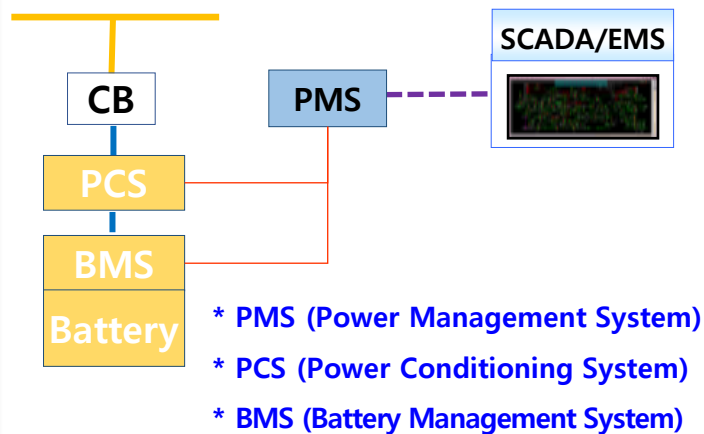
A system that stores power in a battery using converting system(AC↔DC) and then supplies power when necessary, to improve efficiency of the energy



* ESS (Energy Storage System)

Components

Power Grid



ESS Function

Energy efficiency improvement

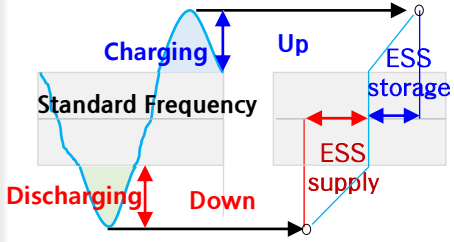
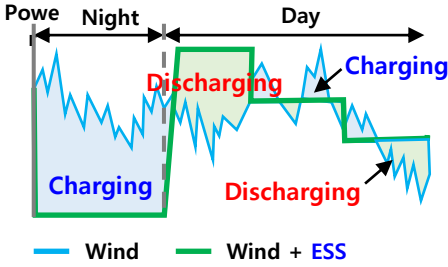
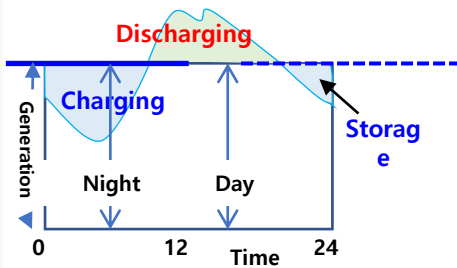



Storing generated power and using stored power when necessary

Stabilizing power supply system

Improving the quality of renewable energy

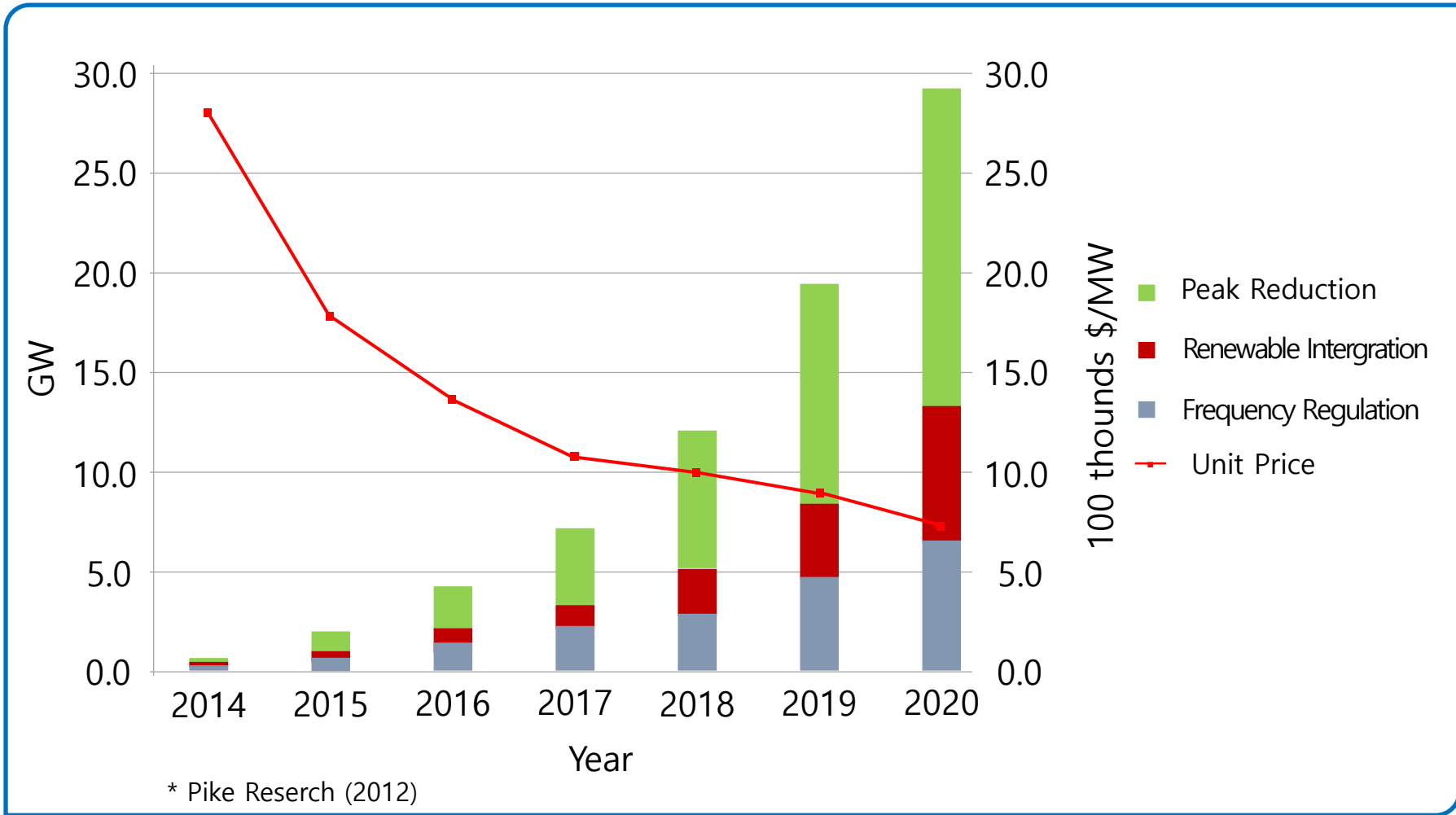
2 The Services of ESS

Services (Focus on Batteries in Power Industry)

Item	Frequency Regulation	Stabilization of Renewable Output	Peak Reduction
Application Method	Frequency up : Charging Frequency down : Discharging	Power Quality Compensation & Stabilization of Output	Night : charging Day : discharging
Content			
Use	 <p>[Power Grid]</p>	 <p>[Renewable Energy]</p>	 <p>[Home and Commercial]</p>

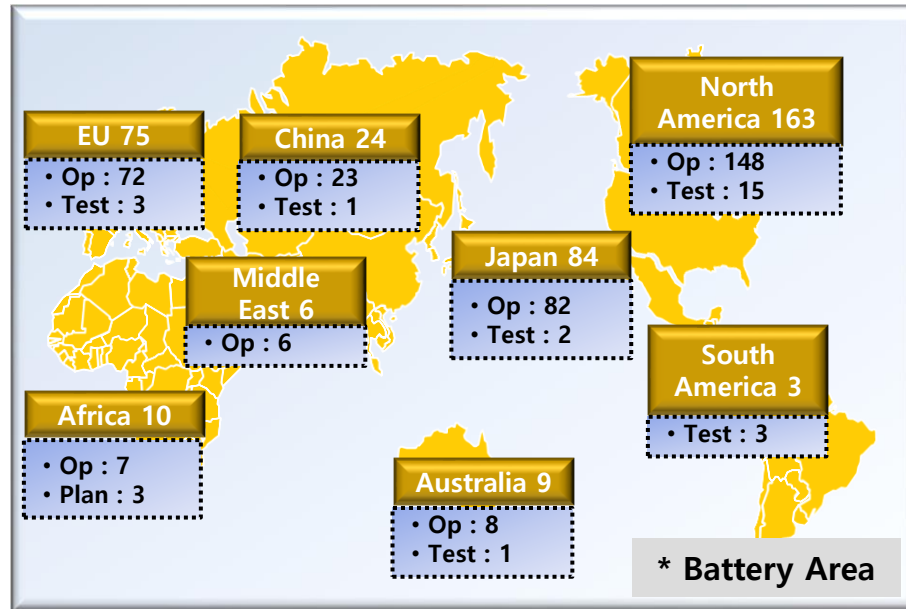
3 Global Market

● Market Forecast : 29GW by 2020



4 Overseas

ESS Operation and Test : 374 Sites



Use	Site	Occupation
F/R	90	24%
Peak Reduction	123	33%
Stabilization of Renewable Output	112	30%
etc	49	13%

Type	Site	Occupation
LiB	224	60%
Lead acid	44	12%
Flow Battery	33	9%
etc	73	19%

Department of Energy (USA, '14.12)

- ▶ **(Technical Level)** Operating and testing stage for peak reduction and renewable energy, Commercializing stage for frequency regulation in the US.
- ▶ **(Promotion Status)** Power facilities and manufacturers testing ESS for various purposes.

5 Korea

ESS Operation and Test : 45 Sites

As of 2016

	F/R	Peak Reduction	Stabilization of Renewables
Sites(%)	13 (29%)	29 (64%)	3 (7%)
Type	LiB	LiB, Lead acid, etc	LiB
Companies	KEPCO	KEPCO, Samsung SDI, KT, etc	KEPCO

- ▶ **(Technical Level)** A world-class battery manufacturing technology, but necessary to verify application technology like power system connection
- ▶ **(Promotion Status)** Testing stage for system link, partial operation stage for commercial

