

INTELLIGENTE SPEICHERSYSTEME FÜR CHINA - TRENDS UND MARKTPOTENTIALE

BUNDESVERBAND ENERGIESPEICHER

*Informationsveranstaltung „Netzintegration und erneuerbare
Energien in China“*

Frankfurt, 21.02.2017

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Agenda

1. **BVES e.V.**
2. **Intelligente Speichersysteme für China - Trends und Marktpotentiale**
 - **Rückblick 2011 - 2015 (12th FYP)**
 - **Ausblick 2016 - 2020 (13th FYP)**
3. **Zusammenfassung**

Der Bundesverband Energiespeicher e.V.

Der Bundesverband Energiespeicher (BVES) vertritt die Interessen von Unternehmen aus verschiedensten Branchen, die das gemeinsame Ziel der Entwicklung und Vermarktung von Energiespeichern in den Bereichen Strom, Wärme und Mobilität verfolgen.

Energiewende = Stromwende + Wärmewende + Mobilitätswende

Als **technologieoffener** Industrie-Verband vertritt der BVES die Interessen der Speicherbranche gegenüber Politik, Verwaltung, Wissenschaft und Öffentlichkeit und unterstützt seine Mitglieder mit gezielter Öffentlichkeitsarbeit.



Mitglieder (Auszug)





SCHNELLE
SPEICHER
STATT LANGER
LEITUNG.

Speicher sind ein Allround-Talent und können noch viel mehr...

- 
- Steigerung der Energieeffizienz
 - Schwarzstart
 - Insellösungen
 - Peak shaving
 - Eigenverbrauch
 - Lastverteilung
 - Frequenzregulierung
 - Spannungshaltung
 - Positive/Negative Regelleistung
 - Sektorkopplung

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Situation in China + Challenges



CHALLENGES:

- Monopolistic grid - transmission, distribution, retail
- Opaque grid operations and costs
- Insufficient mechanisms for energy storage to provide grid services
- Lack of subsidies for energy storage

Mainstream ESS technology in China

- Advanced, high-capacity electric storage technologies :**

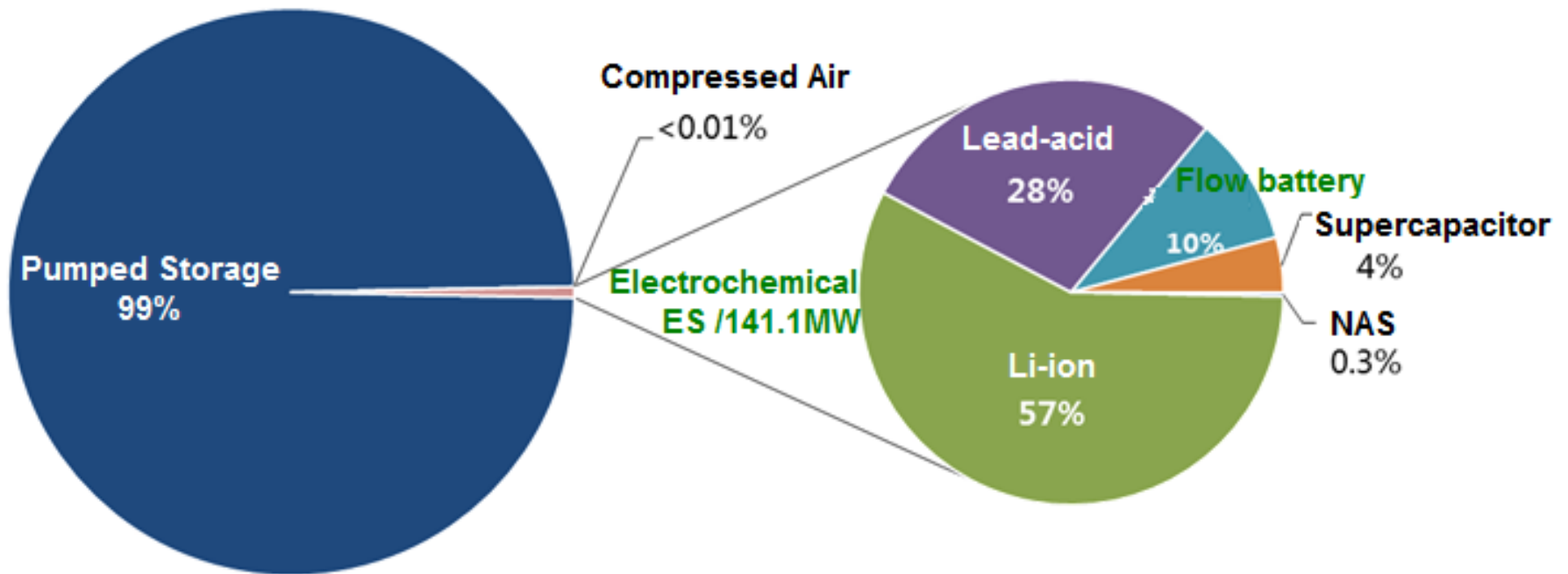
Storage of electric energy in \geq kW range

	Technologies	Characteristics
Physical Storage	<ul style="list-style-type: none">• Pumped Hydro• Compressed Air (supercritical CAES)• Flywheel	<ul style="list-style-type: none">✓ Uses water/air as storage medium✓ No chemical change✓ Mechanical → electric energy
Chemical Storage	<ul style="list-style-type: none">• Lead-acid Battery• Li-ion Battery• Flow Battery (Vanadium, Zn-Br)• Na-S Battery	<ul style="list-style-type: none">✓ Uses chemicals as storage medium✓ Battery charges/discharges with chemical change/valence change
E&M Storage	<ul style="list-style-type: none">• Supercapacitor	<ul style="list-style-type: none">✓ Fast response, can release large amounts electric power in short times, high number of cycles
Other Storage	<ul style="list-style-type: none">• Fuel Cell*• Metal-air Battery*	<ul style="list-style-type: none">✓ Does not possess "charging" characteristics



Market size in China

- ES application market share (up to the end of 2015)



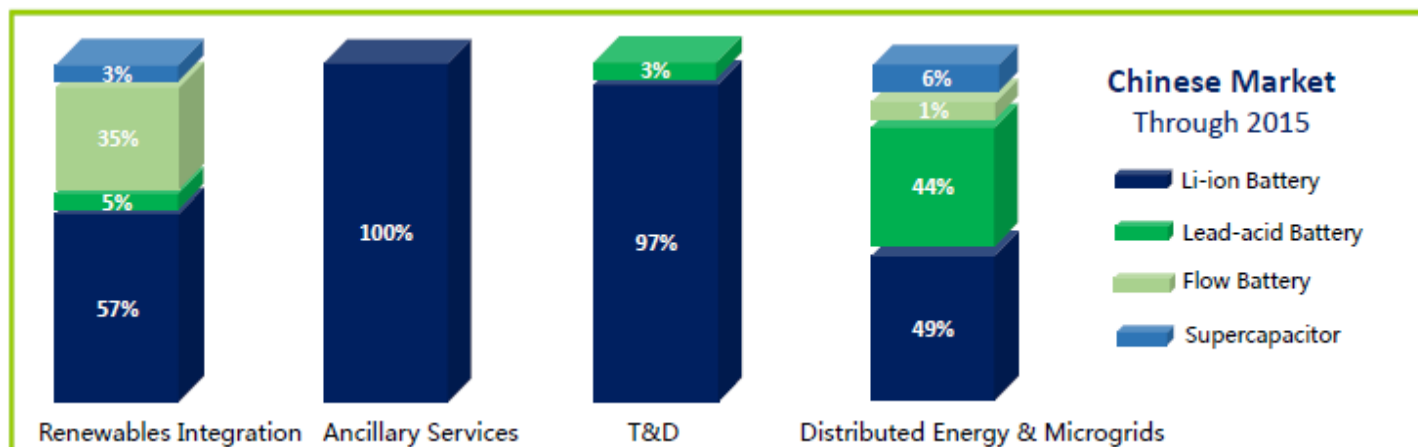
Review of 2011-2015 ES application

1

ES in a multitude of diverse project demonstrations

- *Multiple technologies coexist*
- *Technologies displayed distinct advantages in different applications*
- *Trend in multi-technology combined applications*
- *Costs continue to fall*
- *R&D into new technologies persists*

	2013		2014		2015	
	Accumulated capacity (MW)	Share of market(%)	Accumulated capacity (MW)	Share of market(%)	Accumulated capacity (MW)	Share of market(%)
Li-ion	36.6	59	63.3	55	80.5	57
Lead Acid	13.9	22	35.8	31	39.8	28
Flow Battery	8.7	14	11.9	10	13.9	10
Super Capacitor	3.1	5	4.9	4	5.9	4



Notes: Pumped hydro and thermal storage projects are not included!

China ES application cases

Renewables integration

2

• World's largest Wind/Solar/ES demonstration project

Zhangbei Wind/Solar/Energy Storage Project	
Investor/Owner	SGCC
Capacity	Wind power: 98.5MW, Solar power: 40MW; Energy storage: 14MW
ESS technologies	12MW Li-ion battery and 2 WM vanadium flow battery
Application	Fluctuation smoothing, peak shaving, frequency regulation



China ES application cases

Renewables integration

2

China's first rooftop PV/NAS BESS demonstration project

Crouching Bull Rock Wind Farm Demonstration

Investor/Owner	NR Electric & NGK
Capacity	Rooftop PV power: 5.8MW; Energy storage: 1440 kWh
ESS technologies	Sodium Sulfur(NAS) battery
Application	Peak shaving and load shifting



China ES application cases

Renewables integration

2 • Molten Salt Storage (Concentrated Solar Power – CSP)

Projects (planned or under construction)	Capacity
Delingha, Qinghai	50 MW
Dunhuang, Gansu	10 MW 10 MW
Akesai, Gansu	50 MW
Jiushan, Gansu	300 MW (CSP)



GOAL of the 13th FYP → 10 GW by 2020

China ES application cases

Frequency regulation

2

- World's first MW-level thermal power connected storage FR project

Peking Shijingshan Thermal Plant ES FR Project

Investor/Owner	Ray Power
Capacity	Energy storage: 2MW/500kWh
ESS technologies	2MW/500kWh lithium iron phosphate battery
Application	Frequency regulation, AGC



China ES application cases

Industrial parks / Microgrids

2

- ESS application in large-scale Microgrid pilot projects



Nanji island Microgrid Pilot Project

Investor/Owner	Zhejiang Electric Power
Capacity	Wind:1000kW; Solar: 600 kW; Diesel: 1.8MW; Energy storage: 3 MW.
ESS technologies	2MW/4MWh lithium iron phosphate battery; 1MW/15s super capacitor
Application	Microgrid control, including renewable regulation and reduced Diesel consumption

Luxi island Microgrid Pilot Project

Investor/Owner	Zhejiang Electric Power
Capacity	Wind:1560 kW; Solar: 300 kW; Energy storage: 2.5 MW.
ESS technologies	2MW/4MWh lead carbon battery; 0.5 MW/15s super capacitor
Application	Microgrid control, including renewable regulation and reduced Diesel consumption

China ES application cases

EV - Charging

2

• EV Charging SS application in large-scale Microgrid pilot projects

State Council PHV and EV target 379,000 sold in 2015*;

GOAL: 5 million in 2020

- Build charging/battery switching stations (over 2300 stations by 2015)
- Accelerate research on V2G, second life battery applications and battery recycling systems



Future application

- V2G (grid)
- V2B (building)
- EV + Home ES System



Environmental policies

18



Short-term: air pollution
Air Pollution Action Plan
(2013):

- Reduce coal's share in generation; reduce urban transport-related emissions.

Long-term: carbon emissions by 2030:

- Peak CO₂ emissions (by 2030 at the latest)
- Lower carbon intensity of GDP by 60-65% below 2005 levels
- Increase non-fossil share in primary energy supply to 20%

Environmental policies

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Installed RES capacities as of 2015: Wind 129 GW; Solar 43 GW

- **BUT:** Curtailment issues Average national wind curtailment of 15%, Solar curtailment of 31% in Gansu, 26% in Xinjiang
- → March 2016: policy allowing storage to provide peak shaving services in 13 provinces and regions in China's north.

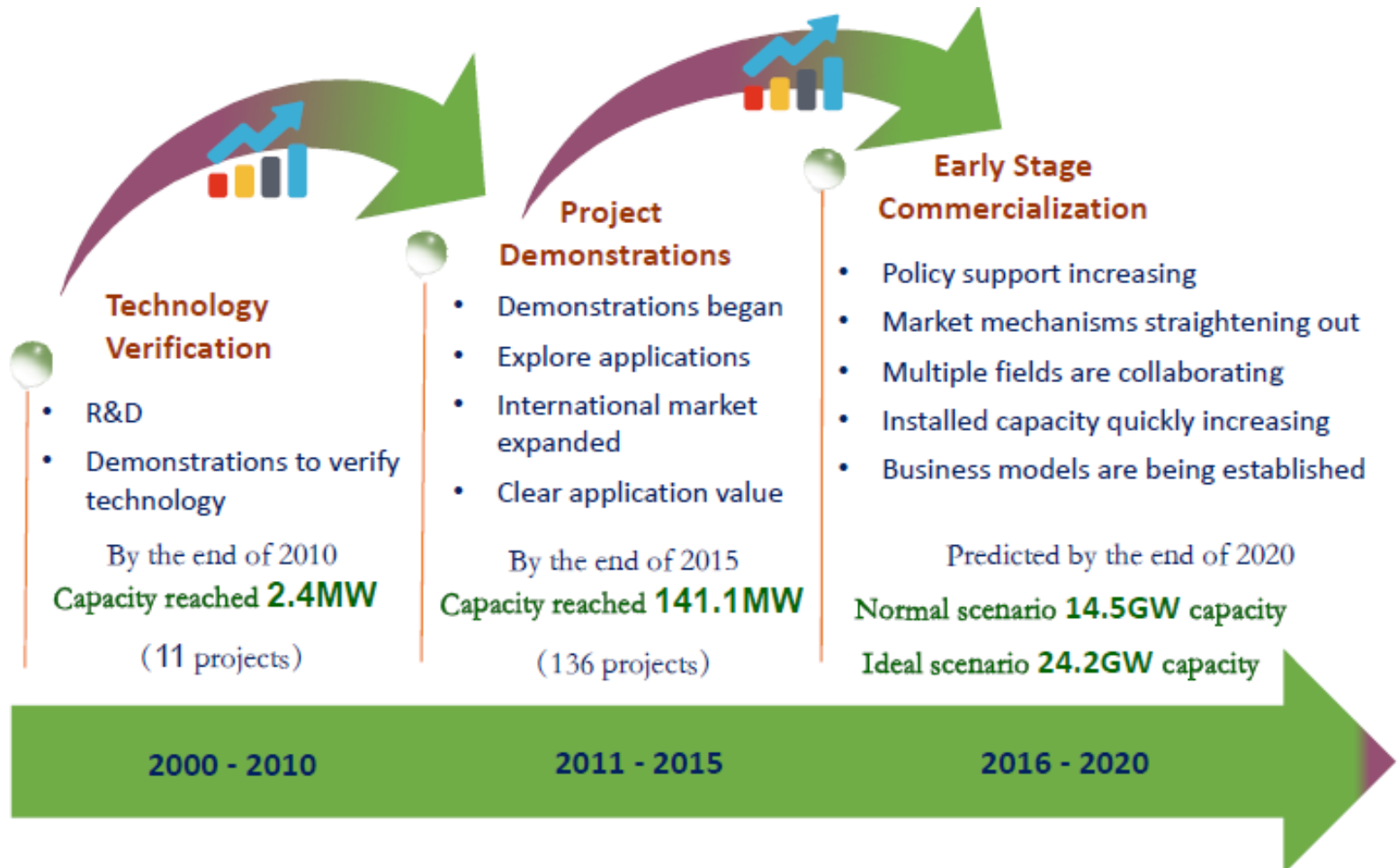


Power Sector Reforms in 2015-2016

- Demand-side management methods to improve grid efficiency
- Retail reforms which allow third-party retailers to serve industrial users
- Opening of competitive power markets, paving the way for competitive frequency regulation markets
- Measures to address renewables curtailment
- Stronger oversight of grid investments



China's ES market development



Notes:

Pumped hydro Storage is not included.

ES development in 13th FYP

- Interest in the ES has increased, the industry is poised for rapid development

Energy Planning

- “13th 5 Year Plan Outline”
- “Action Plan for Energy Development Strategy (2014-2020)”
- “Made in China 2025”
- “Action Plan for Innovation in the Energy Revolution (2016-2030)”

Renewables



New Energy Vehicles



Energy Storage

Power System Reforms

“CPC Central Committee Opinions on how to Intensify Power System Reforms”

The “Internet of Energy”

“Guiding Opinions on the Implementation of the ‘Internet+’ Smart Energy Development”

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China ES application cases

3

- **Potential for large-scale commercial applications of storage technology has emerged**

Main Applications and Profit Points

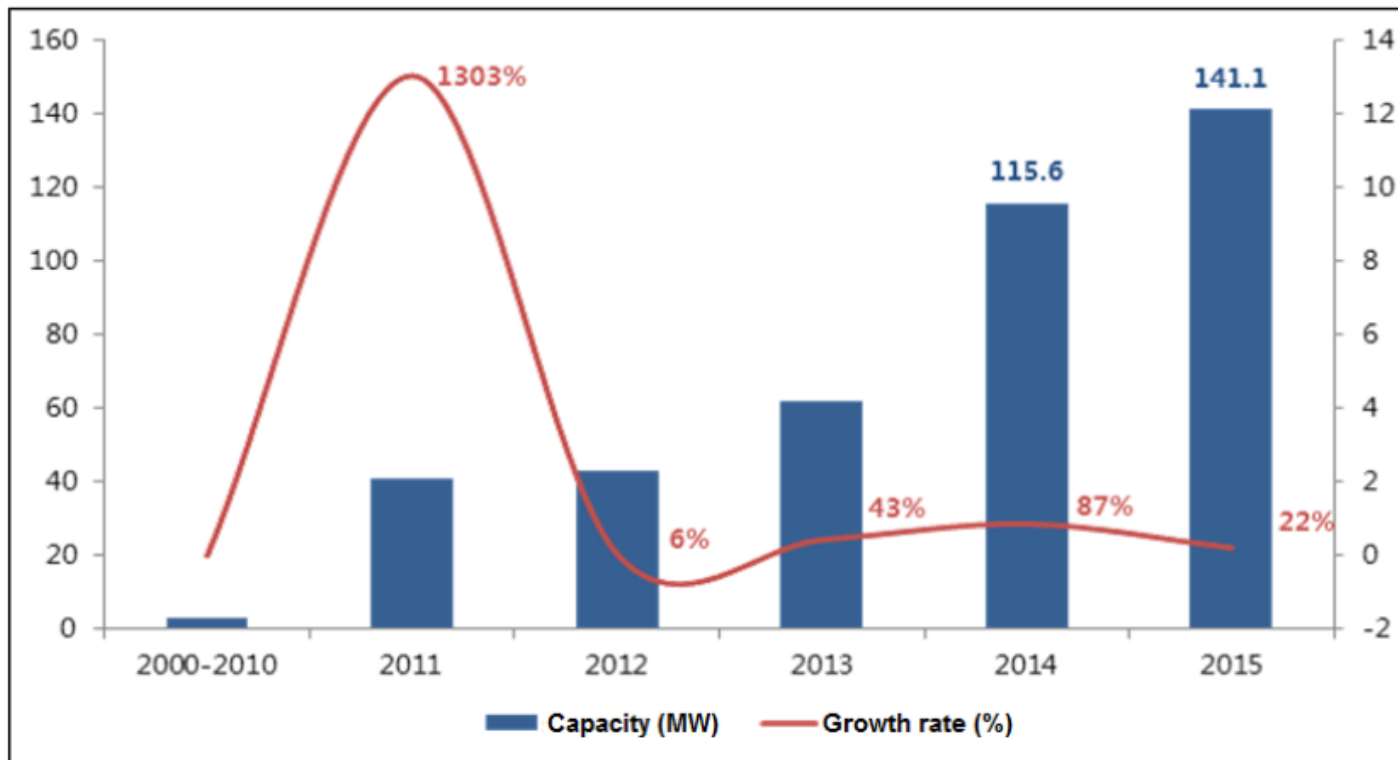


	Generation-Side	Ancillary Services	User-Side
	Wind/Solar + Storage	Storage + thermal power coupling	Rooftop PV + storage
Application	<ul style="list-style-type: none"> • <i>Peak shaving</i> • <i>Output tracking</i> • <i>Fluctuation smoothing</i> • <i>FR, load-shifting</i> 	<ul style="list-style-type: none"> • <i>FR ancillary services</i> 	<ul style="list-style-type: none"> • <i>Manage electricity bill</i> • <i>EV Charging</i> • <i>Back-up electricity</i>
Profit Points	<ul style="list-style-type: none"> • Curtailment limits electricity • Grid power purchasing commitments • Reduces risk of grid audits/penalties 	<p>Increases ancillary services capabilities, daily compensation increases profits</p>	<ul style="list-style-type: none"> • Save on peak/off-peak price differences • Increase PV generation profits

China ES application cases

3

- Potential for large-scale commercial applications of storage technology has emerged



Notes: Pumped hydro and thermal storage projects are not included.

Energy Storage China (ESC) is the most influential gathering of policy, technology and market leaders in energy storage, organized by Messe Düsseldorf China and supported by powerful industry partners

ESC focuses on applications, solutions and projects such as renewable energy integration, power transmission and distribution. The event also showcases innovations in smart grid, microgrid, off-grid, decentralized energy, thermal, telecoms, internet of energy, cost efficiency, mobility and investing

- Exhibitors cover the entire energy storage and energy systems industry
- Participation by key domestic and overseas market leaders
- Concurrent international conference, side events and business matchmaking
- Well-organized international pavilions and buyer groups
- Major support by leading power industry groups, TSOs, DSOs, industry associations and organizations



ENERGY STORAGE CHINA 2017

www.ESCexpo.cn

March 29-31, 2017

China International Exhibition Center, Beijing



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Energy Storage China 2017 is collocated with
Clean Energy China Expo (CEEC), creating
China's Premier Solution Platform
for Energy Storage Technology and Applications

2014-2017
EDITION / 年




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Vielen Dank für Ihre Aufmerksamkeit!

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