

I&R - The Grid Battery Energy Storage Technologies Market Report 2018

<https://marketpublishers.com/r/IC39D57B2F6EN.html>

Date: December 2017

Pages: 281

Price: US\$ 1,600.00 (Single User License)

ID: IC39D57B2F6EN

Abstracts

The Grid Energy Battery Storage (GEBS) technologies storage market is beginning to gain momentum as many electro-chemical technologies evolve from a demonstration projects into commercial deployment on a grid scale level. 2017 saw a number of technologies enter into commercial production both for residential and industrial uses. GEBS technologies provide a number of advantages over other established, emerging and competing technologies such as ease of deployment, flexibility of use, the precision and quality of the service they can provide to grid operators and the lack of geographical constraints experienced by technologies such as CAES and PHS.

Market dynamics such as ageing electrical grids, utility financial constraints, development of renewable intermittent energy sources and an evolving regulatory environment will be key drivers of the adoption of GEBS technologies. As production costs of grid scale battery technologies decline we expect to see increased deployment around the world with U.S, Germany China and Japan being early adopter and drivers, further driving down costs of these systems.

Why you should buy The Grid Battery Energy Storage Technologies Market 2018

282 pages of comprehensive analysis

55 tables, charts, and graphs quantifying the market in detail

Grid Battery Energy Storage Technologies market forecasts between 2018 and 2028

Ten year market forecasts for 5 GBES submarket forecasts including:

Lead-Acid

Lithium-Ion

Sodium-Ion

Flow Batteries

Other Battery Types

Forecasts for the 12 leading and Rest of the World (RoW) markets within the Grid Battery Energy Storage Technologies market:

US

Germany

Canada

China

Japan

Spain

Italy

France

UK

South Korea

Australia

South Korea

Rest of the World

A SWOT analysis that examines the GBES market

74 key companies identified and profiled operating within the Grid Battery Energy Storage Technologies market.

You can order this report today and discover the latest market trends and uncover sources of future market growth for the Grid Battery Energy Storage Technologies industry and gain an understanding of how to tap into the potential of this market by ordering *The Grid Battery Energy Storage Technologies Market 2018*.

Contents

- Executive Summary
- Benefits of the Report
- Intended Audience
- Report Contributors
- Methodology
- Introduction to the Grid Battery Energy Storage Technologies Market
- History of the Evolution Battery Storage Technology
- How Rechargeable Batteries Work
- Description of Grid-scale Battery Energy Storage Technologies and System Components
 - Figure 1: Overview of Grid Battery Electro-Chemical Technologies
 - Figure 2: Typical Wind Farm Grid Battery Storage Facility
- Conventional Batteries
 - Lithium-Ion Batteries
 - Lithium-Ion Battery Composition
 - Figure 3 Lithium-Ion Battery Configuration
 - Lithium-Ion Battery Characteristics
 - Figure 4: Map of Planned and Existing Lithium Ion Demonstrations
 - Advantages Lithium-ion batteries
 - Disadvantage Lithium-ion batteries
 - Table 1: Lithium-Ion Battery Features
 - Table 2: Lithium-Ion Battery Costs by Benefit (2010\$)
- Lead-Acid Batteries
 - Figure 5: Lead-acid Battery Configuration
 - Lead-Acid Battery Configuration
 - Types of Lead-Acid Batteries
 - Flooded Type Lead-acid Batteries
 - Valve-Regulated Lead acid Batteries
 - Maintenance Requirements for Lead-acid Batteries
 - Advanced Lead-acid Batteries
 - Cost of Operating Lead-acid Batteries
 - Table 3: Lead acid battery costs by application (\$)
 - Table 4: Lead-Acid and Advanced Lead Acid Battery Costs by Application (\$)
 - Advantages of Lead-acid Batteries
 - Disadvantages of Lead-acid Batteries
- High Temperature Batteries
- Sodium-Based Batteries

- Figure 6: Sodium Sulphur Cell Construction
- Sodium-Sulphur Battery Configuration
- Commercialization of Sodium-Sulphur Batteries
- Operating Ranges of Sodium-Sulphur Batteries
- Operating Costs of Sodium-Sulphur Batteries
- Sodium-Nickel-Chloride (ZEBRA) Batteries
- Technical Characteristics of Sodium Nickel-Chloride
 - Table 5: Sodium sulphur battery costs by application (\$)
 - Table 6: Sodium Sulphur Battery Costs by Benefit (\$)
- Advantages of Sodium-Based Batteries
 - Figure 7: Advantages of NaS Battery Technology
- Disadvantages of Sodium-Based Batteries
- Flow Batteries
 - Figure 8: Flow battery system
- Types of Flow Battery
 - Figure 9: Flow battery Cell construction
- Hybrid Flow Batteries compared with Redox Flow Batteries
- Redox Flow Batteries
- Vanadium Redox Batteries
- Composition of Vanadium Redox Flow Batteries
- Response Time of Vanadium Redox
 - Table 7: Technical characteristics of VRB systems by application
- Vanadium Redox Batteries Energy & Power Characteristics
- Vanadium Redox Batteries Facilities
- Operating Costs of Vanadium Redox Batteries
 - Figure 10: Component costs of a VRB as a percentage of total capital cost (\$)
 - Figure 11: Present capital costs estimates of VRB systems
- Table 8: VRB capital and operating costs (\$)
- Table 9: VRB Costs by Benefit (\$)
- Hybrid Flow Batteries
- Zinc Redox
- Zinc-Bromine Flow Battery
 - Figure 12: Zinc bromine battery composition
- Operating Range of Zinc-Bromide
- Zinc Bromine Flow Batteries Facilities
- Operating Costs of Zinc-Bromine Flow Batteries
 - Table 10: Zinc Bromine Battery Costs by Application (2003\$)
 - Table 11: Zinc Bromine Battery Cost by Size and Application (2010\$)
- Advantages of Flow Batteries

Disadvantages of Flow Batteries

Nickel-Cadmium (NiCd) & Other Nickel Electrode Batteries

Figure 13: Nickel cadmium cell composition

Operating Ranges of Nickel-Cadmium Batteries

Types of Nickel-Based Batteries

Table 12: Nickel Cadmium Battery Costs by Application (2003\$)

Table 13: Nickel Cadmium Battery Features

Advantages of Nickel-Based Batteries

Disadvantages of Nickel-Based Batteries

Other Battery Designs

Metal Air Batteries

Figure 14: Metal air battery compositions

Molten/Liquid Metal Batteries

Figure 15: General Molten air battery composition

Figure 16: Liquid Metal battery composition

Advantages of Metal Air & Metal Liquid Batteries

Disadvantages of Metal Air & Metal Liquid Batteries

A Comparison of the Different Battery Technologies

Table 14: Select Battery Technology Comparison. (MW, \$/kWh, MWH)

Traditional Electro- Chemicals

New Electro-Chemical Approach

Figure 17: Power Rating and Discharge Duration at Rated Power

Figure 18: A comparison of technology maturity and anticipated R&D expenditure

Cost Comparison

Table 15: Summary of the main Mechanical & electrical Energy Storage systems (MW, \$/kWh, MWH)

Figure 19: Per unit energy and power capital costs by technology

Table 16: Present worth cost of 10-year operation in year 1 (\$/kW)

Figure 20: Energy Storage Technology Applications

Review of other Relevant Utility Scale Storage Technologies

Figure 21: Comparison of PHS, CAES, and Emerging Technologies, system ratings

Figure 22: Comparison of Utility Scale Electricity Storage Technologies costs

Pumped Hydro Storage

Compressed Air Energy Storage

CAES Heat Storage and Advanced Adiabatic CAES

Other Emerging Grid Scale Energy Storage Technologies

Figure 23: Maturity stage of energy storage systems

Supercapacitors

Flywheels

Global Grid Battery Energy Storage Technologies Industry SWOT Analysis

Global Grid Battery Energy Storage Technologies Industry Outlook

Table 17: Global Grid Battery Energy Storage Technologies Market Forecast 2017-2028 (\$m, AGR %)

Chart 1: Global Grid Battery Energy Storage Technologies Market Forecast 2017-2028 (\$m, AGR %)

Chart 2: Global Grid Battery Energy Storage Technologies Capacity Additions Forecast 2017-2028 (MW)

Lithium-Ion Grid Battery Energy Storage Sub-Market

Table 18: Lithium-Ion Grid Battery Energy Storage Sub-Market Forecast 2017-2028 (\$m, AGR %)

Chart 3: Lithium-Ion Grid Battery Energy Storage Sub-Market Forecast 2017-2028 (\$m, AGR %)

Table 19: Li-ion Batteries SWOT

Chart 4: Global Lithium-Ion Grid Battery Energy Storage Capacity Additions Forecast 2017-2028 (MW)

Lead-Acid Grid Battery Energy Storage Sub-Market

Table 20: Lead-Acid Grid Battery Energy Storage Sub-Market Forecast 2017-2028 (\$m, AGR %)

Chart 5: Lead-Acid Grid Battery Energy Storage Sub-Market Forecast 2017-2028 (\$m, AGR %)

Table 21: Lead-Acid Batteries SWOT

Chart 6: Lead Battery Grid Energy Storage Technologies Capacity Additions Forecast 2017-2028 (MW)

Flow Batteries Grid Battery Energy Storage Sub-Market

Table 22: Flow Batteries Grid Battery Energy Storage Sub-Market Forecast 2017-2028 (\$m, AGR %)

Chart 7: Flow Batteries Grid Battery Energy Storage Sub-Market Forecast 2017-2028 (\$m, AGR %)

Table 23: Flow Batteries SWOT

Chart 8: Flow Batteries Grid Battery Energy Storage Technologies Capacity Additions Forecast 2017-2028 (MW)

Sodium-Based Grid Battery Energy Storage Sub-Market

Table 24: Sodium-Based Grid Battery Energy Storage Sub-Market Forecast 2017-2028 (\$m, AGR %)

Chart 9: Sodium-Based Grid Battery Energy Storage Sub-Market Forecast 2017-2028 (\$m, AGR %)

Table 25: Sodium-Based (NaS) Batteries SWOT

Chart 10: Global Grid Battery Energy Storage Technologies Capacity Additions

Forecast 2017-2028 (MW)

Other Grid Battery Energy Storage Sub-Market

Table 26: Other Grid Battery Energy Storage Sub-Market Forecast 2017-2028 (\$m, AGR %)

Chart 11: Other Grid Battery Energy Storage Sub-Market Forecast 2017-2028 (\$m, AGR %)

Chart 12: Global Grid Battery Energy Storage Technologies Capacity Additions Forecast 2017-2028 (MW)

Drivers & Restraints of the Grid Battery Energy Storage Technologies Market

Drivers of the Grid Battery Energy Storage Technologies Market

Rising Energy Prices Indirectly Incentivise Grid Scale Battery Storage

Figure 24: U.S Residential Retail Electricity Price, 1960-2014 (USc/kW)

Investments in Research, Development and Demonstration Projects

Importance of Renewable Energy Integration

Smart Grids and Distributed Power Generation Systems

How Expanding Electricity Demand Can Drive Demand of Grid Scale Battery Storage

The Developing Electric Vehicle Market as a Growth Factor

The Role of Changing National Policies Towards Energy Storage

The Potential of Deregulating the Electric Utility Markets

Grid benefits

Load Levelling

Figure 25: Stylized Representation of a Daily Load Curve

Capacity Factor/Dispatch for Intermittent Renewables

Peaking Power Support

Offset of Needed Peaking Power Generation Capacity

Offset of Needed Renewable Generation Capacity

Economic Benefits

Energy Arbitrage

Investment Deferral

Renewable Energy Dispatch and Timing Benefits (ability to meet Renewable Energy targets, etc.)

Figure 26: Renewable Offsetting Example,

Restraints of the Grid Battery Energy Storage Technologies Market

The Long-Standing Constraint of High Capital Costs of Grid Scale Battery Storage

The Policy and Regulatory Challenges Ahead

How Conservatism in the Utility Industry May Hinder Growth

The Need for Large-Scale Demonstration Projects

Competition From Other Energy Storage Technologies in the Market

Environmental Concerns

Energy Loss During Storage

Economic Risk

Regional Grid Battery Energy Storage Technologies Market Outlook

Table 27: Regional Grid Battery Energy Storage Technologies Market Forecast
2017-2028 (\$m, AGR %)

Chart 13: Regional Grid Battery Energy Storage Technologies Market Forecast
2017-2028 (\$m, AGR %)

U.S Grid Battery Energy Storage Technologies Market Outlook

Table 28: U.S. Grid Battery Energy Storage Technologies Market Forecast 2017-2028
(\$m, AGR %)

Chart 14: U.S. Grid Battery Energy Storage Technologies Market Forecast 2017-2028
(\$m, AGR %)

Chart 15: U.S. Utility-Scale Annual Battery Installations, 2003-2018, (Power Capacity,
MW)

Chart 16: U.S. Operating and Planned Utility-Scale Battery Power Capacity 2018, (MW)

German Grid Battery Energy Storage Technologies Market Outlook

Table 29: German Grid Battery Energy Storage Technologies Market Forecast
2017-2028 (\$m, AGR %)

Chart 17: German Grid Battery Energy Storage Technologies Market Forecast
2017-2028 (\$m, AGR %)

Table 30: Selected German Battery Storage Projects 2018 (MW)

Canadian Grid Battery Energy Storage Technologies Market Outlook

Table 31: Canadian Grid Battery Energy Storage Technologies Market Forecast
2017-2028 (\$m, AGR %)

Chart 18: Canadian Grid Battery Energy Storage Technologies Market Forecast
2017-2028 (\$m, AGR %)

Chinese Grid Battery Energy Storage Technologies Market Outlook

Table 32: Chinese Grid Battery Energy Storage Technologies Market Forecast
2017-2028 (\$m, AGR %)

Chart 19: Chinese Grid Battery Energy Storage Technologies Market Forecast
2017-2028 (\$m, AGR %)

Japanese Grid Battery Energy Storage Technologies Market Outlook

Table 33: Japanese Grid Battery Energy Storage Technologies Market Forecast
2017-2028 (\$m, AGR %)

Chart 20: Japanese Grid Battery Energy Storage Technologies Market Forecast
2017-2028 (\$m, AGR %)

Spanish Grid Battery Energy Storage Technologies Market Outlook

Table 34: Spanish Grid Battery Energy Storage Technologies Market Forecast
2017-2028 (\$m, AGR %)

Chart 21: Spanish Grid Battery Energy Storage Technologies Market Forecast
2017-2028 (\$m, AGR %)

Italian Grid Battery Energy Storage Technologies Market Outlook

Table 35: Italian Grid Battery Energy Storage Technologies Market Forecast
2017-2028 (\$m, AGR %)

Chart 22: Italian Grid Battery Energy Storage Technologies Market Forecast 2017-2028
(\$m, AGR %)

French Grid Battery Energy Storage Technologies Market Outlook

Table 36: French Grid Battery Energy Storage Technologies Market Forecast
2017-2028 (\$m, AGR %)

Chart 23: French Grid Battery Energy Storage Technologies Market Forecast
2017-2028 (\$m, AGR %)

United Kingdom Grid Battery Energy Storage Technologies Market Outlook

Table 37: United Kingdom Grid Battery Energy Storage Technologies Market Forecast
2017-2028 (\$m, AGR %)

Chart 24: United Kingdom Grid Battery Energy Storage Technologies Market Forecast
2017-2028 (\$m, AGR %)

South Korean Grid Battery Energy Storage Technologies Market Outlook

Table 38: South Korean Grid Battery Energy Storage Technologies Market Forecast
2017-2028 (\$m, AGR %)

Chart 25: South Korean Grid Battery Energy Storage Technologies Market Forecast
2017-2028 (\$m, AGR %)

Australian Grid Battery Energy Storage Technologies Market Outlook

Table 39: Australian Grid Battery Energy Storage Technologies Market Forecast
2017-2028 (\$m, AGR %)

Chart 26: Australian Grid Battery Energy Storage Technologies Market Forecast
2017-2028 (\$m, AGR %)

Table 40: Selected Australian Energy Storage Facilities

Rest of the World Grid Battery Energy Storage Technologies Market Outlook

Table 41: RoW Grid Battery Energy Storage Technologies Market Forecast 2017-2028
(\$m, AGR %)

Chart 27: RoW Grid Battery Energy Storage Technologies Market Forecast 2017-2028
(\$m, AGR %)

Regulatory Developments

United States Regulatory Support and Incentives

Federal

U.S. Internal Revenue Service

Renewable Electricity Production Tax Credit

Table 42: Renewable Electricity Production Tax Credit: In-service deadline 2014

(\$/kWh)

Figure 27: Impact of production tax credit expiration and extension on U.S. annual installed wind capacity

Qualifying Advanced Energy Manufacturing Investment Tax Credit

Clean Renewable Energy Bonds

Qualified Energy Conservation Bonds

U.S. Department of the Treasury

Renewable Energy Grants

U.S. Department of Energy

Green Power Purchasing Goal

Loan Guarantee Program

Innovative Technology Loan Guarantee Program

Temporary Loan Guarantee Program

Smart Grid Investment Grant Program

International Regulatory Support and Incentives: Europe

European Union

EU Climate and Energy Package: Renewable Energy Targets

An Energy Policy for Europe

European Council Action Plan (2007–2009) Energy Policy for Europe

Seventh Framework Program for Research and Technological Development

Table 43: Energy Research Under EU initiatives

International Regulatory Support and Incentives: Asia-Pacific

Australia

Renewable Energy Target

Clean Energy Program

China

Preferential Tax Policies for Renewable Energy

Medium- and Long-Term Development Plan for Renewable Energy

Wind Power Concession Programme

India

Renewable Energy Certificates System

Indonesia

National Energy Blueprint

Japan

Strategic Energy Plan (2014)

Basic Energy Plan (2014)

New Zealand

Marine Energy Deployment Fund

Thailand

Strategic Plan for Renewable Energy Development

Industry Trends And Developments

AES and Siemens form Fluence

New York Investing in Energy Storage

Battery Storage Firm Secures Funding

NEC announces 50MW Energy Storage Projects

PSE&G Commissions Battery System For Microgrid Project

Eelpower Commissions Battery Storage System

India's First Grid-Scale Battery Project

Market Overview

Vendor Market Space

Figure 27: Energy Storage Vendor Organisation

Figure 28: Energy Storage Vendor Organisation

Figure 29: U.S. Solar and Storage Vendor Market Space

Company Profiles

Leading Venders Grid Scale Battery Storage Companies

BYD Co. Ltd

GE Energy Storage

NGK Insulators Ltd.

Samsung SDI Co. Ltd.

Sumitomo Electric Industries, Ltd

Other Leading Manufacturers & Supply Companies in the Grid Scale Battery industry

A123 Energy Solutions LLC

ABB Ltd.

Advanced MicroGrid Solutions, Inc.

AES Energy Storage LLC

Alevo Group

Ambri Inc

Amprius Inc.

Aquion Energy, Inc.

Automotive Energy Supply Corporation (AESC)

Axion Power International, Inc.

BrightSource Energy, Inc.,

Bosch Group

Boston-Power Inc,

Chulan Group

Coda Energy Holdings LLC

Cobasys LLC

Demand Energy

Dyna Power Corporation
Duke Energy Corporation
Ecoult
Electrovaya Inc.,
EnerVault Corporation
EnSync Energy
Envia Systems, Inc.
EOS Energy Storage
FIAMM S.p.A.
Fluence Energy
Furukawa Battery Co., Ltd.
Gildemeister Energy Solutions
Green Charge Networks, LLC
Greensmith Inc.
GS Yuasa Corporation
Hokkaido Electric Power Company
Imergy Power Systems
JLM Energy Inc.
Johnson Controls, Inc.
LG Chem Ltd
Lithium Energy Japan (LEJ)
Mitsubishi Heavy Industries, Ltd. (MHI)
NEC Energy Solutions Inc.
Outback Power Systems, Inc.
Panasonic Corporation
Pathion, Inc.
Pellion Technologies
Primus Power Corporation
Prudent Energy Inc.
QuantumScape Corporation
RedFlow Energy Storage Solutions
Renewable Energy Systems Americas Inc. (RES America)
S&C Electric Company Inc.
Saft Groupe S.A.
Sakti3, Inc.
Seeo, Inc.
Sharp Corporation
SK Continental E-motion Korea Co., Ltd.
Siemens Energy

SolarCity Corporation
Solar Grid Storage
Sonnenbatterie GmbH
Stem Inc.
Sunverge Energy, Inc.
Tesla Motors, Inc.
TesVolt GMBH
Tianjin Lishen Battery Co., Ltd.
Toshiba
UET (UniEnergy Technologies)
ViZn Energy Systems, Inc.
Xcel Energy Inc.,
Yunicos, Inc
Conclusions
Glossary Of Terms
Methodology
How We Generate Our Industry Forecasts
Disclaimer
Appendix A
Appendix B

I would like to order

Product name: I&R - The Grid Battery Energy Storage Technologies Market Report 2018

Product link: <https://marketpublishers.com/r/IC39D57B2F6EN.html>

Price: US\$ 1,600.00 (Single User License / Electronic Delivery)

If you want to order Corporate License or Hard Copy, please, contact our Customer Service:

info@marketpublishers.com

Payment

To pay by Credit Card (Visa, MasterCard, American Express, PayPal), please, click button on product page <https://marketpublishers.com/r/IC39D57B2F6EN.html>

To pay by Wire Transfer, please, fill in your contact details in the form below:

First name:
Last name:
Email:
Company:
Address:
City:
Zip code:
Country:
Tel:
Fax:
Your message:

****All fields are required**

Customer signature _____

Please, note that by ordering from marketpublishers.com you are agreeing to our Terms & Conditions at <https://marketpublishers.com/docs/terms.html>

To place an order via fax simply print this form, fill in the information below and fax the completed form to +44 20 7900 3970