



# CLEAN HORIZON

The Energy Storage Experts



## Clean Horizon Energy Storage Source (CHES)

*Worldwide database of MW-scale energy storage projects*



# Worldwide database of MW-scale energy storage projects

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## Search and analyze projects by:

- Revenue models
- Applications
- Stakeholders, from manufacturers to off-takers

## Database key features:

- Updated and curated by our experts
- Advanced and basic searches with modifiable display results
- Projects across 7 continents

# Finding specific storage projects made easy with the “advanced search” tool

## Advanced Search

**Keyword Search**

**Storage Technology**

**Technology Category**  Electrochemical  Mechanical  Electrical  Hydrogen

**Technologies**

**Location**

**Continent**

**Country**

**State / Region**

**City**

**Connection Point**  Generation  T&D  Behind the Meter

**Status**  Operational  Announced  Contracted  Under Construction

**Annoucement Date**

**Commissioning Date**

**Use Case**

**Application**

**Revenues**   
IHI Energy Storage  
Nidec ASI  
LG CNS  
Powin Energy  
**S&C Electric**  
NEC Energy Solutions

**Actors**

**Battery Manufacturer**

**Power Electronics**

**System Integrator**

**Developer**

**Off-taker**

**Size**

**Nominal Power (MW)** 1  85

**Energy Capacity (MWh)** 1  340

**Discharge Duration (h)** 0  700

# Choose display results to display the most relevant information for competitive watch (*exportable in .XLS or .CSV formats*)

## Choose columns to display

### Project Information

- Paired Grid Ressource  Funding

### Storage Technology

- Technology Category  Technology

### Location

- Continent  Country  State / Region  City  
 Connection Point  
 Island / Mainland

### Size

- Rated Power (MW)  Energy Capacity (MWh)  Discharge Duration (h)

### Status

- Status  Annoucement Date  Commissioning Date

### Use Case

- Application(s)  Revenue(s)

### Actors

- Energy Storage Technology Manufacturer  Power Electronics  System Integrator  Developer  Off-taker

### Additional Information

- Links  Last Updated

Basic Search

Advanced Search

Clear

Search

# Descriptions of projects – pertinent details concerning each project along with press release links

## Diablo Energy Storage and LS Power PG&E AB2514

### Location

Island / Mainland: Mainland

Continent: North America

Country: United States

State / Region: California

City: Pittsburg

Connection Point: T&D

LS Power was awarded a 50 MW / 200 MWh Resource Adequacy contract for the Diablo Energy Storage project in Pittsburg, California. The project is located in the San Francisco Bay Area's local reliability area and assists the region meet its clean energy goals by providing power at times of peak demand with no water use or greenhouse gas emissions. The project has a 10-year contract with PG&E for Resource Adequacy.

### Storage Technology

Technology Category:  
Electrochemical

Technology: Lithium-ion Battery

### Size

Nominal Power (MW): 50

Energy Capacity (MWh): 200

Duration Discharge (h): 4

### Status

Status: Contracted

Announcement Date: 2017-12-04

Commissioning Date: 2021-01-12

### Revenue

Main revenue: AB2514 (Long-Term IOU Contract)

### Information

### Actors

LS Power  
PG&E

### Applications

Main application: Load Shifting

### Source

Hyperlink 1: [Link](#)

Hyperlink 2: [Link](#)

Last Updated: 2017-12-29

Comments: Resource Adequacy contract

# Revenues associated with applications to understand storage business models around the world

Application	Revenue Name	Country (Specific)
Frequency Control	Frequency Control Ancillary Service (FCAS)	<i>Australia</i>
	Enhanced Frequency Response	<i>United Kingdom</i>
	Firm Frequency Response	<i>United Kingdom</i>
	PJM Frequency Regulation	<i>United States</i>
	Frequency Containment Reserve	<i>Europe</i>
	KEPCO Frequency Control	<i>South Korea</i>
	IESO Frequency Control	<i>Canada (Ontario)</i>
	ERCOT Reserve Response Service	<i>United States (Texas)</i>
	Fast Frequency Response	<i>Ireland</i>
	Load Shedding Avoidance	-
	Optimization of Conventional Generation	-
Long-term Contract with Utility	-	
Capacity Mechanism	Great Britain Capacity Market	<i>United Kingdom</i>
	U.S.A. Resource Adequacy (IOU)	<i>United States</i>
Electricity Bill Reduction	California Demand Charge Management	<i>United States (California)</i>
	Ontario Global Adjustment	<i>Canada (Ontario)</i>
Load Shifting	Long-Term IOU Contract (AB2514)	<i>United States (California)</i>
	Long-Term Contract (IESO)	<i>Canada (Ontario)</i>
Energy Market	CAISO Energy Market	<i>United States (California)</i>
Renewable Energy Integration	Hokkaido PV + storage Feed-in-Tariff	<i>Japan</i>
	French Island E13 Tariff	<i>France</i>
	PV + storage PPA	-
	PV + storage PPA (Hawaii)	<i>United States (Hawaii)</i>
	French Island RFP (2011- 2015 - 2016)	<i>France</i>
Demand Response	California Demand Response Auction Mechanism	<i>United States (California)</i>
Off-grid	Off-grid Generation Optimization	-
Grid Congestion Management	Grid Investment Deferral	-
	T&D Long-Term Contract	-

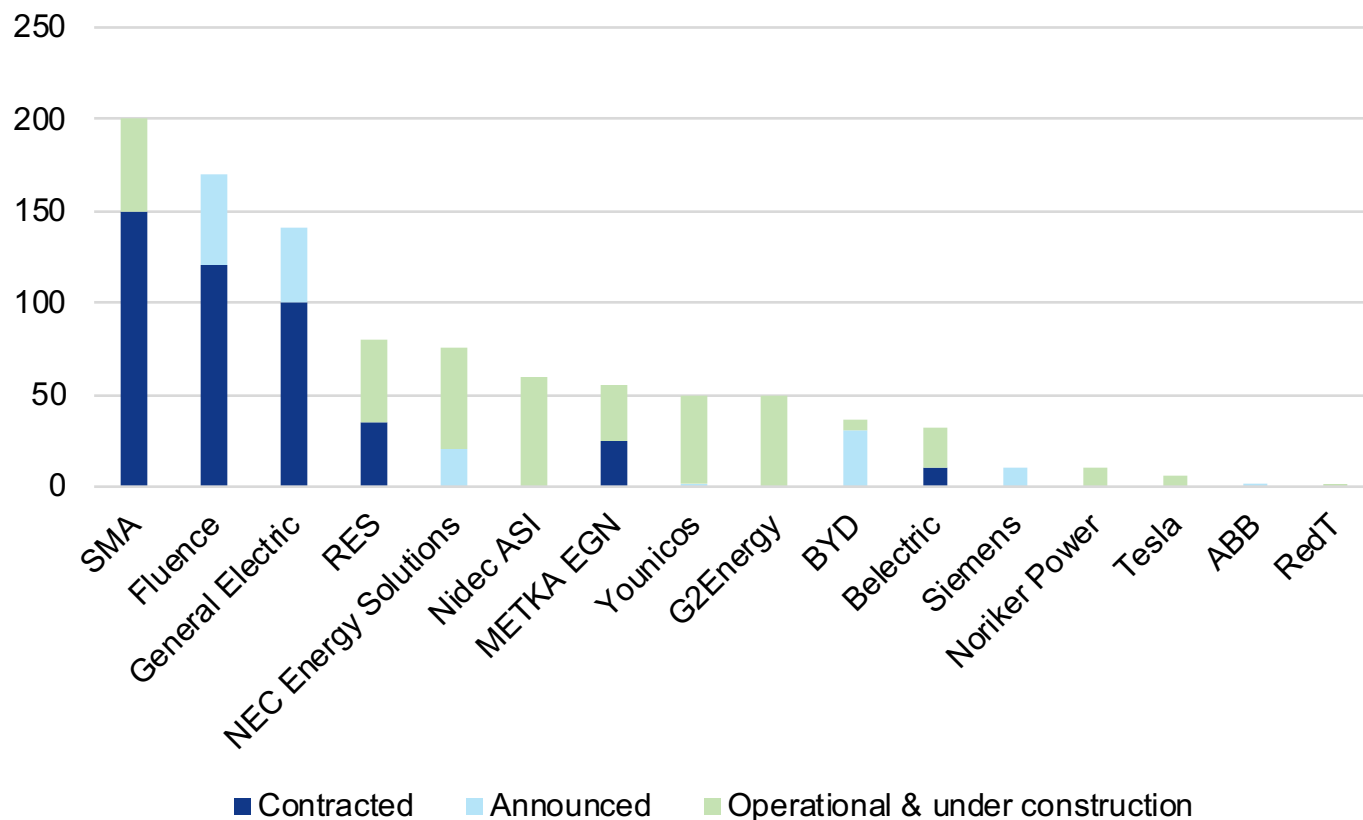
- Clean Horizon has accurately categorized storage projects applications and revenue streams for each project
- Filtering projects by revenues and applications enables to track business models by geographies

# Example of analysis based on CHESS

## Successful system integrators in Great Britain have built partnerships with successful developers

1/4

Systems integrators success in Great Britain depending on projects status<sup>1</sup>  
Storage rated power (in MW) - numbers from June 2018



1. Note: Assuming all Statera projects are integrated by SMA similarly to the Pelham project

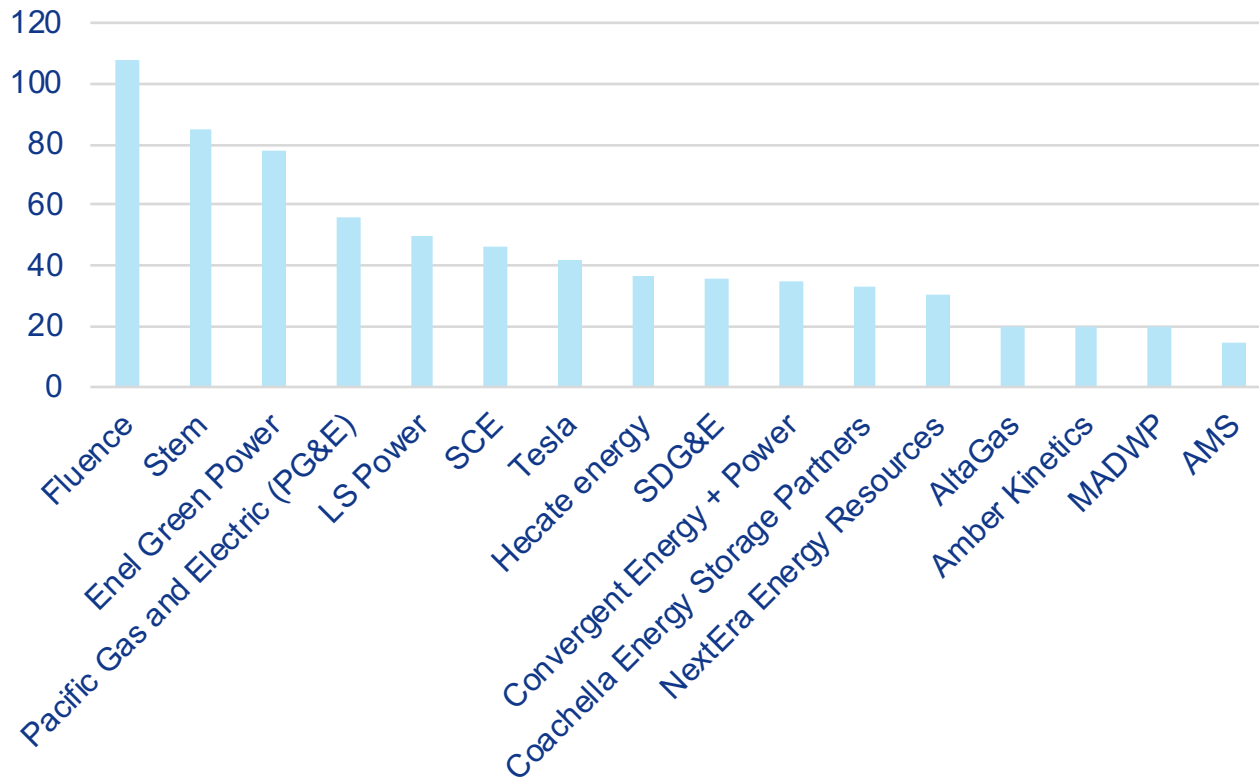
Analyse system integrators in Great Britain within few clicks, partnerships with large developers get integrators to the top of the ranking:

- SMA with Statera Energy
- Fluence with UK Power Reserve
- General Electric with Arenko

# Example of analysis based on CHESS

## Developers in California can be ranked easily based on their operational and contracted storage capacity

**Project owners** with contracted or commissioned energy storage project in California  
*In MW of storage contracted and commissioned capacity – numbers from June 2018*



Stakeholders, such as developers, can easily be ranked to track their portfolios (MW of energy storage) in specific regions

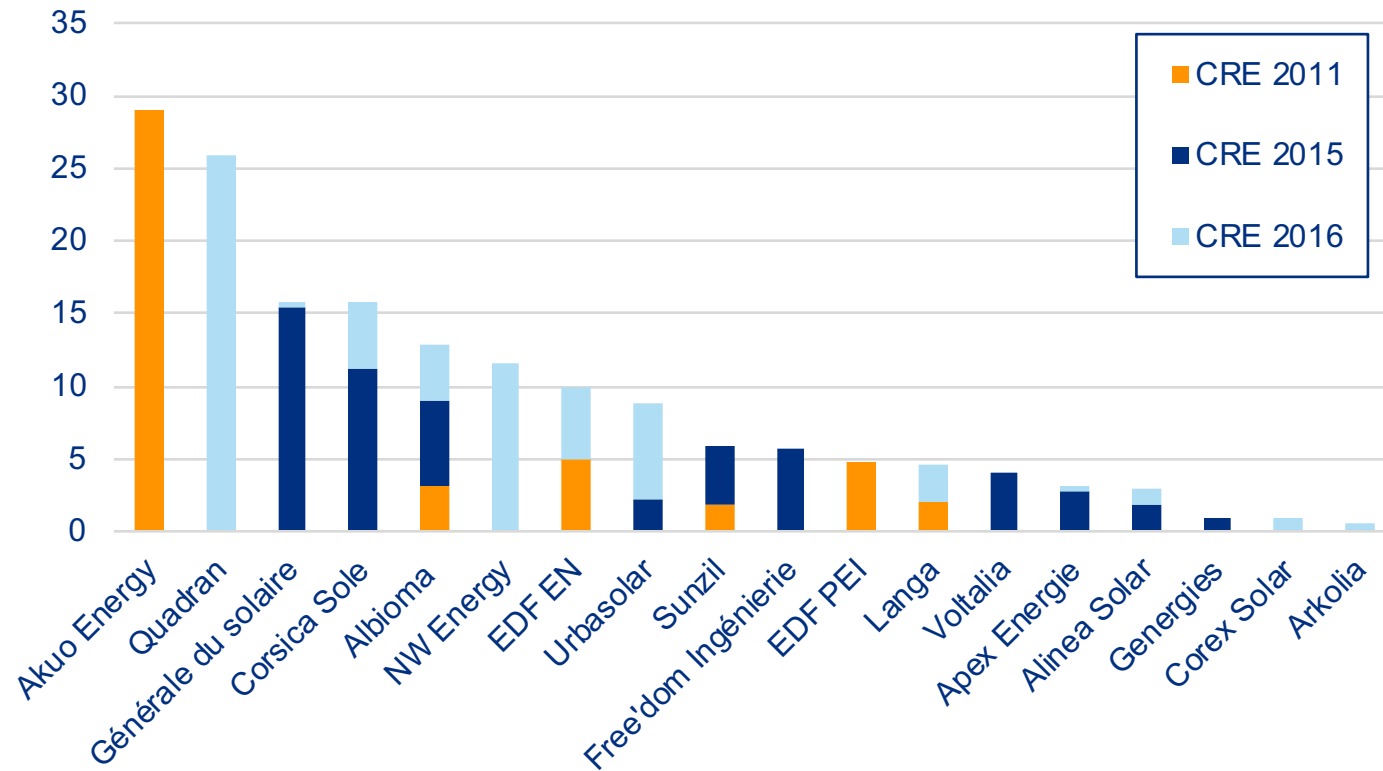


# Example of analysis based on CHEAD

## Track record of project developers on the latest three PV + Storage tenders in the French islands

### Project developer portfolio for the CRE ZNI tenders

In MW<sub>p</sub> of PV contracted capacity – numbers from June 2018

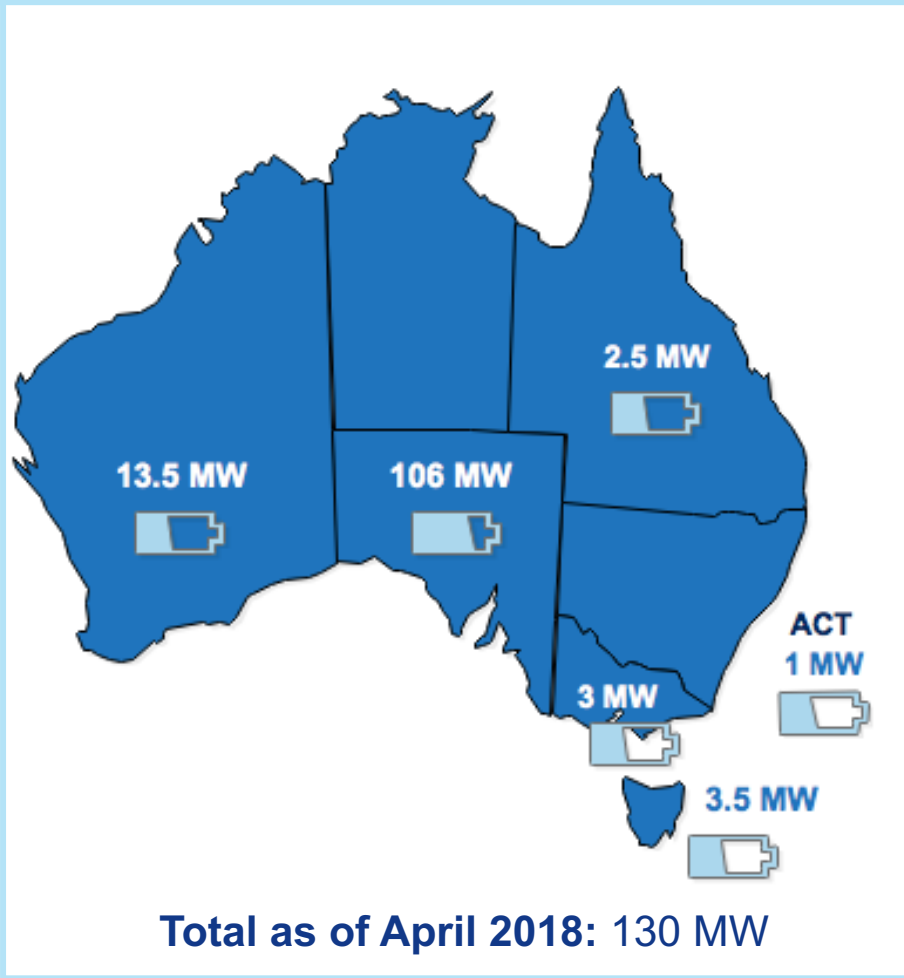


CHESSEases the identification of trends, tender results, and key movements for energy storage in specific regions

# Example of analysis based on CHESS

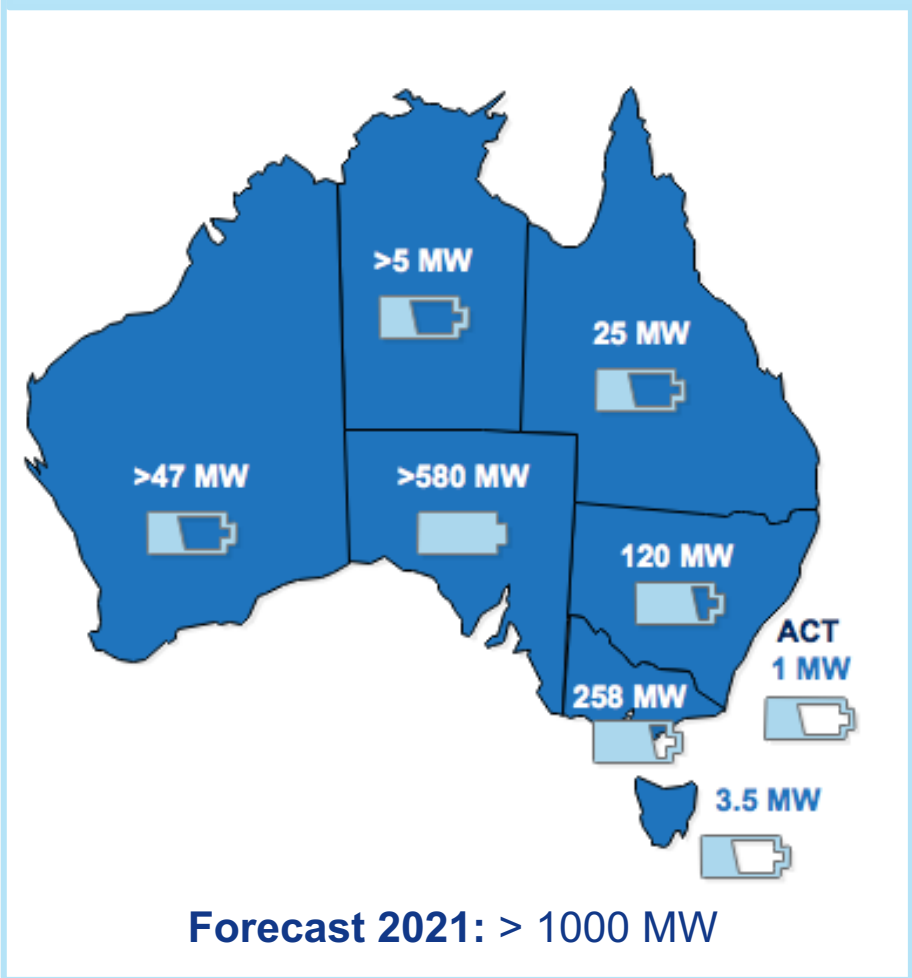
## Australian energy storage market growth

### Operational: Large-scale Energy Storage Systems in Australia (April 2018)



### Planned\*: Large-scale Energy Storage Systems in Australia (next 2-3 years)

\* operational, announced, contracted, tendered, and under construction





# CLEANHORIZON

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# Appendix: a tour of the database

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# Overview of search criteria

HOME ABOUT OUR TEAM ONLINE STORE DATABASE CLIENTS NEWS CONTACT

## Advanced Search

**Keyword Search**

**Storage Technology**

**Technology Category**  Electrochemical  Mechanical  Electrical  Hydrogen

**Location**

**Continent**

**Country**

**State / Region**

**City**

**Connection Point**  Generation  T&D  Behind the Meter  Off-grid

**Island Grid**  Island  Mainland

**Status**  Operational  Announced  Contracted  Under Construction

**Announcement Date**

**Commissioning Date**

**Use Case**

**Application**

**Revenues**

**Actors**

**Battery Manufacturer**

**Power Electronics**

**System Integrator**

**Developer**

**Size**

**Nominal Power (MW)** 0  300

**Energy Capacity (MWh)** 0  1200

**Discharge Duration (h)** 0  15

# Zoom on search criteria 1/3

## Advanced Search

Keyword Search

### Storage Technology

Technology Category

- Electrochemical  Mechanical  Electrical  Hydrogen

### Location

Continent

Country

State / Region

City

Connection Point


- Generation  
 T&D  
 Behind the Meter  
 Off-grid


Island Grid


- Island  Mainland

# Zoom on search criteria 2/3

**Size**

**Nominal Power (MW)** 0  300

**Energy Capacity (MWh)** 0  1200

**Discharge Duration (h)** 0  15

**Status**

Operational  Announced  Contracted  Under Construction

**Announcement Date**

**Commissioning Date**

**Use Case**

**Application**

**Revenues**

# Zoom on search criteria 3/3

## Actors

**Battery Manufacturer**

Select an option

**Power Electronics**

Select an option

**System Integrator**

Select an option

**Developer**

Select an option

**Off-taker**

Select an option

Basic Search

Clear

Search

Choose Results Display



# Displayed elements can also be chosen

## Choose columns to display

### Project Information

- Paired Grid Ressource  Funding

### Storage Technology

- Technology Category  Technology

### Location

- Continent  Country  State / Region  City  
 Connection Point  
 Island / Mainland

### Size

- Rated Power (MW)  Energy Capacity (MWh)  Discharge Duration (h)

### Status

- Status  Announcement Date  Commissioning Date

### Use Case

- Application(s)  Revenue(s)

### Actors

- Energy Storage Technology Manufacturer  Power Electronics  System Integrator  Developer  Off-taker

### Additional Information

- Links  Last Updated

# Projects are displayed on the website

 Print
  Excel
  CSV
  PDF

Show 25 entries

	Project Name ^	Country ^	Technology ^	Rated Power (MW) v	Energy Capacity (MWh) ^	Status ^	Main Application ^
<a href="#">Link</a>	PG&E Vistra Moss Landing Energy Storage	United States	Lithium-ion Battery	300.00	1,200.00	Announced	Capacity Mechanism
<a href="#">Link</a>	Xcel Colorado Energy Plan	United States		275.00	0.00	Announced	Renewable Energy Integration
<a href="#">Link</a>	UET/Rongke Power 800 MWh project	China	Vanadium Redox Flow Battery	200.00	800.00	Announced	Electricity Bill Reduction
<a href="#">Link</a>	NextEra Washoe County Energy Storage Project	United States	Lithium-ion Battery	200.00	0.00	Announced	Renewable Energy Integration
<a href="#">Link</a>	PG&E Moss Landing Substation Energy Storage	United States	Lithium-ion Battery	182.50	730.00	Announced	Capacity Mechanism
<a href="#">Link</a>	Hyundai Electric & Energy Systems and Korea Zinc	South Korea	Lithium-ion Battery	150.00	0.00	Under construction	Electricity Bill Reduction
<a href="#">Link</a>	Neoen Crystal Brook Energy Park	Australia	Lithium-ion Battery	130.00	400.00	Announced	
<a href="#">Link</a>	SIMEC ZEN Port Augusta Battery Plan	Australia	Lithium-ion Battery	120.00	140.00	Announced	Renewable Energy Integration
<a href="#">Link</a>	Abu Dhabi Water & Electricity Authority (ADWEA) NaS BESS	United Arab Emirates	Sodium Sulfur Battery	108.00	648.00	Operational	Electricity Bill Reduction
<a href="#">Link</a>	AES Energy Storage Alamos Storage Array	United States	Lithium-ion Battery	100.00	400.00	Contracted	Load Shifting
<a href="#">Link</a>	Lyon Group Kingfisher (Stage 2)	Australia	Lithium-ion Battery	100.00	200.00	Announced	Renewable Energy Integration
<a href="#">Link</a>	Riverland Solar Storage (SA) Lyon Group	Australia	Lithium-ion Battery	100.00	400.00	Announced	Renewable Energy Integration
<a href="#">Link</a>	Renault-Nissan Alliance Plant	Germany	Lithium-ion Battery	100.00	0.00	Announced	Frequency Control
<a href="#">Link</a>	Neoen's Hornsdale Windfarm	Australia	Lithium-ion Battery	100.00	129.00	Operational	Frequency Control
<a href="#">Link</a>	Centrica and Greener Ideas IDA Park Kilkenny Battery	Ireland	Lithium-ion Battery	100.00	33.00	Announced	Frequency Control

# ... and fully exportable in Excel

 Print  Excel  CSV  PDF

Rated Power (MW) ▼	Energy Capacity (MWh) ▲	Status ▲	Main Application ▲
300.00	1,200.00	Announced	Capacity Mechanism
275.00	0.00	Announced	Renewable Energy Integration

# In addition, each project as its own summary “ID card” (and keyword search in the database is enabled)

## RIVERLAND SOLAR STORAGE (SA) LYON GROUP

The Lyon Group is planning to develop a 120 MW solar PV farm with 100 MW of battery storage at Roxby Downs about 200 kilometres north of Port Augusta in South Australia. The power electronics are to be provided by SMA and AES Energy to effectuate the system integration.

### Location

Island / Mainland:	Mainland
Continent:	Australia & Oceania
Country:	Australia
State / Region:	South Australia
City:	Morgan
Connection Point:	Generation

### Storage Technology

Technology Category:	Electrochemical
Technology:	Lithium-ion Battery

### Status

Status:	Announced
Announcement Date:	30/03/2017

### Size

Nominal Power (MW):	100.00
Energy Capacity (MWh):	400.00
Duration Discharge (h):	4.00

### Revenue(s)

### Application(s)

Main application:	Renewable Energy Integration
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### Additional information

Paired Grid Resource:	330 MW PV
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### Actors

Power Electronics Manufacturer:	AES Energy Storage
System Integrator:	AES Energy Storage
Developer / Owner:	Lyon Group

### References

Hyperlink 1:	<a href="#">Link</a>
Hyperlink 2:	<a href="#">Link</a>
Last Updated:	29/05/2018