



# DOE Global Energy Storage Database

DOE/OE Storage Peer Review  
September 25-28, 2016

# Energy storage is **complex**

50+ technologies

Dozens of use cases

New policies around the world

New codes, standards, and regulations

Wide variance in operational characteristics

# Access to information is critical

## Policy Makers

Need multiple perspectives  
to develop rules

## Developers

Need to understand the  
markets

## Utilities

Need to understand the use  
cases and technologies

## Supply Chain

Needs to track innovation



**4 years later...**  
**mission accomplished?**

# >90% global storage projects captured



## Projects

1,600 energy storage projects  
50+ technologies  
171 GW in 66 countries

Suggest Update

Verify Project



## Policies (U.S. only)

19 policies

Suggest Update

Verify Policy

**New tools** to encourage user participation

# 2 million page views from 189 countries

## Audience Overview

Jun 1, 2012 - Aug 31, 2016

Email Export Add to Dashboard Shortcut

All Users  
100.00% Sessions

+ Add Segment

### Overview

Sessions VS: Select a metric

Hourly Day Week Month

Sessions

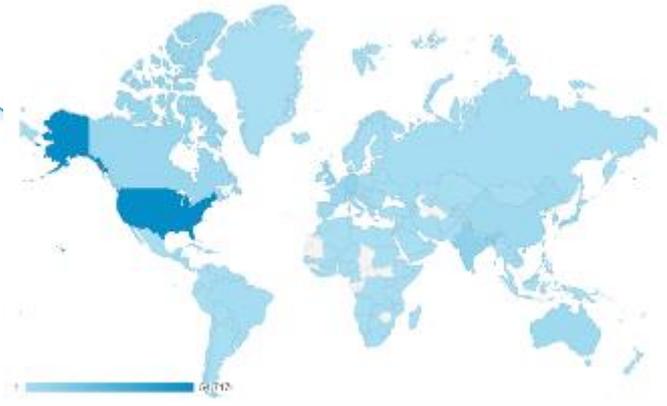


Sessions  
213,098

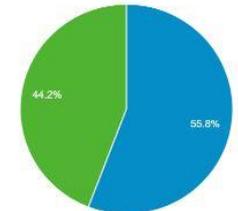
Users  
118,732

% New Sessions  
55.70%

Bounce Rate  
1.84%

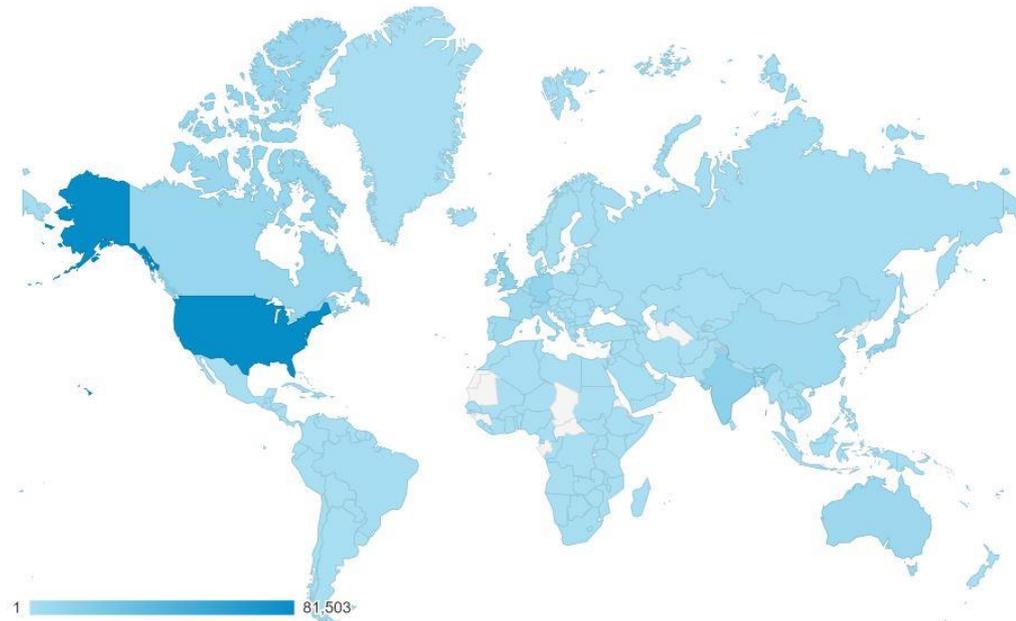


New Visitor Returning Visitor



# Top 10 countries

Country ?	Acquisition
	Sessions ? ↓
	<b>213,098</b> % of Total: 100.00% (213,098)
1.  United States	<b>81,503</b> (38.25%)
2.  India	<b>14,189</b> (6.66%)
3.  United Kingdom	<b>12,207</b> (5.73%)
4.  Germany	<b>11,694</b> (5.49%)
5.  Canada	<b>8,153</b> (3.83%)
6.  South Korea	<b>7,026</b> (3.30%)
7.  Japan	<b>6,805</b> (3.19%)
8.  Australia	<b>6,666</b> (3.13%)
9.  France	<b>6,009</b> (2.82%)
10.  Spain	<b>5,488</b> (2.58%)



# Diverse user base

- Researchers
- Policymakers
- Consultants
- Journalists
- Energy Storage Developers
- Students

 Bloomberg

 Clean Technica

 GreenBiz group

 gtm:

 GIGAOM

 Forbes

 POWER  
BUSINESS AND TECHNOLOGY FOR THE GLOBAL TRANSITION ENERGY

 SA

 SMART GRID NEWS.COM

 Yale

 TriplePundit  
people, planet, profit

 Windpower  
ENGINEERING & DEVELOPMENT

 EPRI | ELECTRIC POWER RESEARCH INSTITUTE

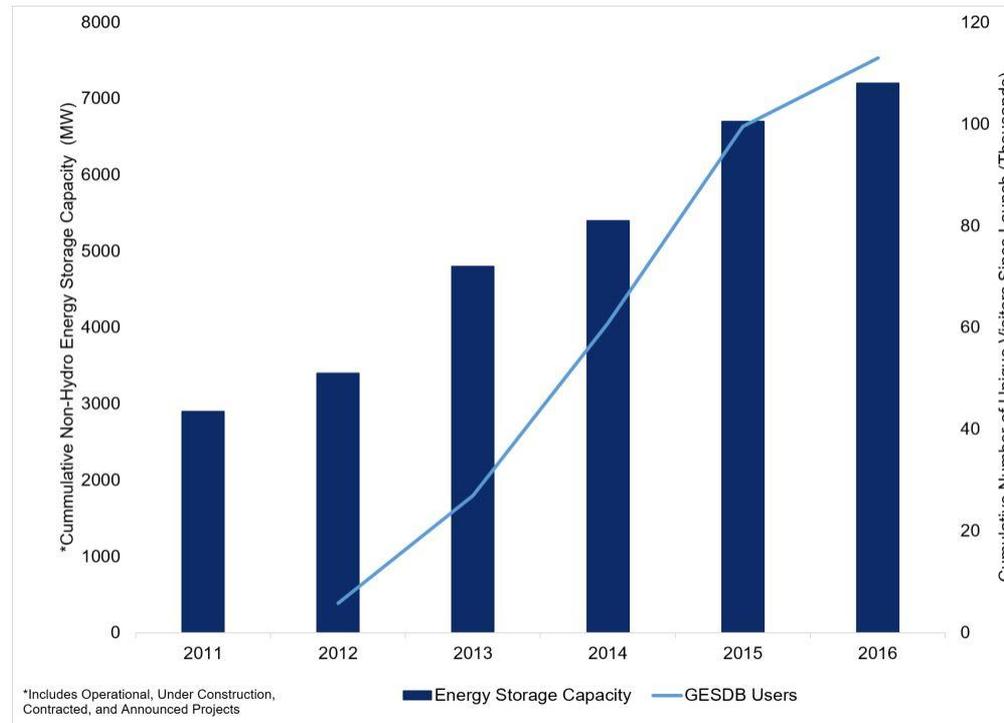
 GESA  
Global Energy Storage Alliance

 iea

 IRENA  
International Renewable Energy Agency

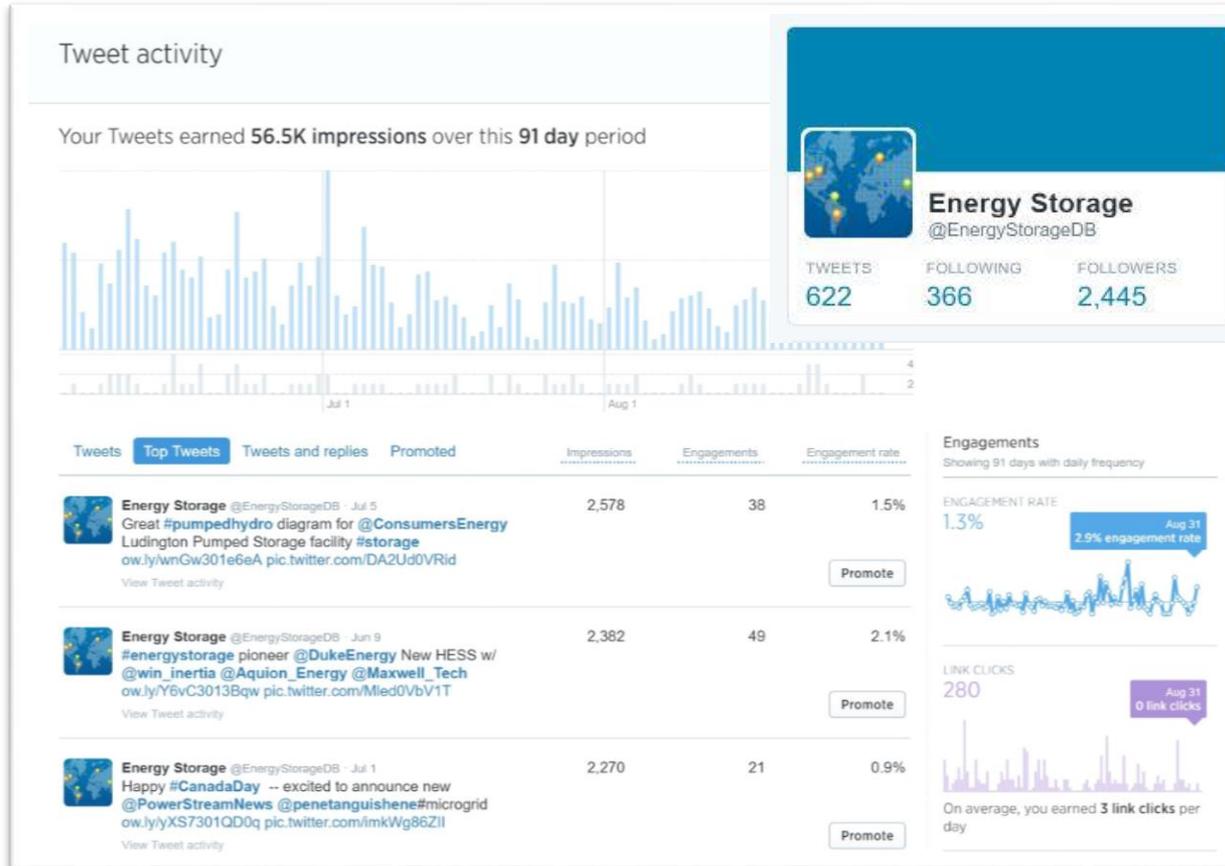


# More projects = more users...



and ...

# ...and higher engagement



Twitter followers increased 2x since 2015

# New tools developed in 2016

## Project entry interface

Need help? Check the glossary of terms.  
New Project

The Project   The Team   Why Storage?

Project photo

Project Name \*

Description \*

Technology Type \*

Can't find the technology? Click here to enter your own.

Rated Power in kW \*   Duration at Rated Power (HH:MM) \*

Web Link 1 \*   Web Link 2

Project Status

Status \*

Projected Project Lifetime (years)

Performance \*

Decline to submit performance

Announcement Date

Construction Date

Commissioning Date

Siting

Street Address   City \*

State/Province \*   Zip/Mail Code

Country \*

ISO/RTO \*

Utility

Can't find the utility? Click here to enter your own.

Utility Type   Grid Interconnection

no image

Drag and drop files here!

http://

## Newsletter

### Spotlight on 6 energy storage projects | July 2016

The DOE Global Energy Storage Database provides free, up-to-date information on grid-connected energy storage projects and relevant state and federal policies.

1.7 million page views | over 1500 energy storage projects | 189 GW

#### Energy Storage Projects



##### 20 Pacifica - AMS

Lithium-ion Battery

250 kW / 1.6 MWh

United States

View



##### Duke Energy HESS

Sodium-ion Battery + Ultracap

60 kW / 300 kWh

United States

View



##### Franchise Services

VRI A

60 kW / 120 kWh

United States

View

##### Canada



##### Australia



##### Germany



# What users are saying

*“Thank you very much for this wonderful overview regarding energy storage!” -- Graz University of Technology (Austria)*

*“I love this website and your team has done a great job!” – Alevo*

*“I love the database. Found it interesting to see what Energy Storage facilities were noted for our footprint and have shared with SPP staff.” -- Southwest Power Pool*

# 2016 initiatives

## Australian Energy Storage Database

The screenshot shows the homepage of the Australian Energy Storage Database. At the top, there are logos for 'AUSTRALIAN ENERGY STORAGE DATABASE', 'DELIVERED BY' (Australian Energy Storage Alliance), 'SUPPORTED BY' (NSW Department of Industry, Energy Resources Australia), and 'POWERED BY' (DOE Global Energy Storage Database, Office of Electricity Delivery & Energy Reliability, Sandia National Laboratories). Below the logos is a navigation bar with 'HOME' and 'PROJECTS' menus, and a search bar. The main content area features a world map with red location pins and numbers (1-34) indicating storage projects. Below the map is a filter section with dropdown menus for Technology Type, Country, State/Province, Rated Power, Duration, Service/Use Case, Ownership Model, Status, and Grid Interconnection. There are buttons for 'FILTER DATABASE' and 'EXPORT DATA XLS', and a 'Map View' option.

## International Energy Agency: New data collection requirements for systems > 1 MW

### SANDIA REPORT

SAND2015-11015  
Unlimited Release  
Printed December 2015

### Recommendations on Energy Storage for the Energy Information Agency

Raymond H. Byrne, Daniel R. Borneo, Cedric O. Christensen, David R. Conover,  
Imre Gyuk, Jacquelynne Hernandez, Georgianne Huff, Michael Kintner-Meyer,  
Janice Lin, David M. Rosewater, David A. Schoenwald, Vilayanur Viswanathan

A Study for the DOE Energy Storage Systems Program

Prepared by  
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Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation,  
a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's  
National Nuclear Security Administration under contract DE-AC04-94AL85000.

Approved for public release; further dissemination unlimited.

# What's next?

Enhance **global relevance**  
through **diversification** of users,  
**international** contributions,  
and **enhanced platform** functionality

# Strong global partnerships

The image features a central network diagram of blue nodes and lines forming a globe. Overlaid on this are several logos and a screenshot of a database interface:

- DOE DEPARTMENT OF ENERGY UNITED STATES OF AMERICA**: The official seal of the U.S. Department of Energy, located at the top center.
- Sandia National Laboratories**: Logo on the left side.
- DOE GLOBAL ENERGY STORAGE DATABASE**: A screenshot of a web interface showing a world map with energy storage project locations, search filters (Technology Type, Capacity, Spacetime, Equal Power, Duration, Service/Use Case, Ownership Model, Status, Legal restriction), and buttons for 'FILTER DATABASE' and 'EXPORT DATA ALL'. The interface also includes navigation links for HOME, PROJECTS, and POLICIES, and a search bar.
- European Union Flag**: Located on the right side.
- RCREEE**: Logo at the bottom left, with the text 'Regional Center for Renewable Energy and Energy Efficiency' and 'المركز الإقليمي للطاقة المتجددة وكفاءة الطاقة' below it.
- australian energy storage alliance**: Logo at the bottom right.

# Expansion of technical data

DOE GLOBAL ENERGY STORAGE DATABASE  
Office of Electricity Delivery & Energy Reliability

HOME PROJECTS - POLICIES - SEARCH

Policy Source: [dropdown] Ownership Model: [dropdown] Service/Use Case: [dropdown]  
Grid Interconnection: [dropdown] Utility Type: [dropdown] Current State: [dropdown]

Show Unverified Entries

**FILTER DATABASE** **EXPORT DATA XLS**

DOE GLOBAL ENERGY STORAGE DATABASE  
Office of Electricity Delivery & Energy Reliability

HOME PROJECTS - POLICIES - SEARCH storage.exchange -



Image Link

## San Diego Zoo Solar-to-EV Project

As part of SDG&E's sustainable communities program, Kokam energy has installed a 100kW/100kWh Lithium Ion Battery Energy Storage system at the San Diego Zoo. The system is coupled with a 90kW solar system which generates electricity for 5 EV chargers and 59 homes. The energy storage system balances the solar power to provide smooth energy output.

Technology Type	Lithium Polymer Battery
Rated Power in kW	100
Duration at Rated Power (HH:MM)	1:00:00
WebLink1	<a href="http://smartcitysd.org/resources/pres...">http://smartcitysd.org/resources/pres...</a>
WebLink2	

### PROJECT STATUS

Status	Operational
Commissioning On	Sep 01, 2012
Project Includes Multiple Systems	No

### SITING

Location	7970 Zoo Drive, San Diego, California United States
ISO/RTO	CAISO
Utility	San Diego Gas and Electric
Utility Type	Investor Owned
Paired Grid Resource	Solar Photovoltaic (PV)

### OWNERSHIP & VALUE CHAIN PARTNERS

Ownership Model	Utility-Owned
Equity Owner 1	San Diego Gas and Electric
Energy Storage Technology Provider	Kokam
Power Electronics Provider	Princeton Power Systems
Integrator Company	Princeton Power Systems
Developer	San Diego Gas and Electric

### COST & PERFORMANCE

Performance	<a href="http://buildingdashboard.com/c/jeats/sandiegoozoo/">http://buildingdashboard.com/c/jeats/sandiegoozoo/</a>
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### Related Projects



Del Lago Academy (IES)  
Lithium-ion Battery

Total Energy to and from Battery Storage  
Kilowatt-hours of electricity charged and discharged this year

SmartCity SAN DIEGO  
SDG&E

**Battery Feeds**

- Grid to Battery: 1,208 kWh
- PV to Battery: 5,948 kWh
- Battery to Grid: 14,798 kWh
- Battery to EV: 569 kWh

Select a Timescale: [dropdown] Select a Unit Equivalent: [dropdown]

Introduction Battery Feeds Solar Canopies EV Chargers Zoo Features SDG&E Sustainability Video Weather

Engage with  
technical  
audience

# DOE Global Energy Storage Database – A Platform for Large Scale Data Analytics and System Performance Metrics

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**Abstract**— The U.S. Department of Energy (U.S. DOE) Global Energy Storage Database (GESDB) is an openly accessible archive of electrical energy storage projects across the electric grid infrastructure and a global repository of relevant policies. The data included in the archive has been fully validated. The GESDB represents a dynamic catalogue with a continuously updated dataset. This is essentially a global industry platform for dissemination of project and performance metrics on the growing fleet of energy storage installations. Over the last four years, the database has been utilized to help shape the development of new projects, improvement of existing systems and to help develop policy and regulatory framework.

**Index Terms**—Energy Storage, Electric Grid, Grid Storage Technology

## I. INTRODUCTION (HEADING 1)

The U.S. Department of Energy (DOE) Global Energy Storage Database (GESDB) began as a public archive that provided free, up-to-date data about grid-connected energy storage projects through the world, along with relevant state and federal energy storage policies. The information included in the archive is independently verified for data quality and accuracy. The chief objective of the database is to enable advances in energy storage technologies and wide

provide a platform for greater data dissemination for the worldwide energy storage community.

## II. DATABASE DEVELOPMENT

A major challenge in creating a reference grade data repository is access to quality data with usable performance metrics over its operational life. We used an iterative design process in creating this database, starting with extensive stakeholder input and engagement with the global energy storage industry.

### A. Defining Use Cases and Data Granularity

To start with, we conducted extensive background research, including interviews with over 50 stakeholders from the utilities, project developers, and energy storage system providers. These interviews led to a greater understanding of the industry needs as well as identified key users, use cases, and the level of granularity needed for the information to be useful for the community. This was followed up by the development of initial prototype database and a framework to generate “fuse case” scenarios to be tested with key user segments and selected stakeholders. The final product is a result of extensive refinement in system architecture, improved user-interface and ease of navigation for user experience.

# Incorporate residential storage data

AUSTRALIA

250,000  
systems  
by 2020

GERMANY

35,000  
systems  
already  
installed

?

# A special thank you

DOE's Office of Electricity and Dr. Imre Gyuk, Program Manager of the Electrical Energy Storage Program, for their support and funding of the Energy Storage Program.

**Dedication** to the energy storage industry

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