Renewable Energy
Energy Storage
PV eBoP
The Energy Business is Changing Dramatically

Customer behavior
Dependency relationships dissolve

Big data
Has to be turned into smart data

Distributed energy systems
Increase complexity

Frequency and voltage stability challenges
More load fluctuations need to be managed

Shorter time-to-market intervals
Make asset management more difficult

Capacity constrains
Require fast reacting grid control and adaptive assets

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FLUENCE Brings Unmatched Experience at Scale From the Partner You Can Trust

EXPERIENCE
10+ years of experience in energy storage from two proven industry pioneers
- World's leading storage provider
- Deployed or been awarded 56 projects, in 15 countries, 485 MW

SCALE
Complete technology and service offerings delivered worldwide
- Proven technology platforms that address full spectrum of applications
- Delivery & integration in 160 countries
- Comprehensive services including financing

THE RIGHT PARTNER
Deep understanding of modern power markets, customer needs, and local market challenges
- Collaborate with customers to solve their energy challenges
- Avoid pitfalls of inexperienced packagers and integrators
- Strong financial backing and industry staying power

Created and backed by two industry powerhouses

SIEMENS
Ingenuity for Life

+ AES
we are the energy
30 MW of energy storage for San Diego Gas & Electric
California, United States

Largest energy storage project in North America
- 30 MW / 120 MWh
- Contract to online in 6 months
- Sited on 1 acre, where a power plant could not be permitted
Energy Storage Continues to Gain Momentum Worldwide…

Battery-based energy storage assets serving constrained power systems with fast, flexible power

- California: target for 1,325MW by 2020
- Hawaii: storage procurement
- Mexico: storage in market reform
- Chile: storage for Ancillary Services
- Ontario, Canada
- New York: REV process T&D
- Puerto Rico: storage requirement for renewables
- United Kingdom: storage for capacity
- Germany: solar storage incentives
- Italy: Island microgrid
- Korea: 200+MW installed
- Japan: wind storage, changing market structure
- Philippines: storage for system security
- India: solar+ storage & diesel replacement
- Australia: transmission crisis
Energy Storage Technologies and Application Areas

- Electrical storage
- Mechanical storage
- Electrochemical storage
- Chemical storage

CAES – Compressed Air Energy Storage

- Know-how in different battery technologies and chemistries
- Designed for the use of various battery suppliers
- Technical data depending on supplier
- Maximum savings through optimized plant operation

Technology
- Chemical storage
- Electrochemical storage
- Mechanical storage
- Electrical storage
Lithium–Ion Cost

Cost reduction rate is not slowing down

Battery pack price ($/kWh)

- 2010: $1000
- 2011: $800 (20% decrease)
- 2012: $642 (7% decrease)
- 2013: $599 (10% decrease)
- 2014: $540 (35% decrease)
- 2015: $350 (22% decrease)
- 2016: $273 (24% decrease)
- 2017: $209

SIEMENS
Ingenio para la vida
### Applications and Use Cases

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Our Offer: PV eBoP
Inverter solution

A. DC Connection
- Combiner Boxes
- LP Switching
- DC Fusing
- DC-Cables to Inverter

B. INVERTER CABINET
- Outdoor Inverter
- Up to 1500 VDC
- Up to 4 MVA

C. MV Components
- MV transformer
- RMU (8DJH…)

D. Grid Connection
- MV/HV Substation
- HV Transformer
- Switchboard Station
- MV Switchgear
- MV/AUX Transformer

E. Upsides
- Monitoring & Control
- Warranty extension
- Operation & Maintenance
- Repair Services

F. SIESTORAGE
- Energy Storage System
- Battery Ion – Lithium system
Our Offer: PV eBoP

Scope

Non Siemens scope

Siemens SCADA

Siemens PCyM

Power Transformer 100 MVA 38:115 kV

Main MV SWGR

Siestorage

MV Skid

0.55:34.5 kV

Combiner box

To CENACE

Existing CFE's HV SE

User's HV SE
What is energy storage? Large-scale batteries for Industrial applications...

Modular, scalable arrays of proven technologies integrated at utility and industrial scale.
Advantages

A modular system, flexible and scalable

- Flexible design for various power and capacity requirements
- High redundancy for outstanding availability

SIESTORAGE functional diagram

Point of Interconnection

A Grid connection cabinet
B Converter cabinet
C Control cabinet
D Battery cabinet

* System Control Unit

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Benefit
Eco friendly: A sustainable solution with less CO₂ emissions

SIESTORAGE for electrical balance of plant to integrate PV generation into the grid

1. Combiner box
2. MV converter station
3. SIESTORAGE
4. E-House
5. Transformer
6. Monitoring & control center
Germany, VEO (Vulkan Energie Oderbrücke GmbH)
The Steel Plant Of Eisenhüttenstadt Depends On It

2.8 MW
1080 kWh
SIESTORAGE system

Main applications
Black start of a gas turbine

Turnkey solution
Portugal, InovGrid Évora, edp
Energy Storage Pilot Project

472 kW
360 kWh
SIESTORAGE system

Main applications
Energy backup, voltage regulation, peak shaving

Turnkey solution
Island of Ventotene, ENEL, Italy: SIESTORAGE and SICAM
Microgrid Manager – Off-grid Electrification And Sustainable Microgrid

500 kW
600 kWh
SIESTORAGE system

~15%
Fuel savings

~ -55%
gen-set operating hours

Improved grid stability, reduction of CO2 and maintenance costs

“This has improved our way of life on the island – and it is the beginning of a new co-existence with respect for our environment.”

Mr. Pennacchio (Resident of Ventotene)
Netherlands, SIESTORAGE for Primary Reserve Power
Very Compact Design = 27 ft Container Only

1.6 MW
1.3 MWh
SIESTORAGE system

Main applications
Primary Reserve Power

Turnkey solution
27" container
Italy, Enel Distribuzione S.p.A., Isernia
SIESTORAGE in a Smart Grid

1 MVA
500 KWh
SIESTORAGE system

Main applications
Network stabilization for
decentralized power generation /
integration of renewables

Turnkey solution

“We need better ways to store energy for our pilot projects, and because Siemens was strongly committed to investing its expertise and efforts into the new energy storage system, we chose Siemens from among seven bidders.”

Paola Petroni - Head of Network Technologies, Infrastructure and Networks Division
The SIESTORAGE system is an excellent addition to our facilities for energy storage research. It will allow us to devise and evaluate control and operating strategies for future grid systems, and also to understand the requirements for next generation storage devices such as those based on graphene.

Prof Andrew Forsyth, Professor of Power Electronics
Germany, Hydroelectric Power Plant
SIESTORAGE for Frequency Regulation

10 MW
13 MWh
SIESTORAGE system

Main applications
Network stabilization for decentralized power generation

Turnkey solution
Germany, Siemens
SIESTORAGE for Peak Shaving (Grid Fee Reduction)

1.4 MW
1.8 MWh
SIESTORAGE system

Main applications
Peak Load Management
ROI ≈ 4yrs through yearly grid fee reduction

Turnkey solution
Contact MS CAM&CAR
Battery Energy Storage System Business

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