

How can storage contribute to wholesale power markets?

ETCSEE – Prague – 14th June 2017



AES leadership

A top tier IPP, now recognized as
worldwide leader for BESS integration



About the AES Corporation:

Mission: Improving lives by providing safe, reliable and sustainable energy solutions in every market we serve.



6 MARKET-FACING
STRATEGIC BUSINESS UNITS
4 CONTINENTS
17 COUNTRIES

\$37B
TOTAL ASSETS
OWNED & MANAGED

\$15B
TOTAL 2015
REVENUES

36,000 MW
GENERATION CAPACITY

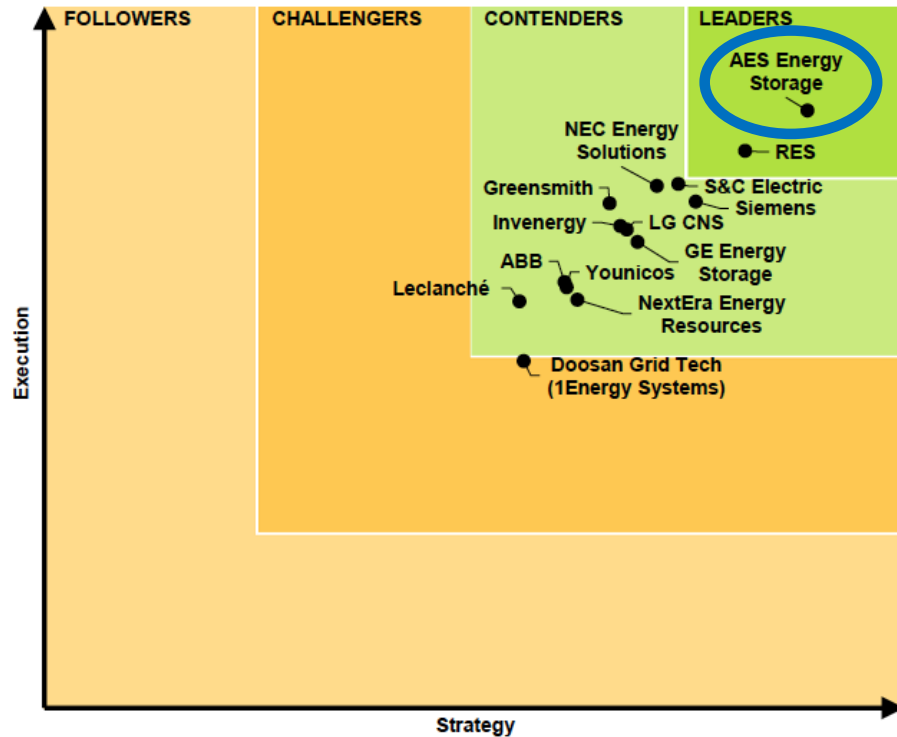

AES Serves
10M
CUSTOMERS


8
UTILITY
COMPANIES


21,000
GLOBAL
WORKFORCE

AES is recognised as the global market leader in energy storage

10 years of experience at utility scale with nearly 4 TWh of mileage across its installed capacity fleet



#1 Energy Storage Systems
Integrator – 2015 & 2016

NAVIGANT
RESEARCH

436 TOTAL
mw*

*In operation, construction, or late stage development.

19
LOCATIONS



IN

7
DIFFERENT COUNTRIES

The New Energy Network

How to achieve the full potential of the electric system



Unlock the **full potential** of your electric system.

Let's build the new energy network.



Electrify
everything.



Accelerate
renewables.



Transform the grid with
energy storage.

Transform the grid
with **energy storage**.



The ability to store energy anywhere on the grid changes everything.

When, where, and how people consume electricity is changing.

The rise of renewables and distributed generation are creating new challenges and opportunities for the electric power system.

Energy storage **decouples supply and demand** and introduces an unprecedented level of flexibility and control.

BESS is already a mature solution for flexibility needs

Flexible, scalable, reliable and affordable to support electricity grid





Teylers Museum in Haarlem
18th century batteries

AES Zeeland BESS
10MW 1h
Commissioned in December 2015



Energy storage delivers value in multiple applications

AES Laurel Mountain | Belington, WV





32 M_W

INTERCONNECTED

64 M_W

RESOURCE

FREQUENCY REGULATION

The AES Laurel Mountain Storage array enables a 98MW wind farm to be among the first wind generation facilities to supply critical grid stability services

AES Gener Power Plant | Angamos, Chile





20 M_W

INTERCONNECTED

40 M_W

RESOURCE

CAPACITY RELEASE

The AES Angamos Storage Array integrates 20MW of energy storage with a 544MW thermal plant to provide advanced reserve capacity

Alamitos Power Center | Alamitos, CA





100 M_W

INTERCONNECTED

200 M_W

RESOURCE

FLEXIBLE PEAKING CAPACITY

Resulting from a three year process (2012 through 2014 – part of California’s Long Term Procurement Plan), SCE’s unconstrained economic model identified 400-900MW of grid-scale energy storage as the most optimal resource.

San Diego Gas & Electric chose AES - Advancion solution for a BESS of 150 MWh (37.5MW 4h) commissioned in record time

Meeting peak energy needs in Southern California

LOCATION

San Diego, California



In southern California where resources are needed to meet local peak capacity needs

THE NEED

Reliable and affordable energy to meet peak demand



Deliver energy storage for peak capacity applications in 6 months.



Generation Alternative

World's largest battery providing peak power & capacity

SERVICES

- Capacity, local reliability
- Peak power mitigation
- Ramping / flexibility
- Ancillary services

IMPACT

- ✓ Rapid deployment
- ✓ Competitive & cost effective
- ✓ Meets flexibility (duck curve)

30 MW Advancion® Array
Escondido, San Diego, California

BESS perspectives for Power Wholesales Markets in Europe

Fundamentals, regulatory barriers and
perspectives



How BESS can support electricity wholesales markets in Europe?

- ▶ Make the grid more reliable
 - ◆ Ancillary services to increase reliability of the grid
 - ◆ Congestion management (DSO/TSO level, national, regional, interconnections) to avoid or mitigate loop flows impact
- ▶ Support asset based trading
 - ◆ Improving efficiency of the power asset fleet (RE, traditional thermal power plants, ramp up/down)
 - ◆ Manage better commissioning/retirement of assets
 - ◆ Natural hedge for assets facing market exposure
- ▶ Optimize flexibility value for traders and aggregators
 - ◆ Balancing perimeter optimization
 - ◆ Support valuation of flexibility needs

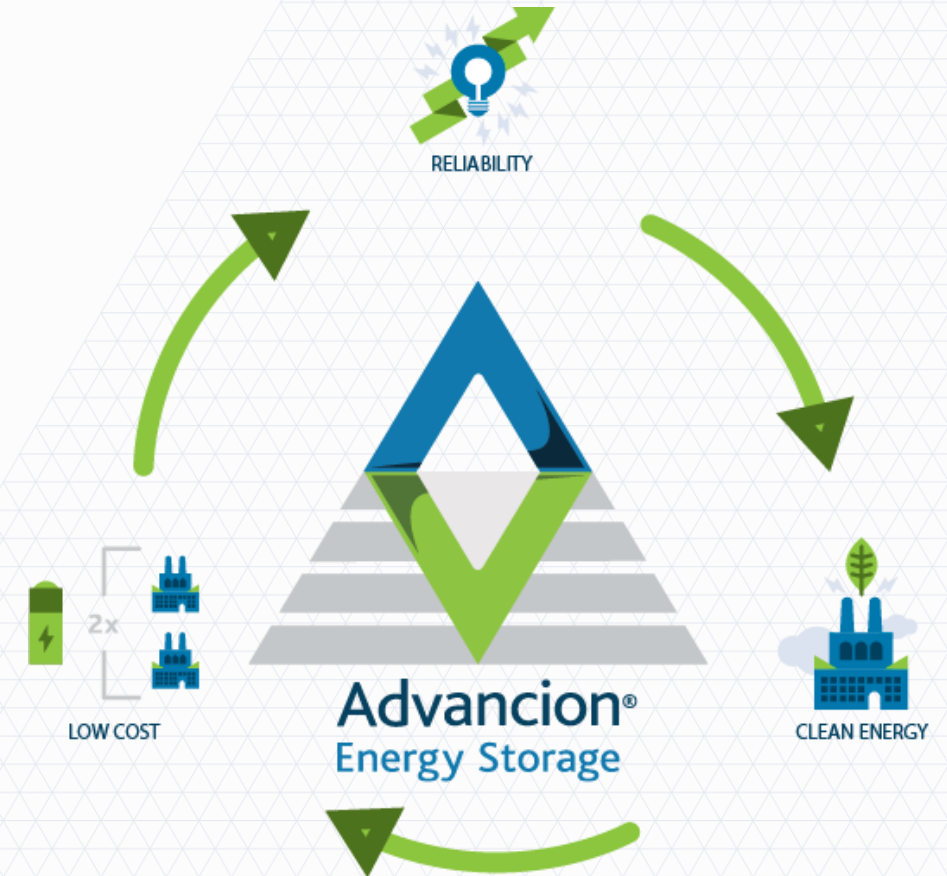
Challenges for BESS in Europe

- ▶ Fundamentals
 - ◆ One market?
 - ◆ Flexibility needs (RE integration, retirement of power assets)
 - ◆ Overcapacity (traditional thermal assets, hydro pump storage...)
- ▶ Regulatory framework
 - ◆ EU level (“winter package”, ACER, ENTSOe, EASE)
 - ◆ National level (EU regulation interpretation, tax, technology neutral approach of national regulators)
- ▶ Financial viability
 - ◆ Merchant approach vs PPA
 - ◆ Valuation of the optionality of flexibility
 - ◆ Cost benefits analysis approach vs yield approach
 - ◆ Subsidies (pilot) vs fair treatment for a new class of assets

AES Advancion Solves the “Energy Trilemma”

A smarter investment for creating a clean, unbreakable grid

- Incredibly fast, precise and controllable
- Zero minimum generation
- Rapid deployment (less than a year)
- Not geographically constrained
- Modular, scalable and redeployable
- High round trip efficiency (over 85%)
- Proven, reliable and ‘always on’



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