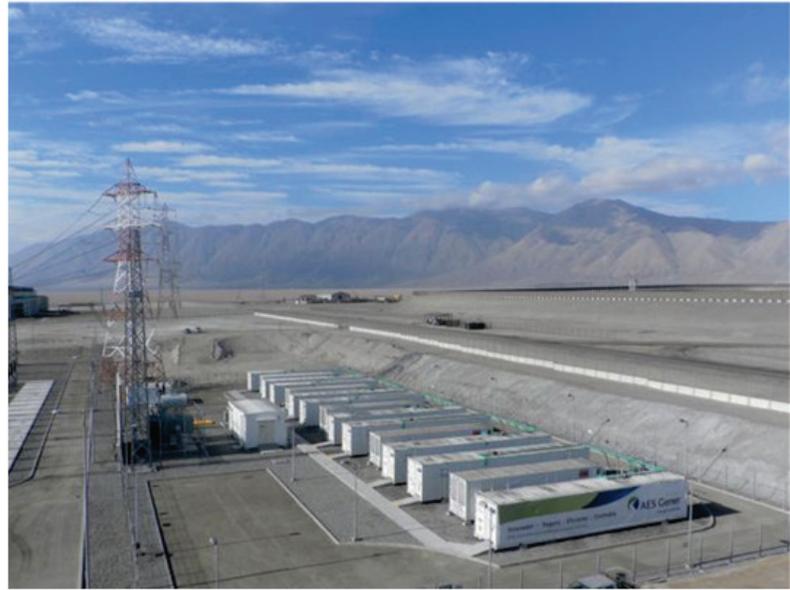


# Case Study

## AES Angamos BESS, Mejillones, Chile



AES Angamos 20 MW BESS, near Mejillones, Chile

### **Name of Project:**

AES Angamos BESS

### **Owner/Purchaser:**

AES Gener, a subsidiary of the AES Corporation, is the second-largest generator of electricity in Chile with more than 4,500MW of generation capacity installed (primarily in Chile with some located in Argentina and Colombia).

### **Developer Lead:**

AES Energy Storage, a subsidiary of AES Corporation, is the owner-operator of advanced storage projects that provide emissions-free capacity to improve the performance and reliability of today's power grid.

### **Technology Provider (s):**

A123 Systems

### **Funding:**

Private

### **Date:**

Operational since December 2011

### **Opportunity**

In 2011, AES Gener, in cooperation with its subsidiary Empresa Eléctrica Angamos, completed construction on a 544MW thermal power plant in the town of Mejillones in Northern Chile. The plant provides electricity to this important mining region. To ensure grid reliability against transmission or generation losses, power generators in the region each holdback capacity to meet system response for primary and secondary reserves. Based on the success of their Los Andes BESS project, AES Gener and AES Energy Storage developed a battery based storage system to meet the critical grid reliability needs of the SING.

### **Approach**

For the Angamos project, AES Gener and AES Energy Storage developed a 20MW/5MWh containerized grid energy storage solution to perform reserve capacity functions for grid support. A123 Systems supplied the storage system and provided system integration of the power electronics from ABB. The storage unit continuously monitors the condition of the power system and responds immediately with up to 20MW to any significant frequency deviations (i.e., the loss of a generator or transmission line). The system supplies sufficient immediate power response to help maintain the grid until the fault can be cleared or other resources can be re-dispatched.

### **Results**

The storage unit has been performing the critical reserve capacity function required since commissioning. By meeting the reserve obligations of the plant with storage, AES Gener was able to free up reserve capacity on the plant and increase the power generation available to its customers by 20MW. In reports by CDEC-SING, the unit provides very fast response and is among the most reliable available for grid contingency events. The speed of response also provides for quicker restoration and stability of the system. In early 2012, the Edison Electric Institute (EEI) recognized AES Angamos as the International Edison Award winner of the Year.

# Case Study

## AES Gener Los Andes BESS, Atacama, Chile



AES Gener 20MW Los Andes BESS in Northern Chile's Atacama Desert

### **Name of Project:**

AES Los Andes BESS

### **Owner/Purchaser:**

AES Gener, a subsidiary of the AES Corporation, is the second-largest generator of electricity in Chile with more than 4,500MW of generation capacity installed (primarily in Chile with some located in Argentina and Colombia).

### **Developer Lead:**

AES Energy Storage, a subsidiary of AES Corporation, is the owner-operator of advanced storage projects that provide emissions-free capacity to improve the performance and reliability of today's power grid.

### **Technology Provider (s):**

A123 Systems (storage system);  
Parker-Hannifin (power electronics)

### **Funding:**

Private

### **Date:**

Operational since November 2009

### **Opportunity**

AES Gener's Los Andes substation is located in the Atacama Desert in Northern Chile and provides electricity to this important mining region. To ensure grid reliability against transmission or generation losses, power generators in the region each holdback capacity to meet system response for primary and secondary reserves. If an alternate solution could qualify to meet the critical grid reliability needs, then AES would be able to supply more needed energy generation to this important region of Chile.

### **Approach**

AESGener and AES Energy Storage worked together to develop a solution for stand-by spinning reserves using advanced lithium ion battery systems to meet a portion of the obligation of the power plant. The company worked closely with CDEC-SING, the region's grid operator, to develop advanced models of performance improvement and qualify the storage to perform this important role. AES worked with key partners A123 Systems and Parker-Hannifin as the core suppliers for a 12MW/4MWh energy storage solution. A123 Systems supplied the batteries and overall system integration, while Parker-Hannifin supplied the power electronics. The system was developed to operate in both a dispatch or autonomous mode, responding directly to significant frequency deviations in accordance with the boundaries supplied by the system operator. The system supplies sufficient immediate power response to help maintain the grid until the fault can be cleared or other resources can be re-dispatched.

### **Results/Outcomes**

Since commissioning, the storage has been in continuous operation and achieved 100% commercial availability. By meeting the reserve obligations of the plant with storage, AES Gener was able to free up reserve capacity on the plant and increase the power generation available to its customers by 12MW. In reports by CDEC-SING, the units provide very fast response and are among the most reliable units available for grid contingency events. The speed of response also provides for quicker restoration and stability of the system. Success of this first of a kind project, led to the implementation of AES Angamos BESS, a larger storage system also installed in Northern Chile.

# Case Study

## AES Laurel Mountain, Belington, West Virginia



*32MW storage system at AES Laurel Mountain wind generation facility is the largest lithium ion battery project of its kind in commercial operation*

### **Name of Project:**

AES Laurel Mountain

### **Owner/Purchaser:**

AES Wind Generation, a subsidiary of AES Corporation formed in 2005 that operates more than 1,900MW of wind capacity in the U.S., China and Europe.

### **Developer Lead:**

AES Energy Storage, a subsidiary of AES Corporation, is the owner-operator of advanced storage projects that provide emissions-free capacity to improve the performance and reliability of today's power grid.

### **Technology Provider (s):**

A123 Systems

### **Funding:**

Private

### **Date:**

Operational since September 2011

### **Opportunity**

AES Laurel Mountain is a 98MW wind power generation plant located in Belington, WV that is built to supply more than 260,000MWh of renewable energy annually to the PJM Interconnection. However, since wind generation is variable, wind power plants are unable to supply capacity services to assist with grid reliability or earn additional revenue associated with those services like most other power plants.

### **Approach**

Building on its five years of implementing grid scale storage and history as a global developer of power generation, AES developed a 32MW/8MWh grid energy storage solution at the Laurel Mountain facility. The storage system is the largest of its kind and uses A123 System's advanced lithium ion battery technology. AES employed its storage operating system (sOS) for market optimization and interacts with controls in A123's AEROS management system.

### **Results**

The energy storage system enables AES Laurel Mountain to provide frequency regulation services to the PJM market, adding a revenue stream and operating capability not available from most wind generating plants. This emissions-free operating reserve capacity plays a critical role in maintaining overall grid reliability and AES operates it at better than 95% availability. In addition, the storage system provides the capability to moderate the output of the wind generation to manage ramp rates or other factors. The facility was recognized as 2011 Wind Project of the Year by Renewable Energy World.