Challenge

Austin Energy (AE) is the nation’s 8th largest publicly owned electric utility. Its mission is to safely deliver clean, affordable, reliable energy and excellent customer service. It has the following renewable energy goals by 2025: 55% renewable energy, 200 MW local solar, 100 MW customer-sited solar, and all City of Austin facilities, operations and fleet carbon neutral.

Doosan GridTech Solution

Doosan GridTech deployed 2 ESSs with Doosan GridTech’s DG-IC® and DG-DERO® software to dramatically increase the penetration of solar photovoltaic (PV) power in AE’s electric distribution system. Using open standards (MESA, SunSpec, and OpenADR), our software optimizes a diverse suite of distributed energy resources (DER), including energy storage and solar to increase the amount of PV-generated energy on a utility feeder far beyond current practical limits. This extensible platform enables distributed control and optimization of both utility scale and customer-owned energy resources. The project, selected and partially funded by the U.S. Department of Energy under its SHINES program, deployed in 2018 and complete by 2020.

In addition to providing the DG-IC® and DG-DERO®, we provided two turnkey ESS’s at two different substations. Doosan conducted design studies to size the energy storage system and identify the operating modes to meet the specific needs for each ESS. One of the ESSs mitigates a 2 MW community solar array near the substation. The other ESS mitigates rooftop PV on the local circuit. Doosan GridTech software will control both the AE-owned energy storage and customer-owned PV systems using open communications standards to address all devices (MESA, SunSpec, OpenADR or SEP, as applicable).

Outcomes:
1. Minimize the levelized cost to serve load of 14 cents per kWh on circuits with high penetrations of distributed solar
2. Optimize the distribution grid by putting control intelligence at the fleet level, the circuit level, and behind the meter.
DOE/Austin Energy SHINES Vision

- Demonstrate how utility-hosted controls and optimization can enable the highest possible penetration of solar PV for the lowest cost.
- Demonstrate repeatable methodologies for designing and operating energy storage and solar PV as part of the grid.
- Identify and demonstrate optimal aggregation and communications models for DER integration.
- Demonstrate how coordinated DER control that is integrated with traditional grid assets increases the value of DER for all customers.

Innovation

Key project outcomes include the creation and use of the “System LCOE to Serve Load” metric, which encompasses the holistic, system-level costs and benefits of all resources. Outcomes also include the creation of new DER control methodologies deployable within a utility-grade software platform, optimal design methodologies for individual DER installations, a comparison of multiple DER aggregation and ownership methodologies (including direct utility control, third-party aggregator, and autonomous), a comparison of multiple DER technology mixes and configurations within the distribution system. Because the outcomes of this project will be based on actual large-scale PV and storage deployments and operation experiences, the project will provide insight on which technologies will serve energy loads at low costs and high penetrations of solar.
Challenge

With a target of 178 MW of new energy storage to meet by 2021 and a need to address grid reliability issues created by the interruption in natural gas supply from SoCal Gas’ Aliso Canyon storage facility, the Los Angeles Department of Water and Power (LADWP) is fielding a 20 MW / 10 MWh battery energy storage system (BESS) adjacent to its Beacon Solar Plant in the Mojave Desert.

Doosan GridTech Solution

Doosan’s modular turnkey design includes thirteen transformer/PCS/lithium-ion battery strings, redundant auxiliary power systems, and 100% redundant HVAC systems. The design also enables preventative maintenance, which is necessary in the harsh Mojave Desert environment, to occur without sacrificing availability.

The BESS is controlled by the Doosan GridTech Intelligent Controller® (DG-IC®) - one of the first software control systems built on open standard interfaces. The DG-IC is the “brains” within each BESS, with intelligence to coordinate schedules and operating modes with SCADA and respond to local signals from power meters and other sources. The software is highly scalable enabling LADWP to potentially expand the Beacon site up to 50 MW of capacity without the need for additional control software.
PROJECT PROFILE
MESA 1 and 2
Hardeson and Everett Substations ESS

Challenge

After growing its wind generation from 0-to-8% in just two years, Snohomish County (SnoPUD) realized it would not be able to keep adding wind generation to the system without help managing its intermittency. They turned to energy storage as the answer, both to address renewable intermittency and to more broadly support the transmission and distribution grid. SnoPUD recognized that to cost-effectively deploy more than one ESS, energy storage had to become more scalable and replicable. Economies of scale require standardized components and publicly available software interfaces for connecting them together.

Doosan GridTech Solution

Doosan GridTech delivered a holistically designed, grid-integrated and optimized, set of energy storage systems for SnoPUD. The set is comprised of three separate energy storage systems, fully designed, procured, installed, commissioned by Doosan GridTech. Two ESSs were deployed at the same substation, and demonstrated the capability of the Doosan GridTech Intelligent Controller® (DG-IC®) to manage more than one ESS at the substation. The third ESS is an energy dense (2MW/8MWh) vanadium redox flow battery, with another DG-IC® control system. All ESSs were deployed using the MESA standards, ensuring that SnoPUD has standardized communication interfaces, uniform scheduling capability, and reliable security parameters.

Doosan GridTech integrated its DG-IC® controls into SnoPUD’s communication and SCADA control systems, with scheduling functionality for optimal management. Effective and functional integration of ESS controls into SCADA and other control systems is one of the most important factors of ESS scalability, and is the reason that more and more utilities are requiring compliance with MESA standards.

Outcomes:
1. Automatic and complete integration of renewable power into the distribution grid.
2. Grid-modernization built on a core of substation-sited energy storage systems.
3. Control systems for the next generation distribution grid.
Doosan GridTech’s Distributed Energy Resource Optimizer® (DG-DERO®) is the keystone of SnoPUD’s program. It is the first integrated, scalable, fleet optimization system involving multiple energy storage systems, different battery performance characteristics, and the integration of multiple types of renewable energy. DERO® runs in the SnoPUD data center and is built on open standards such as MESA, OpenADR, Web Services, ICCP, and DNP3. Drawing on its suite of bulk power applications, DERO® maximizes the economics of the fleet of energy storage systems by matching each storage asset to the most valuable mix of opportunities on a day-ahead, hour-ahead and real-time basis.

The first open standards-based energy storage program that proves that a component-based ESS fleet can be tightly integrated into grid operations.
Challenge

As part of a commitment to advance cleaner energy for its customers and provide a stable and resilient grid, Duke Energy commissioned a storage + solar system to operate as a microgrid at the Indiana National Guard’s Camp Atterbury training operation center in Johnson County. A separate battery storage project at its Nabb substation in Clark County was also commissioned.

Both installations will dispatch energy during times of peak demand, provide frequency regulation services to the Midcontinent Independent System Operator (MISO), and provide energy security and back-up power. Providing backup power to Camp Atterbury is especially paramount, so the camp can continue its mission-critical operations in the unlikely event of a large grid outage.

Doosan GridTech performed as the EPC contractor and systems integrator for both the Camp Atterbury and Nabb substation projects. The systems are expected to come online in late 2019.

Doosan GridTech Solution

The self-contained Atterbury microgrid will include a 5MW BESS that is AC-coupled to the 2MW-DC photovoltaic solar installation. In the unlikely event of a major grid failure, the microgrid would continue to meet customer power needs. The microgrid would interconnect to Duke Energy Indiana’s 12.47 kV distribution substation located at the national guard base.

At the Nabb substation, a similar 5 MW battery will be installed near and interconnect with an existing 34.5 kV distribution substation. As with Atterbury, it is designed to provide grid benefits during normal operations as well as back-up customer power in the event of an outage.

It is anticipated that both systems will provide services to MISO, in addition to improving system and customer reliability. Doosan GridTech worked very closely with Duke Energy and the battery vendor Samsung SDI to right-size the battery to account for the demanding duty cycle associated with such services. Through this collaborative effort, Doosan GridTech developed a battery storage system that it guarantees will meet Duke Energy’s needs over a 12-year life.

Doosan’s battery energy storage control system, the DG-Intelligent Controller®️️, will be embedded in both systems to manage the transition between the grid and island, and control the DERs to maximize the uptime of the island.

Outcomes:
1. Improve customer reliability and ensure power supply to mission critical military operations
2. Access the fast frequency regulation market
3. Integrate with distribution operations to provide grid support services as needed
Doosan GridTech Solution

Doosan GridTech supplied advanced control system software to the project, which has 3 different solar power stations with 3.5MW total capacity and contains an 8MWh energy storage system (ESS). The energy storage enables the client to gain additional profit from selling stored electricity.

DHI carried out business development, engineering, procurement, and construction (EPC) duties for both the PV and the storage systems, designing, installing and commissioning the facility and taking in responsibility for future operations and maintenance (O&M) duties.

Challenge

To become the frontrunner in the delivery of optimized products and maintenance services for hybrid plants, Doosan Heavy Industries & Construction (DHI) self-executed this solar-plus-storage project at its offices in Changwon and Gunsan. By capitalizing on the experience and know-how gained from operating these systems, this and other projects on its premises will be used as a learning curve for external projects.

Rather than being used for onsite self-consumption of PV power, generated energy will be sold to KEPCO (Korea Electric Power Corporation).

Outcomes:
1. Create REC Sales profit by charging and discharging of electricity from solar PV.
2. Maximize the PV plant capacity and provide stable electricity by storing energy.
Challenge

To become the frontrunner in the delivery of optimized products and maintenance services for ESS plants, Doosan Heavy Industries & Construction (DHI) was awarded this Demand Energy Management project from SK E&S and executed the project at its head offices in Changwon, South Korea.

This demand management system helps customers to save electricity bills using fare gaps between the maximum and minimum energy loading period.

Doosan GridTech Solution

Doosan GridTech supplied advanced control system software to the project (12MW power control system (PCS) with a 70MWh energy storage system (ESS)). The system can dispatch energy source to when it is most desired by discharging stored electricity.

DHI carried out engineering, procurement and construction (EPC) duties for the storage systems, designing, installing and commissioning the facility and is responsible for future operations and maintenance (O&M) duties.

Outcomes:
1. Reduce the cost of energy by using fare gaps between the maximum and minimum energy loading period.
2. Create additional profit by discharging for demand response.
Challenge

Glacier is a small remote community near Mt. Baker – a 20 mile drive to the Mt. Baker Ski Area. There are 1,048 PSE customers on the GLA-12 circuit, including a number of local businesses. Glacier suffers from frequent outages that are generally quite long (approximately 2.8 outages per year at 7.5 hours average duration). The outages are primarily due to faults on the long and exposed Kendall-Glacier 55kV transmission due to dense vegetation. Several small hydro generation facilities interconnect to this circuit and lose revenue during outages. Few good options exist for increasing the reliability on this line. This was one of the poorest performing transmission lines within PSE’s territory.

Doosan GridTech Solution

PSE deployed a 2MW/4MWh BYD lithium ion battery with the Doosan GridTech Intelligent Controller as the brains of the system. Doosan GridTech worked closely with PSE to configure the DG-IC to address the following use cases and needs:

- Energy shifting
- Energy shifting from peak to off-peak on a daily basis
- System capacity to meet adequacy requirements
- Grid Flexibility
- Regulation services
- Load following services
- Improving distribution system efficiency
- Load shaping
- Deferment of distribution system upgrades
- Outage management of critical loads

Outcomes:

1. Automatic outage management of critical loads.
2. Improved grid flexibility through regulation and load following services.