Smart Energy Storage to accelerate green energy transition

R-evolution's solar park in Archidona, Spain

Hagal, R-evolution and Ansasol are partnering up to build the Smart Distributed Battery System to unlock the full potential of Renewable Energy production with Energy Storage

Smart Distributed Battery System Results

- **Maximized yield** with peak mgmt. & Inverter optimization
- **Plug & Play** Industrialized Scalable design
- **Lower integration cost** with distributed energy solution
- **Pre-integrated** SW solution (BMS & APM)
- **Extended** battery **life** up to 30%

Smart Energy Storage Solution for Solar PV to accelerate the renewable energy transition, improve energy yield and lower total costs

The coming decades will be defined by new energy systems with renewables at its core, with the ambition to lower CO_2 emissions to the minimum, limit global warming to 1.5°C and avoid more severe climate change impacts. To create clean and affordable energy, a renewables-first grid must optimize the interplay between complementary technologies, such as solar photovoltaic (PV) or wind with energy storage or green hydrogen.

Starting with the existing Archidona solar park near Malaga, Spain, R-evolution, Hagal, and Ansasol are revolutionizing the relationship between photovoltaic power generation and energy storage.

R-evolution

R-evolution, a Hexagon green-tech company, leverages technology innovation, investment, and venture capital to grow and accelerate sustainable business opportunities from investing in and operating renewable energy assets to blue carbon and green hydrogen.

Hagal

Hagal is a Norwegian technology company that develops hardware and software solutions for optimizing battery management and efficiency. Hagal's key product is RebelCore™, a single-cell control battery management system to manage cells individually.

In partnership with **Ansasol**

Ansasol is a PV plant engineering and development company and an independent power producer. Since 2004, has developed more than 1,200 MW of renewable generation in Andalusia, Spain. Looking ahead, it plans to continue the expansion of PV capacity, underpinning energy benchmarking, and green hydrogen.

R-evolution owns and operates the **Archidona solar park**. The site hosts 16.44 MWp of grid-connected photovoltaic solar panels. The total capacity is enough to power close to 6,000 households each year.

R-evolution is using Hexagon's hardware and software solutions and partner technology, such as Google BigLake and now also Hagal's smart battery, to boost the solar park's efficiency. The technologies create a Smart Digital Reality of the entire system that is remotely and autonomously monitored to detect solar panel anomalies, improve maintenance, aid inspections, improve energy yield and more.

The Challenge

Solar irradiance provides the Earth with infinite renewable energy. The conversion of this energy into electrical energy and use by end-consumers is not one-for-one. Various challenges make conversion of the solar energy into usable electrical energy inefficient for traditional systems.

These inefficiencies, such as conversion and intermittency, are "costs" that inflate the levelized cost of electricity. Inefficiencies pose technical hurdles that require solutions to ensure higher electrical output, consistent power injection to the grid and, ultimately, a lower levelized cost of electricity.

The Solution

This project is launching the distributed Smart Energy Storage model at the solar park in Archidona to eliminate those inefficiencies. Hagal's Sunpack™ battery module arrived on site in May 2023.

The novel solution entails the direct integration of Hagal's smart battery with the solar line inverters. Each solar line and inverter have its own dedicated battery – a distributed and networked design within the solar park.

When integrated with each solar string and inverter, the smart battery maximizes output and enables an efficient distribution of power between the solar panels, the battery, and the grid.

Temperature – The smart battery manages the energy flow and optimizes energy usage. Excess energy produced can be stored in the battery during high solar irradiance, rather than wasted as heat. This reduces the temperature of the solar panels, helping them operate more efficiently.

Time-shifting – The smart battery stores excess energy produced by each solar string during peak sunlight hours. The energy can be used later when demand is higher or solar production is lower, such as during the evening or on cloudy days. This not only helps reduce the temperature of the solar array during peak hours but also minimizes the need for grid electricity, reducing energy loss and improving overall system efficiency.

Curtailment – The smart battery acts as a buffer, absorbing excess power and reducing strain on the grid. This improves grid stability and renewables' utilization rate, supporting the integration of renewable energy sources.

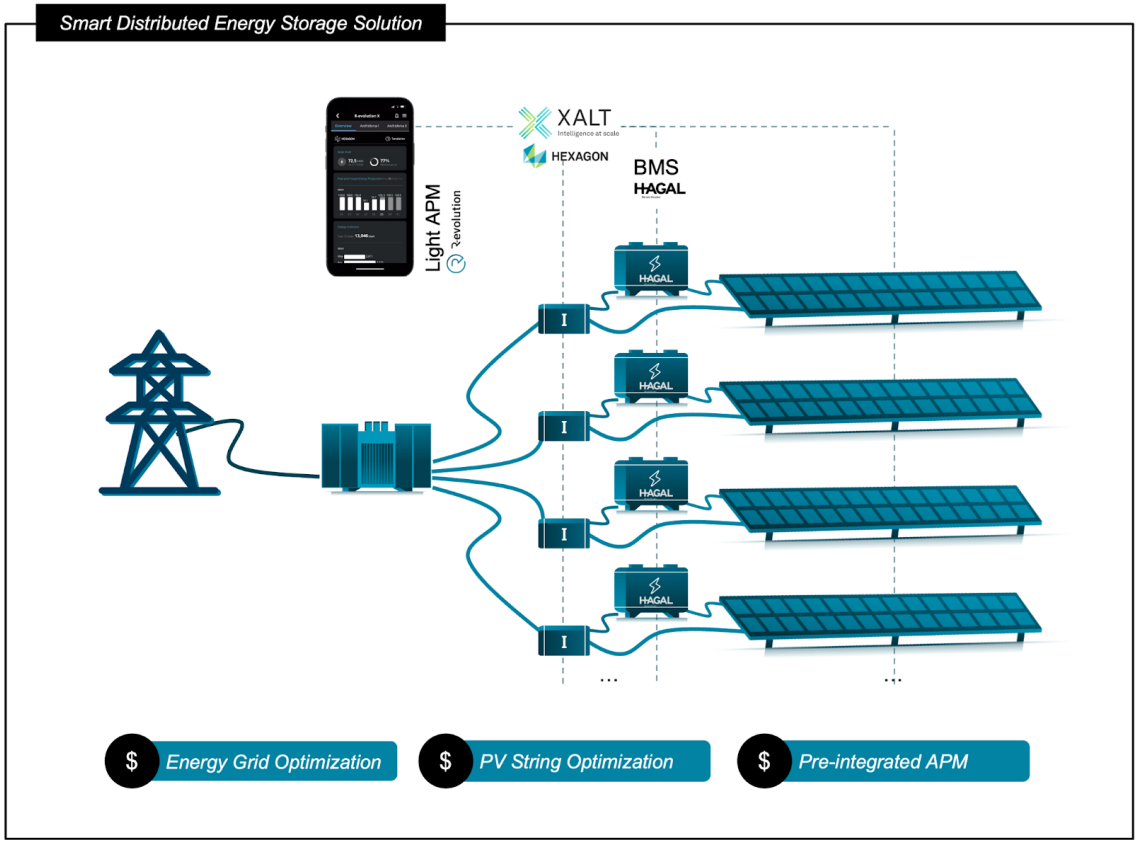
Hagal's battery management system, working in conjunction with R-evolution's sensors, will test and employ different optimization algorithms in order to minimize inefficiencies, hence reducing the lowest levelized cost of energy (LCOE).

By adopting a distributed and networked approach to battery storage at the solar park allows to individualize and customize management of each solar string and distributed battery system.

This distributed approach also generates other efficiency benefits, including:

- Reduced cabling and other associated infrastructure requirements
- A smaller land footprint for equivalent battery storage capacity
- Easy installation at existing solar parks
- Simplified permitting compared to a traditional battery storage park

Solving these challenges creates immediate gains for owners of solar parks. The value can be measured by lower electrical losses and boosted electrical output. The future is so much brighter for energy storage solutions when optimization and the lowest LCOE can be achieved.



The Impact

Battery storage is widely understood to enhance solar and wind park economics – firming renewables by "extending" power outside sunny or windy hours, grid frequency support, load balancing, and energy arbitrage, among others.

The specific implementation at Archidona, a distributed and networked battery solution, will unlock further economic value by lowering electrical losses, slashing battery CapEx, and enhancing electrical output. It has been estimated a reduction in aggregate losses of at least 1% per annum— such gains make good projects great and marginal projects viable.

For Spain's 17,000 solar installations, the applied solution can unlock economics to support more renewable electricity for export into the grid.

Reach out to us to get some more details and see how this solution can work for your business:

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