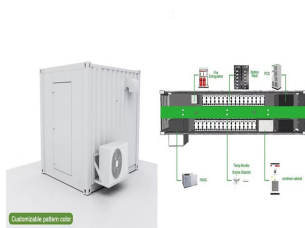


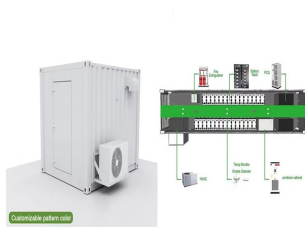
# APIA COMPLIANT BATTERY ENERGY STORAGE PROJECT



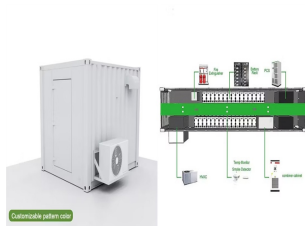
What is a battery energy storage system? Battery energy storage systems provide multifarious applications in the power grid. BESS synergizes widely with energy production, consumption & storage components. An up-to-date overview of BESS grid services is provided for the last 10 years. Indicators are proposed to describe long-term battery grid service usage patterns.



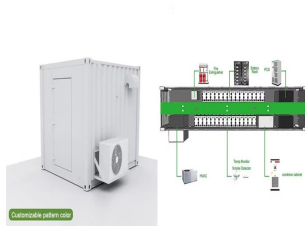
Why is battery energy storage important? WHY BATTERY ENERGY STORAGE? Battery Energy Storage Systems (BESS) are advanced technology systems designed to store electrical energy for later use. These systems store energy in the form of chemical potential within rechargeable batteries, allowing the stored energy to be discharged back into the grid network or used on-site when needed.



What is a hybrid energy storage system? A hybrid energy storage system is designed to perform the firm frequency response in Ref. , which uses fuzzy logic with the dynamic filtering algorithm to tackle battery degradation.



What are utility-scale mobile battery energy storage systems (MBESS)? The concept of utility-scale mobile battery energy storage systems (MBESS) represents the combination of BESS and transportation methods such as the truck and train. The MBESS has the advantage of solving the grid congestion as the capacity could be transported by vehicles to change the grid connection point physically.



What are the advantages of rechargeable batteries compared to other components? The nature of rechargeable batteries, charging for down-regulation and discharging for up-regulation with immediate response and adjustable power scale is the inherent advantage compared with other components in the power system.

# APIA COMPLIANT BATTERY ENERGY STORAGE PROJECT



US Energy Information Administration, Battery Storage in the United States: An Update on Market Trends, p. 8 (Aug. 2021). Wood Mackenzie Power & Renewables/American Clean Power Association, US Storage Energy Monitor, p. 3 (Sept. 2022). See IEA, Natural Gas-Fired Electricity (last accessed Jan. 23, 2023); IEA, Unabated Gas-Fired Generation in the Net ???



Utility-scale battery storage is expected to grow significantly: Research firm Visiongain reported it projects the grid scale battery storage technologies market to grow a compounded annual rate of 15.6% by 2032. In its Preliminary Monthly Electric Generator Inventory (November 23, 2022), EIA expects battery storage to increase by 10 gigawatts



California heavily relies on carbon-emitting fossil-fueled power resources to meet peak energy needs. Battery storage is an essential component of grid reliability and resilience as San Diego and our state transition away from fossil fuels and increasingly adopt renewables like wind and solar for cleaner air in our communities and meeting California's ???



Generally speaking, a battery project has to be a certain size to make it attractive to project finance providers ??? historically a lot of energy storage projects have been quite small. However, with early battery storage projects now able to point to a proven track record of successful operation, and with the scale of projects now coming

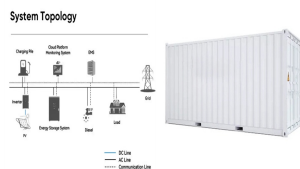


The International Renewable Energy Agency predicts that with current national policies, targets and energy plans, global renewable energy shares are expected to reach 36% and 3400 GWh of stationary energy ???

# APIA COMPLIANT BATTERY ENERGY STORAGE PROJECT



ACCIONA Energía has signed an agreement with Qcells, a subsidiary of the South Korean industrial group Hanwha Corporation, to acquire the battery energy storage system (BESS) project Cunningham, the largest of its kind in Texas, scheduled for commissioning in the first quarter of 2023.



US-headquartered Fluence Energy, Inc. has completed the 570-megawatt battery energy storage system (BESS) project that it had installed for leading Philippine energy player SMC Global Power Holdings Corp. (SMCGP) of the San Miguel group. The other BESS projects which already passed grid compliance tests of system operator National Grid



Groundbreaking ceremony at the Scatter Wash project, held towards the beginning of this year. Image: Strata Clean Energy . Copenhagen Infrastructure Partners (CIP) has acquired a 1GWh battery storage project in Arizona, US, from developer Strata Clean Energy.



The project comprises 100 MW Solar PV Project coupled with 120 MWh Utility Scale Battery Energy Storage System To generate an estimated 243.53 million units of energy annually and reduce carbon footprint of 4.87 million tonnes of CO<sub>2</sub> in 25 years The cutting-edge bifacial mono crystalline technology was used in the project Tata Power Solar Systems



Energy battery storage creates grid resiliency, stabilizes power supply costs, and enhances renewable availability. Skip site navigation Arica and Victory Pass Solar + Storage is paired with 463 MW of solar and 186 MW of energy storage. The project represents a major renewable energy investment in Riverside County generating enough clean

# APIA COMPLIANT BATTERY ENERGY STORAGE PROJECT



Compass Energy Storage LLC proposes to construct, own, and operate an approximately 250-megawatt (MW) battery energy storage system (BESS) in the City of San Juan Capistrano. The approximately 13-acre project site is located within the northern portion of the City of San Juan Capistrano, adjacent to Camino Capistrano and Interstate-5 to the east. The BESS would be ???



The primary components of the project include an up to 3,200-megawatt-hour (MWh) battery energy storage system (BESS) facility, an operations and maintenance (O& M) building, a project substation, a 500-kilovolt (kV) overhead intertie transmission (gen-tie) line, and interconnection facilities within the Pacific Gas and Electric Company (PG& E



Tenaga Nasional Bhd will kick-start a 400 megawatt-hour (MWh) battery energy storage system (BESS) pilot project in this quarter, marking Malaysia's first utility-scale battery storage project to address intermittency issues of renewable energy (RE).



eight energy storage site evaluations and meetings with industry experts to build a comprehensive plan for safe BESS deployment. BACKGROUND Owners of energy storage need to be sure that they can deploy systems safely. Over a recent 18-month period ending in early 2020, over two dozen large-scale battery energy storage sites around the



Utilizing a system design by Energy Dome, this innovative and efficient approach to long-duration energy storage is both simple and sustainable. The Columbia Energy Storage Project will take energy from the grid and store it by converting CO<sub>2</sub> gas into a compressed liquid form. When energy is needed, the system converts the liquid CO<sub>2</sub> back to a gas, which powers a turbine ???

# APIA COMPLIANT BATTERY ENERGY STORAGE PROJECT



2.1 trackable Value Streams for Battery Energy Storage System Projects S  
17 2.2 ADB Economic Analysis Framework 18 2.3 Expected Drop in  
Lithium-Ion Cell Prices over the Next Few Years (\$/kWh) 19 2.4 breakdown  
of Battery Cost, 2015???2020 Br 20 2.5 Benchmark Capital Costs for a 1  
MW/1 MWh Utility-Sale Energy Storage System Project 20



In the first installment of our series addressing best practices, challenges and opportunities in BESS deployment, we will look at models and recommendations for land use permitting and environmental review compliance for battery energy storage projects with a particular focus on California, which is leading the nation in deploying utility



State regulators approved Dominion Energy's long-term energy storage proposals last week, as Appalachian Power Company is seeking bids for a swath of renewable electricity sources, marking the advancement of renewable energy projects at Virginia's two largest electric utilities.. The approval for Dominion is seen as a critical next step in supplying ???



of energy storage technologies, the majority of new projects utilize batteries. Energy storage technologies have experienced rapid growth over the past few years, with battery energy storage deployments growing by more than 1,200% between 2016 and 2021. This growth is expected to continue over the next decade.



Kenya to Implement 100MW battery Energy Storage System Project The Kenya Electricity Generating Company PLC (KenGen), has been designated to be the Implementing Agency for the Kenyan Battery Energy Storage System (BESS), which is part of the Kenya Green and Resilient Expansion of Energy (GREEN) program, funded by the World Bank.

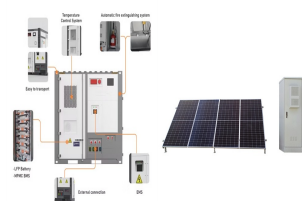
# APIA COMPLIANT BATTERY ENERGY STORAGE PROJECT



Greenbacker Renewable Energy Company and Blackstone-owned Aypa Power have acquired pre-operational battery energy storage system (BESS) developments totalling 110MW of power. Greenbacker has purchased a portfolio of two standalone lithium-ion BESS sites and two solar portfolios of up to seven projects, all pre-operational, from developer Borrego.



Battery Energy Storage. Systems (BESS) What is BESS? Similar to the batteries that power your phone, computer, and other electronics, large- Currently hundreds of large-scale energy storage projects are operating and in construction in the US. Located in dense, urban areas and/or rural, State and Local governments ensure compliance with



3 ? The battery production facility forms part of a larger, \$1.8bn suite of partnerships signed by Acwa Power on the sidelines of the 8th Future Investment Initiative (FII8) held in Riyadh from October 29 to 31. These encompass ???



1 ? The multi-institution teams, one led by Argonne National Laboratory in Illinois, and the other by Stanford University/SLAC, will develop scientific concepts and understanding with an eye to decarbonizing transportation and ???



The project will contribute to significantly reducing CO2 emissions by storing and supplying renewable electricity to the grid, improving the overall efficiency and environmental ???



# APIA COMPLIANT BATTERY ENERGY STORAGE PROJECT



The North America and Western Europe (NAWE) region leads the power storage pipeline, bolstered by the region's substantial BESS segment. The region has the largest share of power storage projects within our KPD, with a total of 453 BESS projects, seven CAES projects and two thermal energy storage (TES) projects, representing nearly 60% of the global ???



The Battery Energy Storage Project (Project) provides a solution to address both challenges. The Project can store excess renewable energy in low demand periods and release the energy during peak hours, meeting the demand with energy from renewable resources and minimizing the use of fossil-fuel based generation. The Project will also reduce



"We are pleased to partner with Dominion Energy on the innovative Darbytown Storage Pilot Project and look forward to delivering a 100-hour iron-air battery system that will enhance grid reliability and provide Dominion's Virginia customers with access to wind and solar energy when and where it is needed over periods of multiple days," Form



The Skyview 2 Battery Energy Storage Project ("Skyview 2 BESS" or the "Project") is a battery energy storage project proposed in the Township of Edwardsburgh Cardinal. The proposed Project is a lithium-ion battery energy storage facility sized to provide up to 411MW (1,560+ Megawatt-hours). It occupies approximately 30 acres of land



The International Renewable Energy Agency predicts that with current national policies, targets and energy plans, global renewable energy shares are expected to reach 36% and 3400 GWh of stationary energy storage by 2050. However, IRENA Energy Transformation Scenario forecasts that these targets should be at 61% and 9000 GWh to achieve net zero ???