Meetings International SciTechnol

Terence Goh, J Pharm Sci Emerg Drugs 2018, Volume:6
DOI: 10.4172/2380-9477-C8-026

Mitigating Solar Ramping by Energy Storage

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The Solar Energy Corporation of India (SECI) had issued a request for selection (RfS) document for the tendering of 4x50 MW of grid-connected solar PV, with each 50MW solar PV farm connected to a 5MW/2.5MWh Battery Energy Storage System (BESS) for Energy Storage Demonstration Projects initiatives scheduled in the period of 2017-2021. The primary application of this BESS bid, solar smoothing, refers to the use of the BESS application to "mitigate rapid fluctuations in PV power output (eg. during transient cloud shadows on PV arrays) by adding power to or subtracting power from the output of a PV system in order to smooth out the high frequency components of the PV power generated". As utility-scale battery storage for renewable integration in India is yet at a pilot stage with limited operational data and references available, a feasibility study was carried out in accordance with the relevant BESS operation and performance requirements as stipulated in the RfS. The main objectives of this study were to assess if the BESS capacities proposed fulfil and comply with the RfS requirements. The outcome deliverables present results in: a. The technical assessment of the 5MW/2.5MWh BESS module's behaviour for charging and discharging to the grid, as based on simulated modelling against the solar+BESS operational requirements (e.g. ramp rates, SOC range and DOD limits, etc.) and the expected solar fluctuations for different panel configurations (fixed tilt and tracker) at the solar farm site. b. Such simulated annual operation runs cover two different solar fluctuation limits (2% and 8%) and include three different scenarios regarding the BESS capacity (1) full capacity, (2) 80% capacity limit and (3) a degraded capacity after 10 years operation. c. Sensitivity analysis results on both the ramp rate limit and BESS round trip efficiency.

Biography

Terence Goh is an Energy Storage Consultant & Advisor in Sunseap Group, Singapore, the leading rooftop PV PPA developer in Singapore, with over 115MW of rooftop already installed. Dr Goh has more than two decades of experience in energy systems related to microgrid and mobile applications. He is the Energy Storage Lead for APAC and the Centre of Excellence Leader for Energy Storage and Smart Grid for Singapore as well. He is presently managing several projects in rural electrifications, microgrid and on-grid energy storage projects across the Asia Pacific countries. He is an authority and thought leader on Energy Storage and has been both panel chairman and speaker at several international conferences (Australia All Energy Conferences 2015, 2016, Australia Energy Storage Conference 2015, SIEW 2017, 11th SNEC International Photovoltaic Conference & Exhibition, Shanghai 2017, the Singapore Battery Meeting 2017, CISOLAR 2018 in Ukraine and recently, the Energy Executive Program backed by the Thailand's Renewable Ministry. Dr Goh holds a concurrent Associate Professor appointment at the National University of Singapore and is a Senior Research Scientist specializing in environmental sustainability and renewable energy research. He is actively involved in R&D projects with energy storage specialists in the Polytechnics, the NUS and NTU. He had overseen the design and operational implementation of microgrids and had worked on the system integration of Li-ion and ultra-capacitors for electric vehicle applications. He has hands-on experience in the development of battery management system (BMS) for hybrid energy systems comprising fuel cells and Li-ion batteries.

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