The need for substation controls and automation is getting more and more attention as the grid becomes more complex and new Smart Grid applications are introduced. Today, large scale solar farms, wind farms and MW sized Battery Energy Storage Systems (BESSs) are integrated in many HV/MV substations, as part of independent power producers plants or by utilities to support the grid operation. Due to their variable generation profile and uncertainty in operating points, these sources of energy should be closely controlled with more precise and intelligent control schemes to minimize any adverse impact on the operation of the grid. Various levels of protection and automations, as well as remote monitoring and controls through system operator commands are needed to ensure grid integrity and stability during sudden changes in the operating conditions and/or system contingencies.

Quanta Technology, through our microgrid protection and control unit (MPAC), is offering the next level of protection and control systems for microgrids, which is able to control and determine operating setpoints for solar and wind farms, BESSs, diesel generators and loads in a coordinated manner. The control system is designed according to the IEC 61131-3 standard language and has a modular structure. The controller functionality is extensively tested and verified, using a Real-Time Digital Simulator (RTDS®) hardware-in-loop setup, in which multiple system conditions and various operating scenarios are simulated and evaluated.

MPAC incorporates control and protection for two separate modes — Grid Connected Mode (GCM) and Stand Alone Mode (SAM) — as well as manages transitions between the two modes. In GCM, the ‘battery’ State of the Charge (SOC), the substation capacitors and On-Load Tap Changer (OLTC) are controlled to maintain proper voltage/reactive power profiles and reserve capacity. In SAM, or ‘islanded’ mode, the controller acts as a supervisory control system as part of the substation controls and protection to apply a power balancing scheme with the aim of increasing the contribution of renewable resources (PV & wind).

For more information regarding Quanta Technology’s Microgrid expertise, contact Farid Katiraei at (647) 330-7379 or fkatiraei@quanta-technology.com.