Power Plant Controller Solutions for Energy Storage Systems

Recently, new energy storage technologies are experiencing increasing penetration in the renewable/electricity market. With storage systems, excess energy can now be cost-efficiently stored, can respond to on-demand energy requirements at peak periods, and can be used to accurately control generation output to serve grid requirements.

These new energy storage systems can reduce the costs for commercial/residential installations, increase revenues for utility-scale power plants, secure the grid operation and power quality, as well as most importantly prevent unnecessary and costly central investments required.

To respond to the growing demand for control systems for these new systems, Inaccess has developed S-PPC, a Storage-Enabling extension to Inaccess PV Power Plant Controller.
S-PPC: Solutions for Energy Storage Systems

Power Plant Controller for Energy Storage Systems (S-PPC) is our vendor independent modular solution which complements the core PPC product line, complies with any grid code requirements and is scalable for use by plants of a few hundreds of KW of up to hundreds of MW. It integrates with any battery technology, battery management system and inverter model, ensuring the result with be compliant to the grid code requirements and plant-specific needs.

![Diagram of PV Plant with S-PPC for Energy Storage Systems](image)

**Figure 2 - PV Plant with S-PPC for Energy Storage Systems**

In addition to the standard PPC functions of a PV Power Plant, S-PPC effectively controls the Battery Management System (BMS) and the Storage Inverters, coordinating the Storage controls with the PV Plant active power control and reactive power compensation resources (inverter, capacitors, etc).

S-PPC maximizes revenues and reduces costs for the plant owner by executing control functionality with Frequency Regulation, Peak Shaving, Spinning Reserve, Ramp Rate Control and Capacity Firming, while always complying to grid code requirements.
Energy Storage Applications

Storage technologies provide significant benefits for the grid operator and plant owner for both commercial or utility-scale applications. S-PPC is fully compliant with all energy storage schemes, coordinating all plant assets and use scenarios.

**FREQUENCY SUPPORT**

Frequency regulation is one of most critical ancillary services provided for grid management. Frequency support is provided by ramping up or down the generation assets, for underfrequency or overfrequency events. Using the storage systems, the PPC can coordinate the frequency support in parallel with other plant generators. Response time is several msec while the coordination is performed in 1 sec.

**PEAK SHAVING / ENERGY TIME SHIFTING**

In plants with Export Limitation, S-PPC can maximize generation by charging batteries when excess power is not required / curtailed and discharging in periods of low power generation. For commercial installations, PPC with storage can balance generation and consumption curves minimizing consumption. In ToU or Demand-based pricing schemes, the control system can minimize consumption in peak periods.

**CAPACITY FIRMING AND ACTIVE POWER CONTROL**

Now Owners/Operators can transform PV plants into dispatchable assets. Using the energy stored, S-PPC can secure the availability of PV plant power thus enabling the operator to bid firm capacity into merchant markets, bypassing its intermittent nature. PV generation is now a dispatchable revenue generating asset which depending on the available market can translate to higher kWh rates during dispatchable periods.
RENEWABLE INTEGRATION RAMP RATES

S-PPC can monitor the PV Plant output and regulate ramp up/down rates according to grid requirements. Furthermore, with storage-supported ramp up rate control, energy that would be lost when a PV inverter enforced internally the ramp rate limitations (standard industry practice) can now be stored.

SPINNING RESERVE

Storage systems provide a respective Spinning Reserve resource avoiding the respective generator losses for a power plant. Spinning Reserve refers to a Generation capacity that is standby and that can respond within 10 minutes to compensate for generation or transmission outages. Frequency-response reserves respond within 10 seconds to maintain system frequency. This means that system generators must have a share of immediate reserve capacity associated with their primary energy sources, wasting energy if not stored as in the case of storage systems.

INTEGRATED ENERGY AND POWER MONITORING

S-PPC is fully interoperable with Inaccess or 3rd party SCADA systems, delivering end-to-end Energy Storage Monitoring, as well as full Plant and Loads monitoring.
### Benefits for Plant Owners and Grid Operators

<table>
<thead>
<tr>
<th>FOR GRID OPERATORS</th>
<th>FOR PLANT OWNERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV plants become dispatchable assets - the grid can consider them fully responsive and not intermittent by nature.</td>
<td>PV plants become dispatchable - the plant can participate in bids it could not address so far.</td>
</tr>
<tr>
<td>Capacity of backup resources can be reduced while still securing supply security.</td>
<td>Maximize energy generation, minimize curtailment losses of solar resource.</td>
</tr>
<tr>
<td>Securing power quality with less transmission infrastructure investments.</td>
<td>Maximize profit, selling energy at the most profitable price.</td>
</tr>
<tr>
<td>Distribution grids are stabilized and relieved from heavy energy shifting.</td>
<td>Fully compensate consumption in zero export scenarios.</td>
</tr>
<tr>
<td>Energy self-consumption on-site can significantly be increased.</td>
<td>Full grid integration with ramp rates, 4-Q reactive power control.</td>
</tr>
</tbody>
</table>