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**Question:**

Have similar (or other) hardware deployment challenges been seen in other jurisdictions as increasing variable renewable energy is deployed and system operations/market operations needs to move closer to real-time? How crucial are metering infrastructure/enhancements (at utility-scale and distributed scale)?

**Response:**

Implementation of Storage in the power system it is necessary with increasing variable renewable energy. The following proposals of places to implement means of Storage are suggested:

- In wind and solar parks to control the power delivered;
- In distribution grids to control the power flow, reducing investments of expanding these grids;
- In transmission grids to control the power flow, reducing investments of expanding these grids:
  - At the 230 kV level to control the power flow in areas;
  - At the 500 kV level to control the power flow in regional subsystems and in interregional interconnections;
- Reservoirs of hydro plants should store the generation surplus at a system level.

The objectives and procedures for implementing storage are presented below.

In wind and solar parks

The implementation of Storage in wind and solar parks has the main objective of controlling the power delivered to obtain the following benefits:

- Increase in the efficiency of these parks, making them more competitive;
- Reduction in the amount of distribution and transmission use contracts;
- Reduction in the use of the power grid and, in consequence, the amount of investments;
- Reduction in the amount of non-generated power;
- Reduction in the variability of generated power, common in variable generation;
- Finally, full control of the power delivered by the parks.

Batteries are the most common means of Storage used at the local level due to the reduction of price over time. However, other resources of Storage are used in specific situations.

In distribution and transmission grids

The process of implementing Storage in distribution and transmission grids should consider the following sequential stages:

- Definition of the expansion of the power grid to eliminate bottlenecks for variable generation;

- Definition of the implementation of Storage means at the points of bottlenecks;
- Evaluation of the investments required for each option: expansion of the power grid X implementation of Storage.

The Storage means would be a new option to be evaluated in the expansion of the power grid in comparison with conventional installations such as transmission lines.