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SOLAR PV INTEGRATION IN POWER GRID - ISSUES AND CHALLENGES

Renewable energy sources are intermittent in nature hence; it is therefore a challenging task to integrate renewable energy resources into the power grid. Challenges and issues associated with the grid integration of various renewable energy sources particularly solar photovoltaic and wind energy conversion systems are broadly classified into technical and non-technical and described below.

A. Technical Issues: The following are the technical issues are described as

1. Power quality: Harmonics, Flicker.
2. Power fluctuation: Small time power fluctuations, Long time or seasonal power fluctuations.
3. Storage
4. Protection issues
5. Optimal placement of renewable energy sources
6. Islanding.

B. Non-Technical Issues:

1. Due to scarcity of technical skilled workers.
2. Less availability of transmission line to accommodate renewable energy sources.
3. RES technologies are excluded from the competition which discourages the installation of new power plant for reserve purpose.
4. Wind and Solar Resources are highly Location Dependent.
5. Quality wind and solar resources that are most feasible for renewable energy generation are based on specific locations.
6. Transaction Costs: Another logistical worry for utilities is the significantly higher transaction effort in terms of metering, inspection and certifications.
7. Non-standard technical regulations, procedures and specifications across states can act as a strong barrier, resulting in additional costs for manufacturing and deployment and thereby slowing down the growth of this sector. This is especially important for metering regulations.
8. Lengthy procedures and delay in implementation [1].

Challenges with solar PV integration

Although solar energy is an infinite energy source derived from the environment, its supply is intermittent, yet its availability is less than predictable and is outside human control as compared to conventional power plants. Continuous research and development are going on to meet the challenges pertaining to solar power generation. viz. high initial cost, variability, requirement of space for PV panel installation, less efficient energy conversion to name a few . Solar power is not always available where and when needed. Unlike conventional sources of electric

power, solar resources are not — dispatchable —the power output cannot be controlled. Daily and seasonal effects and limited predictability result in intermittent generation. This poses many challenges for the Grid integration. Some of these challenges are given in the next section.

1. Intermittent Generation

The intermittent nature of solar resource and limited dis-patchability require grid operators to maintain additional spinning reserves. Accurate hourly and sub hourly solar generation forecasting is required to allow for unit commitment and spinning reserves , scheduling and dispatch.

2. Transmission System issue

Large scale solar plants (100 MW and above) may be located in places distant from any existing transmission lines. Planning for transmission expansion to support increasing level of solar generation in dispersed areas is essential to the growth of the solar power sector. Planning and system studies are required to determine seasonal requirements for up -regulation, down – regulation and ramping capacities. Long term resource adequacy issues also need to be addressed. The interconnection protocols and standards may needed to be modified to address greater level of power factor control and low voltage ride through to mitigate any transient stability issues.

3. Distribution system issues

The increasing penetration of institutional and residential solar generation imposes challenges on the existing distribution infrastructure. Grid operators are facing shifts in peak demand, load pattern resulting in a scenario where in generators are being called upon to ramp up their output more than before and for which they may have not been designed , New control strategies to enhance distribution automation and microgrid capabilities , voltage and var management are the need of the hour. Integration of renewable energy into the smart grid with innovative energy storage is the key to smooth this variability's, partially alleviate some of these challenges and achieve greater reliability in delivery. Future energy sustainability depends heavily on how the renewable energy problem is addressed in the next few decades.

4. Integrating Energy storage

An excellent style m Electric Energy storage although is a well established practice, its use in PV systems is usually for Standalone systems [2]

References

1. P. Suresh and T. Gowri Manohar ,Integration of Renewable Energy Sources to Indian Grid: Issues and Challenges-A Review, on pages 2239-2240.
2. Associate Professor T. Kaur, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 4, Issue 7, July 2015, on page 5863.

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