

Smart grid and power quality issues

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*Amalorpavaraj Rini Ann Jerin**, *Natarajan Prabakaran***, *Nallapaneni Manoj Kumar[†]*, *Kaliannan Palanisamy**, *Subramaniam Umashankar**, *Pierluigi Siano[‡]*
*VIT University, Vellore, India; **Madanapalle Institute of Technology and Science, Madanapalle, India; [†]Universiti Malaysia Pahang, Pekan, Malaysia; [‡]University of Salerno, Fisciano, Italy

1 Introduction

Smart Grids are going to replace the traditional concept of electrical networks in order to satisfy the increasing needs in terms of flexibility, accessibility, reliability, and quality of the power supply. Economy and energy efficiency are the paradigms followed to exploit the available distributed energy resources (DERs), guaranteeing technical and environment-friendly standards. Obviously, the path to Smart Grids is complicated by the increasing heterogeneity of Smart Grid components, such as renewable, storage systems, fossil-fueled generators, and controllable loads [1]. Fortunately, the synergic interaction between DERs and information and communication technologies (ICT) foster the coordination among different infrastructures, promoting the development of Smart Grids at both theoretical and practical levels.

The major highlights of utilizing smart grids are the capacity to self-heal from power quality (PQ) issues, efficient energy management, incorporation of automation based on ICT and smart metering, integration of distributed power generation, renewable energy resources, and storage units [2]. The advantages contribute to maintain good PQ and to maintain the reliability. In this regard, the concept of microgrid is brought to the stage as one of the main building blocks of the future smart grids [3].

PQ has emerged as a standout among the most essential issues of smart grid [4]. Although PQ has been a well-known concern of the conventional power grid, it has acquired exceptional concern in smart grids predominantly because of the following reasons:

- Expanding utilization of delicate loads and control forms as of late.
- Expansion of various nonlinear and single-stage loads which may antagonistically influence the PQ.
- Accessibility of cutting edge metering, detecting and control functionalities in smart grids which can be used to give an alluring PQ level for purchasers.

The term power quality is used to describe the nonstationary disturbances, which cause the major malfunctioning of the electrical equipments. Operation of the electric loads without the proper power causes the electrical devices or loads to malfunction,