

# IoT Assisted Power Electronics for Modern Power Systems

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**Abstract**—The Internet of things (IoT) plays important roles in the modern digital world. It has several important roles in the modern power systems and power grids. IoT presents a lot of potential in the power systems and power grids. Some of the support functions are direct and several others are found to be indirect. Either way, IoT can play a lot of important roles in the modern power systems. It can help significantly in the measurement, control, and monitoring of the physical parameters in the power grids. It helps to in the reduction of energy consumption in the power electronic components. It has the potential to provide a lot of operational flexibilities in the power electronic components. Implementation of advanced operational algorithms using artificial intelligence and machine learning is facilitated by the IoT based sensors, actuators and other key components. It can provide smart operational assistance to the power electronic systems used in the power grids. Due to their logical flexibilities IoT sensors can be deployed alongside the power electronic components to track their performances. Consequently, using the IoT sensors' information, the actuators are driven to deliver optimal outcome. IoT sensors' information can be sent directly to the central servers in regular intervals to monitor the overall performances of the power electronic components. In addition to the aforesaid applications, several other potential uses of IoT in power electronics include monitoring of critical power grid parameters such as temperature, current, voltage and vibration at different key locations. In this paper, we analyze the use of IoT in power electronic components in the modern power systems.

**Keywords**—Internet of things, IoT for power electronics, IoT for power grids, power electronics 2.0

## I. INTRODUCTION

Modern power systems are large in size and incorporate several heterogeneous components in it. Starting from the generation to distribution to the final consumption a lot of complexities are found in these systems. In the smart grid initiatives many different sources provide power to the grid and the sources are very much different in features and dynamics. The load demands from these power systems are equally complex. Based on the heterogeneity of the structure

and loads these power systems need modern advanced technologies to control and monitor them properly. A lot of power electronic components are used in the modern power systems for the control, protection, measurement and monitoring applications. Traditional power electronic components are not energy efficient and their performances too lag when compared with the modern IoT based systems. Similarly, the electro-mechanical control and protection switch gears are not efficient when compared with the IoT based systems. The power electronic systems of the modern power grids can be made smarter using the IoT based support systems.

Applications of IoT in the power electronic system are very new. This area promises a lot of new initiatives in the power systems. The novel applications of IoT and other sensor based technologies have created a lot of aura in the power electronics [1]. This new artificial intelligence (AI) enabled IoT assisted power electronic systems are considered as a new generation in power electronics. In [2], assistance of IoT in power electronics components are presented with respect to the power system related applications. Energy efficiency is one of the main motivations for the use of IoT in the power electronic systems. In [3], energy efficient version of IoT has been studied which is suitable for all low power wide area (LPWA) applications. It can also be applied for the sensing and other applications in power electronic components. In [4], the major changing trends of the information and communication technologies (ICT) are presented with the focus on economical aspects. It shows that the new generations of mobile communications and the IoT are going to change the global ICT to a large extent. It is expected to be a complex arrangement to provide spectrum to all the emerging networks and technologies such as 5G and IoT [5]. Therefore, new spectrum and unused spectrum are targeted for these emerging applications of the future. In the last few years, several new applications have emerged in the common domains such as logistics and transportation. In [6] and [7], location based services have been presented