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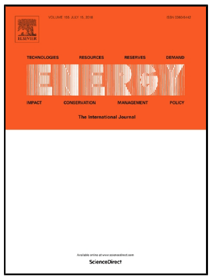

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IMPACT OF LARGE SCALE POWER PLANT CONNECTION ON CONGESTION IN THE ALGERIAN ELECTRICITY TRANSMISSION SYSTEM

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ABSTRACT

In the context of the electrical system, the implementation of a new power plant must be submitted for review so that the economical and technical aspects of the electrical system would not be altered, so far as possible, by this implementation. The conditions set by Directives relating to the electricity company for connecting to the power grid, should also be considered. In addition, the results of the study, made by the network manager, must include feasible solutions for integrating the new generation. This paper gets in sight of the constraints that may occur on the power system after integrating new installation. For this purpose, the Algerian power system was chosen as example to examin the impact of large scale power plant connection on network congestion. The congestion costs associated with this connection are assessed using buy back model. Tow scenarios are considered in order to assess the impact of such power plant on network congestion. These scenarios correspond to the maximum and the minimum of a typical daily demand. The results show that this connection highlights a transmission congestion at the maximum demand level. In order to relieve this congestion, it is recommended to reinforce the concerned transmission line.

Keywords: congestion, impact analysis, power system operating, network, load flow

1 INTRODUCTION

The network ability to ensure the load satisfaction is strongly requiested. It needs to have sufficient flexibility to maintain the load-generation balance at all time with access to the cheapest energy resources. Hydroelectric and gas turbines are typical examples of flexible load-following plants which can rapidly ramp up (or down) supply to balance demand [1]. However, with a high penetration of renewable energy sources, the amount of energy imbalance [2,3] increases relatively due to the inflexible nature of these variable energy sources. Raul et al. who led a study on the feasibility of integrating large scale wind power in the Brazilian Northeast subsystem proved that the high penetration of renewable energy sources might not happen, mainly due to inflexibility constraints in Brazilian power plants and also to transmission limits [4]. Due to the amount of flexible energy required, it is very important to involve the new flexible technologies such as Combined Heat and Power (CHP) and heat pumps in the grid stabilisation tasks, i.e. to secure and maintain voltage and frequency in the electricity supply [5]. Besides flexible generation, many other alternative flexibility sources are considered in [6–8]. Flexible demand and flexible energy storage [8], demand-side management to store excess generation [5]. The interconnection with other areas is also a way to add flexibility to power system. These studies intend to improve the operational flexibility throughout the power system, which is composed by the regional transmission and distribution networks as well as generation units and loads.

However, in recent years a significant restructuring of the power sector has spread rapidly around the world, resulting in the separation of power generation, transmission and distribution activities. As a result, the number of players in the electricity market has increased and competition between electricity suppliers has been introduced. The choice of suppliers is made then on new market structures in which the transmission network operator does not have control and that causes massive power transfers guided solely by an economic logic. These power transfers generate the appearance of