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Power System Analysis of Ughelli- 15 (U-15), 15mva, 33/11kv Injection Substation Network and Data

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Abstract

Frequent power outages of both generating stations and transmission lines in Nigeria Power System ranging from inadequate gas supply to the generating station and frequent tripping of the 33/11kVA lines resulting in too many unplanned outages in the system. In this study, Ughelli 15, 15 MVA 33/11kVA injection substation which comprises 63 substations, three feeder pillars, energy commission of Nigeria (ECN) feeder (29), old road feeder (33), and Beta glass feeder (1) which is also a load point was analyzed, it was discovered that during peak period the highest percentage voltage drop was 21.99%, and at off peak period, 1.79%..

Keywords: Peak, off peak, feeder, substation

1.0 Introduction

Electric power system is the back bone for technological development; if a nation must developinvestment in its power sector which is key for technological revolution [1].The load distributing centers should continually determine the pattern for load planning without violating the power system constraints to ensure efficient reliable and secure power supply to all consumers. Electric power provider try to predict the energy demanded in the future in their areas and develop new generating strategies accordingly, to met with the frequent changes from its consumer's so as to retain its power system stability especially in deregulated electricity markets[2].

Frequent power outages in Nigeria power system led to the deregulation in the power sector, which involves professionals acting in an autonomous pattern and their ownway of doing business, in line with the power sector reform Act of the country. Therefore, in a deregulated system, the available transmission and electrical facilities is highly utilized with large amounts of power transfer through tie-lines. Extensive interconnection of power system in such environment alters the stability of the system making the power system operators to operate closer to their maximum limits, hence,coordination and control functions of the system become more difficult to realize which could lead to power system swing and instabilities during large and small disturbances. Consequently, the system experiences a number of power outages blackouts due to dynamic instability in the system[3]. Deploying Automatic Load Shedding technology at the distribution network level, the swing and instability experience during large and small disturbances in power system can be controlled and managed. Power distribution system is one of the major critical components of the electric power industry. In a power deregulated system, distribution system provides the required environment for competition among power utility participants. Restructuring and deregulation have resulted in unbundling the roles of network stakeholders, Unbundling the power sector in Nigeria has brought new challenges for stakeholders. Stakeholders have different desires and vision from the performance and expansion of their system. Hence, there is no specified pattern for load and power been distributedin deregulated power system due to these uncertainties in power system network, losses in power system can majorly be classified as technical and non-technical losses, Technical losses are caused by internal factors in the power system those cause by external factors are called non-technical losses. The Nigerian electricity grid has buck of transmission and distribution power losses due to the size of Nigeria power system and ageing of power facility, Generally, power system losses increase the operating cost of electric utilities, leading to high cost of electricity provided by both generating and transmission companies, to the customers, and the country at large[4].

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