URN etd-0407109-183718-1438
Author Lai-Fa Li
Author's Email Address No Public.
Statistics This thesis had been viewed 45 times. Download 14 times.
Department
Year 2006
Semester 2
Degree Master
Type of Document Master's Thesis
Language zh-TW.Big5 Chinese
Title Analysis of Key Affecting Factors and Improvement Measures for the Reliability of Power Supply and Power Quality in Tainan Science Park
Date of Defense 0000-00-00
Page Count 128

Keyword
Grey Analytical Hierarchy Process
Power Supply Reliability
Power Quality
Voltage Sag

Abstract
Following the rapid development of Tainan Science Park in recent years, the power usage is growing in the Park area every year. Besides, the production facilities of these high-tech factories inside the Park are highly sensitive; therefore, they are susceptible to factors such as accidents of power supply system and unstable power quality. For providing stable, sufficient, high quality power to satisfy the demand of the factories in Park area and for avoiding production interruption and substantial economic loss because of power supply system accident and unstable power quality, it is imperative for the Taiwan Power Company and other government agencies to expedite the planning and construction of the power supply system facilities in the Park area. Hence, the purpose of this study was to investigate the major aspects and key factors of power supply reliability and power quality, using grey analytical hierarchy process, and address specific strategies for improvement. Study results may help to provide major information on improving power supply reliability and power quality in Tainan Science Park and therefore, benefit the policy-making process in Taiwan Power Company and other government agencies for more effective and sound decisions.
This study began with supply/demand analysis and power supply system accident analysis in Tainan Science Park. Secondly, according to the results of power supply system accident analysis, relevant literatures for the past years domestically or abroad and professional opinions from Taiwan Power Company and Tainan Science Park Administration Offices, we deliberated to look for the significant aspects and factors of power supply reliability and power quality. Then, we proceeded with the hierarchy structural drawing of “Evaluation and analysis of the key factors for Tainan Science Park power supply reliability and power quality.” After expert questionnaire design and survey, we calculated the significance of every aspect and factor in affecting the power supply reliability and power quality using gray analytical hierarchy process; and thus proceeded with the sorting according to the priority of importance. Finally, we focused on the most important seven key factors which influence the power supply reliability and power quality in Tainan Science Park to provide specific and feasible suggestions for power supply businesses (Taiwan Power Company and IPP power plant), industries in Park area, Tainan Science Park Administration Offices and manufactures of power supply equipments and materials.
According to the analysis results in the study, the most important aspect which has effect on the power supply reliability and power quality in Tainan Science Park is “technical operation”; and the

most important seven key factors are as follows: “human errors”, “work negligence”, “reinforce the supervision of construction”, “establish important dual-loop power supply capacity”, “equipment defect”, “improper design”, and “lack of improvement equipment”.
Based on the above-mentioned seven key factors, we proposed the following important, specific and feasible strategies for improvement:
1. For Taiwan Power Company: (1) For avoiding “human errors”, education and training for the power supply system operating personnel on duty should be emphasized and standardized operational procedures should be implemented; accident drills should be held at least once every year for preparing both of power supply businesses and industrial subscribers. (2) For avoiding “work negligence”, maintenance staffs are required to be familiar with maintaining the function and operation of the facilities in the factory. Proceed with maintenance tasks based on system maintenance manual and standardized operational procedures for safety precaution. (3) For reinforcing the supervision of construction, it is required to send personnel to supervise power supply transmission and distribution. (4) For establishing important dual-loop power supply capacity, build dual-loop power supply capacity in SanFuKe substation in the Park area and individual independent dual-loop power supply for high voltage users (161 kV). (5) For avoiding the accidents caused by “equipment defect”, examine and maintain power supply facility periodically, and keep files for relevant maintenance records; establish a system for reserving components or spare parts of the facility and equipment for urgent repair in emergency; develop measures for updating major facility of power supply system so that the defective, outdated with insufficient capacity can be replaced. (6) Enforce strict regulations on power system designers to follow the design standards and related laws rigorously, to prevent the occurrence of accidents due to “improper design”. (7) Upgrade the stilted power lines in the park into underground power lines, to prevent voltage sag due to natural disaster or contact with foreign objects.
2. For IPP power plant: Same as the (1), (2), and (5) suggestions for Taiwan Power Company.
3. For the industrial subscribers in the Park area: (1) For avoiding the accidents caused by “human errors”, implement measures of power supply system operation and maintenance; improve on-the-job training for electric operating staffs; and require certification of all personnel for promoting the quality of staffs.(2) For avoiding accidents caused by “work negligence”, except the second suggestion for Taiwan Power Company, it is strictly forbidden to allow uncertified staffs to operate or maintain equipments. (3) For avoiding accidents caused by “equipment defect”, same as the suggestion. (5) for Taiwan Power Company. (4) For improving the problem of voltage sag, it is suggested to use commercialized voltage sag improvement equipment.
4. For the Tainan Science Park Administration Offices: (1) For avoiding the accidents caused by “ human errors”, provide assistance to conduct certification test for the electric operating staffs of industrial subscriber in the Park area so that the certification system can be implemented and the quality of electrical operating staff can be promoted. (2) For avoiding the accidents caused by “ reinforce the supervision of construction”, it is required to notify Taiwan Power Company for sending people to assist the supervision when the contractors or industrial subscribers are working on the construction under (on the side of) the transmission or distribution electric wires.
5. For the manufacturers of power supply equipments or materials: (1) For avoiding the accidents caused by “equipment defect”, improve testing and quality control procedures to assure quality before the products leave the factory. (2) Develop contingency and back-up plans for emergency situation so that the clients can be prepared and provided with reserved parts for urgent repair in critical condition to ease off their loss.
Advisory Committee Jung-Hsiang Yen - advisor

Files etd-0407109-183718-1438-001.pdf

indicate access worldwide

Date of Submission 2007-07-04