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碩士論文

風力發電系統對汽電共生廠
之影響分析

**A Study of Effects of Wind Turbine Generator
on Cogeneration System**

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摘要

本論文主旨在探討風力發電系統對汽電共生系統的影響。文中選擇以新竹科學園區的汽電共生廠作為研究對象，建立汽電共生系統之發電機、激磁系統、調速系統的數學模型和相關參數，並使用 ETAP 模擬軟體來建立電力系統架構，在廠內不同的負載情況及台電系統發生故障時，分析系統電壓降及暫態穩定度，並由分析結果設計聯結線的保護電驛，使得在不同的操作模式下能確實解聯。解聯後的汽電共生廠，為解決因發電量低於負載需求而導致的機組跳脫，甚而致使全廠停電而遭受重大損失的問題，需制定一套完整的卸載略策。本論文則藉由汽電共生系統，解聯後計算其初始頻率變化率，來決定負載應卸載量，以避免因變動迅速的負載而致使判斷失誤，導致不正確的卸載而使得廠內電力系統崩潰。此外，針對不同風機併網位置及數量，探討對汽電共生廠匯流排電壓變動影響，模擬結果可作為評估風力發電機併網可能對系統造成衝擊與影響之參考。

關鍵詞：汽電共生、風力發電、暫態穩定度、保護電驛、卸載、解聯

Abstract

The major purpose of this thesis is to investigate the effect of wind power generators connected to cogeneration system. This thesis selects a cogeneration plant in Hsin Chu Science-Based Industrial Park for case study. The mathematical models and the relevant parameters of the generators, exciters, and governors in the cogeneration system are firstly established. The power system scheme is then built using ETAP package software. For different load conditions in facility and fault occurrence in Taiwan power system, the voltage sags and transient stability are analyzed. The results of the analysis can be used to design the protective relays of tie line so that it can make sure the tie line tripping under different operation modes. To overcome the generators outage due to the generation power of the cogeneration plant is less than the load demand after the tie line tripping, we need to make a complete load shedding strategy. In this thesis, the initial frequency rate of change can be calculated at the moment of the cogeneration system tripping to determine the amount of unloading. The rapid load changes resulted in misjudgment will be avoided to prevent the power system from collapse due to incorrect load shedding. In addition, different amount and locations of wind turbine generators connected to grid are examined to analyze the effects of bus voltage variations in cogeneration plant. The results of this study can evaluate the impact and effect of wind turbine generators connected to grid for this system.

Keywords: *Cogeneration, Wind Power, Transient Stability, Protective Relays, Load Shedding, Disconnection*