Impact of precise Modeling of the fuel consumption curve of a Combined Cycle on the economic operation of an Island Power System

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A B S T R A C T

Combined Cycle Units (CCGTs) are characterized by quick response and start-up, high power density and both, higher efficiency and flexibility, compared to other Conventional Units. However, their fuel consumption modeling for use in Economic Scheduling functions is not an easy task due to the correlation of production among the Units comprising the CCGT Unit. This paper presents various methods for modeling the fuel consumption curve of a Combined Cycle Unit on the autonomous Power System of Crete/Greece. The most precise method is based on real-time measurements, not only of the power production of each of the Units in the Power System, but also of oil flow. The impact of a more precise fuel consumption modeling of the CCGT, when compared to modeling based on mere statistical data on the operating cost of the Power System of Crete, is evaluated using actual hourly operating data and an Economic Dispatch algorithm. The analysis reveals that the improved knowledge of the fuel consumption curve of the CCGT obtained with actual data as opposed to statistical ones, combined with improved economic scheduling functions, can result in significant economic benefits within a single year, much higher than the required infrastructure cost for obtaining oil flow measurements. Hence, the requirement for actual oil flow measurements is proposed to be incorporated in the Grid Codes for more efficient operation.