

DETERMINATION OF LOSS - OF - LOAD PROBABILITY (LOLP) BY
CONSIDERING THE EFFECTIVE FORCED OUTAGE RATE (EFOR) OF
WIND POWER PLANTS

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ABSTRACT

Wind energy plays an important role in the growth of installed power generation. Due to an increase of power demand and limited power generator in most countries, wind power plants can be used as an alternative for future electric supply. However the variations of power generation due to wind uncertainty do not typically recognize. Most of the wind generator models provide an accurate representation of output power, but do not incorporate any probabilistic assessment of whether the given level of wind power will vary from its expected value due to the uncertainty of wind velocity. This is important to find more accurately the optimum power supplied by the wind power plants. This paper presents the sliding window technique (SWT) that used to determine the effective forced outage rate (EFOR) of wind power plants. Then, the EFOR is used in the determination of loss-of-load probability (LOLP) in order to measure the reliability of wind power system generation. The determination of LOLP considering the wind power generation is verified on a modified 24 Bus IEEE reliability test system.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

In recent years, the exploitation of renewable resources for electric power supply has considerably grown which is motivated by economic and ecological interest and also demand. Nowadays, there is a trend in the utilization of new wind power plants in which the world installed power generation increases from 6200 MW in 1996 to 17706 MW in 2000. It is expected that in 2010 it will exceeds 92000 MW. A massive development of wind power generations is focused more on the industrialized country such as United State, Europe, Germany, Spain and Denmark [1].

In Malaysia, the potential for wind energy generation depends on the availability of the wind resource that varies depending on the location. The right location for installing the power plan is still under investigation. They are only one location in the island of Sabah which utilizes the wind generation that provides electric power supply. The wind generation produced significant output energy of 150 kW. The study was conducted by University Kebangsaan Malaysia (UKM) in the year 2005 and results have shown that a 150 kW wind turbine in the Terumbu Layang-Layang demonstrated with some success in providing effective electricity supply [2]. Moreover, it is explained the wind energy conversion systems have great potential in attracting the tourist in Malaysia.

As the development of wind power is continuously expands therefore, the reliability analysis of wind power generation should be conducted to determine whether it is adequate to provide electricity supply. This thesis explained on the sliding window technique that used to calculate the expected force outage rate (EFOR) of wind power plants. The EFOR for every hour is