

The Effect of Economic Benefits in Pool Based Market Model

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ABSTRACT: Nowadays, electricity is an important input in the modern economy. Therefore, enhancing its electricity supply industry is necessary to become more straightforward and productive with competitive environment. Under wholesale market model, the pool model is recognized as a conceivable and transparent, also is amongst the most preferred electricity market model. However, there are issues on the benefit of the generators involved. Hence, the economic analysis is performed to highlight the effect of generation revenue to demand assessment in pool based market model. Therefore, each generator's revenue involving 24 generators around Peninsular Malaysia under hybrid model, pool hybrid model and spot market model is conducted. Results have shown that the pool hybrid market ensures the intermediate value of generation revenue and decreased the demand payment.

Keywords: *Capacity payment, Electricity supply industry, Pool market,*

1. INTRODUCTION

In Malaysia, the demand and supply have expanded very rapidly [1]. In the tenth Malaysia plan, the increasing of renewable energy (RE) application from 1% in 2009 to 5.5% of Malaysia's total electricity generated by 2015 as expected with the overall cost for a particular RE technology will decrease gradually as its technology is becoming easier and cheaper [2]. However, according to the plants' retirement schedule, the total installed capacity stood at 21,954 MW, but reduced to 20,909 MW by the end of 2015 with a reserve margin hovering above 25% for the first half of the year [3]. Several plants retired from the system in the following half of 2015, causing the reserve margin to reduce in October and November to 20% and 22% respectively. However, the minimum requirement for operating reserve of 2,600 MW was met 94% through the year of which the generation capacity was sufficient with a Loss of Load Expectation (LOLE) of 0.8 day/year [4]. Due to volatile fuel prices and independent power producers (IPP) payments, as well as earnings below cost of capital, future challenges might expense the cost of supply and subsidy [5]. Therefore, to accommodate a fair competitive trading between power producers and all involved parties especially to the IPPs, the pool based market model could be applied as an alternative

electricity market model.

The aim of this research study is to improve the pool based market model, in order to enhance efficiency and to promote competition in order to lower costs. The major objective of the paper is to show the effect of generators revenue to demand payment, which involving the pool based market model, i.e., hybrid model, pool hybrid model and spot market model. Emphasis is placed on 24 generators around Malaysia with combined cycle gas turbine (CCGT), thermal and open cycle gas turbine (OCGT) power plants. The results are documented in this paper, which can be some form of guide and help in assisting new policy set out, also for further research works in dealing with this crisis.

2. METHODOLOGY

The various plant types, open cycle, thermal, and combined cycle were selected for 24 generators around Malaysia. The data including the MW installed capacity; energy prices, capacity prices, and efficiency of the generators. Based on the data, the load profiles, the generation curves and the thermal efficiency of TNB and IPPs generating plants, the generators revenue are calculated according to market model; hybrid model, pool hybrid model and spot market model. Based on the generation revenue, the demand assessment is determined and analysed. The generators bid the same prices in 24 hours. However, due to the monetary values involved in this paper are confidential, estimated values in used instead.

3. RESULT AND DISCUSSION

Fig. 1 (a) and (b) show the generation revenue for each of the IPP involved on Wednesday and Sunday according to hybrid model, pool hybrid model and spot market model. Fig. 2 shows the total generation revenue for each of the market model involved. Based on Fig. 1 and Fig. 2 the analysis of the demand side investigation on Wednesday and Sunday are conducted.

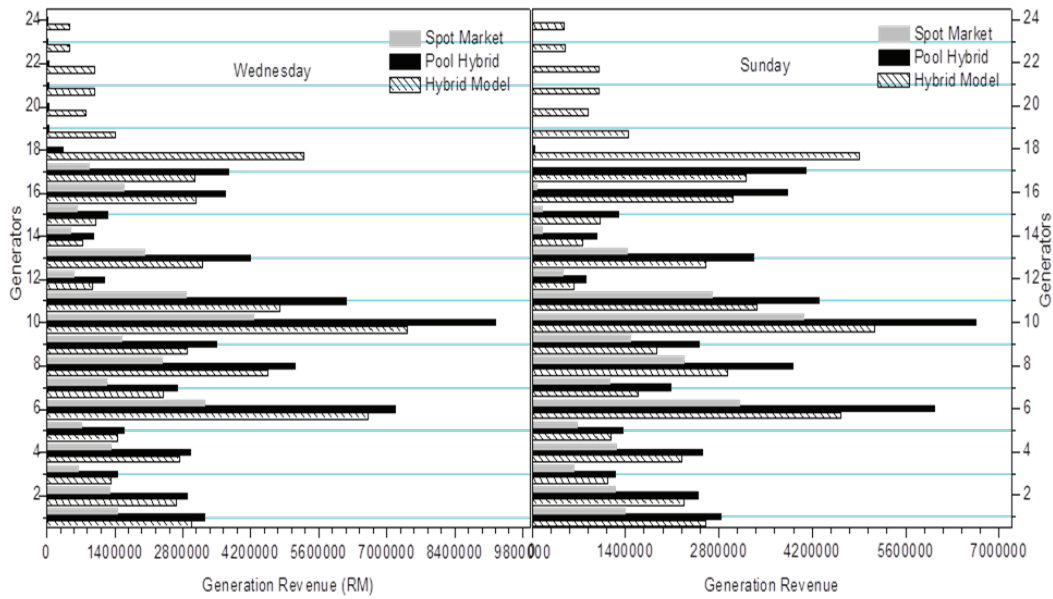


Fig. 1: Comparison of generator's revenue for (a) Wednesday and (b) Sunday

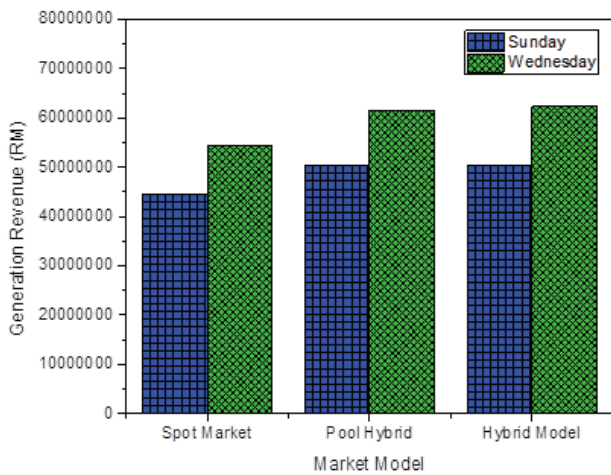


Fig. 2: Comparison of total generation revenue on Wednesday and Sunday.

4. CONCLUSION

Total generation revenue for pool hybrid model is lower than hybrid model. Generator's revenue for low and medium price generator decreased compared to hybrid model due to changes to minimum generation capacity payment based on efficiency of the generators. It is more fair to all the generators involved, whether their loose or win in bidding but still get the remuneration. Therefore, the expensive generators still get the revenue to cover their variable costs. However, the base load sharing approach increased the capacity used of the base load plant to fulfil the load demand, which offer cheaper prices of energy. This situation helps in reducing the demand payment, even though the spot market is the lowest demand payment, but did not guarantee reasonable income for low and medium price generator. Still, the expensive price generators can receive their revenue through remuneration from minimum generation capacity payment and bidding in pool based on energy bid during remaining capacity in high demand.

Consequently, the pool hybrid market is able to provide for competitive and effective environment with efficient electricity supplies.

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