New electricity trading arrangements economics essay

Economics

ABSTRACT

Bilateral contract market is one in which a sales contract is formed between the generator and the supplier (buyer) without having a third party as facilitator although there is a market operator that regulates the market activities, and also assists in the standardisation of terms and policies. Bilateral contract always places more emphasis on supplier involvement that determines on when the generator runs. Electricity markets are opening to competition in nearly all International Energy Agency countries. Most IEA member governments have implemented laws to liberalise wholesale electricity markets and allow at least some of the large consumers the opportunity to choose suppliers, to permit electricity generators and consumers to have non-discriminatory access to transmission and distribution systems, to liberalise electricity trading on a bilateral basis and on organised exchanges, and to allow for free entry of new producers, on non-discriminatory conditions. This paper will use descriptive analysis method to examine if bilateral contract can help in solving electricity crisis in power shortage capacity countries than any other form of trading power in a liberalised market.

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LIST OF ABBREVIATIONS

CEPMLPCentre for Energy, Petroleum, Mineral Law and Policy

CfDsContract for Differences

CPCapacity Payment

IEAInternational Energy Agency

LOLPLoss of Load Probability

NETANew Electricity Trading Arrangements

PIPPool Input Price

PPAsPower Purchase Agreements

PPPPool Purchase Price

PSPPool Selling Price

SBPSystem Marginal Price

SSPSystem Selling Price

UKUnited Kingdom

USUnited States

VOLLValue of Loss of Load

INTRODUCTION

The electricity industry comprises of many activities which include Generation, transmission, distribution, and metering[1]. Traditionally, the industry was made up of vertically integrated organisations[2].

In 1980 Liberalisation system was introduced into the electricity industry, and many countries have now removed vertical integration, for instance many EU countries have followed the UK's way and have introduced comprehensive electricity sector liberalisation methods[3], and restructured electricity production around markets[4].

In 2006, Joskow proved it is preferable to say when electricity is restructuring and competition activities are arranged and implemented adequately, then the performance of the electricity sector, for instance operating costs, generator availability, physical network losses, theft of service, investment, availability of service, price levels, quality of service etc., can be expected to greatly improve compare to individual regulated vertically integrated monopoly or the notable state-owned, although this fact is not totally assured because some regulated vertically integrated monopolies do perform better, and all these depends on the expectation of the policy makers[5].

Liberalisation systems allow each activity in the electricity industry to be separated, and this can easily allow competition, which is one of the key aims of liberalisation[6], [7]. Liberalisation should create prices that will not discourage investment and encourage wasteful electricity consumption[8],[9]. Some of the aims of liberalisation in the electricity sector is to keep the electricity prices low while doing away with power failure/shortage, and to organise trade between electricity generators and buyers in the wholesale market. Many power shortage countries are having problems attracting investors who can generate electricity that will match the demand due to the fact of lack of assurance of a constant cash flow that can back up a investment[10], and can the bilateral model give a best solution to capacity shortage country and also is this the best option to trade power in a liberalised electricity market?

The bilateral model has a more market oriented structure that allows more activities between the generators and buyers, for the determination of electricity prices at the wholesale stage; determination of when the generators can increase or reduce or stop production/generating (dispatch and scheduling); the period of generation imbalances i. e. demand excess or shortfalls; and other constraints that can affect system stability as a result of transmission capacity[11].

This paper uses the descriptive analysis method to address the above question in this order:

Chapter one has given the introduction,

Chapter two presents descriptive analysis of how bilateral trading operates using market rules and structures;

Chapter three gives the descriptive analysis on how an electricity pool can replace the bilateral contract using market rules and structure,

Chapter four present analysis on how both models differ in market rules and structures;

Chapter five examines the England and Wales electricity industry experience i. e. transition from pool to a bilateral model;

Chapter six gives the conclusion of the research paper.

What is bilateral trading?

The bilateral trading system involves buyers and generators (many customers and suppliers) entering into bilateral contract whereby the trading parties (a buyer and a seller) typically negotiate a set of master terms and conditions that form the basis of trade between them[12]. Once the master agreement has been finalised, electricity trading can then commence on contracts of any length[13]. The contract specifies the amount and price of electricity to be traded and when the trading will take place[14]. Bilateral contracts place greater emphases on supplier involvement who determine which generator runs[15]but does not always occur. Intermediaries can also facilitate trading between sellers and buyers[16]. The England and Wales electricity market has been the New Electricity Trading Arrangement (NETA) since 2001, and this is a type of Bilateral trading market.

2. 10How does Bilateral Trading Operate?

Bilateral trading works in this way- A seller and a buyer i. e. the trading parties negotiate a set of master terms and conditions that serves as the basis of trading between the parties, and once the master agreement has been finalised, then electricity trading can start on contracts of any length[17].

A bilateral contract can operate on long-term contract, which is used to back the investment. This contract is the main contract upon which the investing decision is made, for instance 20 years contracts. It guarantees cash flows for that period. It sells capacity i. e. what the power station is physically capable of producing if it were running non-stop[18].

The medium-term contract is used to deal with market share fluctuations. Using the medium term contract the supplier is able to address things like growing his market share[19].

The short-term (day ahead) contract helps the buyer to provide more indication of his electricity requirement. The generator can then match this nomination as closely as possible[20].

The balancing market term contract (in-day) is almost an instantaneous balancing of the market. These four contracts are responsible for the total outcome of delivery of electricity where and when it is needed[21].

The contracts indicate the price and amount of electricity to trade and when the trading will take place. Before gate closure, at an agreed time before delivery, the system operator will require all participants to disclose their net sales and purchases in order to facilitate the market system[22]. Each day, the participants advise the Independent Market Operator of their bilateral contract position, make bids to buy and offer to sell electricity in each trading interval on the following day relative to their bilateral position. The Bilateral contract and Short Term Energy Market (STEM) processes determine the quantity of electricity that will be provided by each generator in each trading interval[23]. The Independent Market Operator prepares forecasts of the quantity of electricity that it expects consumers to use on an annual basis over the next ten years[24]. The Independent Market Operator then determines how much generator capacity is required to meet this demand and provides an adequate reserve margin to cover plant outages or other contingencies[25].

The generator then decides when to dispatch while the system operator helps to manage any imbalances that could occur. However, since the Independent market/system operator does not has any capabilities in order to generate and balance the system, there must be a way to amend/pay for any imbalances[26]. There are two ways in which the Independent system operator can adjust for the imbalances- a punitive price or a market price. Many factors hinder the market adopts option and this includes the cost of maintaining security in the system. For instance in Norway, where electricity is produced through relatively less expensive hydro plants, and a huge volume of the power is being sold through contracts while some being sold in spot market, whereby the price from spot market helps to settle the imbalances. This is different in England and Wales (under NETA) where they penalise any shortfall imbalances and also reward surpluses using a dual pricing method[27].

The Independent system/market operator auctions right of transmission in order to manage congestion[28]. The auction helps to resolves who the user of the transmission system is and the price to pay[29].

Bilateral contracts can exist side by side with electricity in a forward market. This does not involve physical delivery of electricity in a standardised contracts but rather mainly financial in nature. The trading of the contract can last from six months to fifteen years ahead[30]

How can electricity pool replace bilateral contract?

What is Electricity Pool?

An electricity pool allows competition between the generators and the actual price paid for electricity supply by the buyers. All the participants i. e. generators, markets operator, system operator, suppliers, buyers etc. are important signatories in the pooling agreement which guide the activities of the pools[31].

A pool can either be voluntary or compulsory pool. A gross or compulsory pool involves all generators, excluding the smallest generators to sell their output at the pool price in the pool market while in a net or voluntary pool; the supplier/generators can make use of bilateral contract to trade with the buyers for the delivery of power/electricity supply while the system operator is accountable for scheduling[32].

In Electricity pools, it is expected for generators to present bids showing how much electricity they can generate in a pool at a given pool price. The generators are not restricted to a particular price (price-based pools) but the bid price could be structured on predetermined variable costs i. e. cost-based pools[33]'[34].

A pool can be one-sided or two-sided. In a one-sided pool, the market operator assumes/predicts demand and then dispatches generators against the demand prediction without input from any buyers but in a two-sided pool, the market operator will dispatch depending on the quantity of electricity demanded by the buyers on the demand curve of those buyers[35].

3. 1. 1How can A Pool Operate?

Electricity pools do operate on the same fundamental principles[36]. The UK Model i. e. England and Wales power pool 1990-2001, has been the leading example that has influenced many countries in Latin America, Europe and Asia towards reforming processes[37].

Pools mostly operate on an interval basis for instance hourly, where the generators will compete to meet the demand per hour. This shows that in a day there will be 24 different periods for pool markets. The demand curve and the ability of the system operator in handling the administrative workload/burden will determine the number of separate markets that a pool could have[38].

A pool could have many combinations such as intraday, close to real time on spot market and day-ahead[39]. In a compulsory pool, the generators will submit bids for delivering/supplying a specific volume of electricity at a given price, mostly a day ahead. The independent market operator will accept these bids, and then start bidding with the cheapest bids until the market demand forecasts are achieved. A generator is ‘ in merit’ if his/her bid is successful and ‘ out of merit’ when such bid is not successful[40].

The Independent system operator will then use a computer programme to generate a schedule on the least cost generation that will be used for the trading day. This is known as ‘ unconstrained schedule’ because it predicts/assume that there will be no constrains during the transmission of electricity[41].

There are many issues like the unavailability of ‘ in-merit’ generators, errors in demand forecasts etc, that the independent system operator can influence and capture into his/her unconstrained schedule that can be used to prepare constrained schedule[42]. The independent system operator always regulates these system/schedules in order to control any imbalances, ancillary services and congestion[43].

The followings make up the final price that will be paid to a successful generator[44]:

System Marginal Price (SMP): This is the highest successful bid price or Pool Input Price (PIP)[45]. It is also known as the bid price for the marginal unit or most expensive supplier/generator, which is used to meet the forecasts demand by independent market operator forecast in the market period[46].

Loss of Load Probability (LOLP): This is the payment to generators in recognition of their contribution to system integrity. In countries where there is a large excess generation capacity, the LOLP is likely to be smaller but in systems with regular capacity shortages, and blackouts, the payment tends to be higher. It is part of the signal as to whether new investment is needed[47].

The Value of Loss of Load Payment (VOLL): This is an estimate value to consumers[48], the maximum price allocated for meeting the electricity demand by the supplier[49]. The VOLL allows plant built in crucial locations to be rewarded because given the transmission constraints, and the diverse location of demand centres, it is inevitable that some generating plants will be seen as more valuable to the electricity supply industry than others[50].

Capacity Payment (CP): This is paid irrespective of generators production provided there is capacity availability. It could fall whenever system capacity is more than demand or rise when there is a shortage[51].

Many Generators will bid as low as possible even to the point of zero in order to remain in merit, and where this occur, the Generator is taking the risk that others will not, or that he has a financial hedge through what is known as the Contract for Differences (CfD), a separate arrangement made with the supplier that he will pay a certain amount for the power giving the generator his legitimate (price) expectation. This is to avoid the risk of the pool when bidding is low. Where the PIP is lower than the hedge, the generator will get the hedge. The generator who establishes a hedge and bids zero will receive the hedge plus the VOLL and LOLP[52].

Using the UK model, the total amount of CP and SMP is calculated as LOLP x (VOLL-SMP) which results to Pool Purchase Price (PPP), and is always calculated before the actual trading day. The inclusion of the uplift payment into PPP will produce the Pool Selling Price (PSP). Pool Selling Price is the price that the buyers paid to the generators. Uplift payment will cover the cost of transmission such as any losses during transmission system,

and this is difference between unconstrained schedule and cost on the trading day[53]'[54]

3. 1. 2Contract for Differences

The daily fluctuations in demand for electricity in a pool market causes alteration in the price of electricity from one stage to another[55]. Volatility in price is what the sellers and buyers always want to hedge against through bilateral contracts known as Contract for Differences (CfD). The seller and buyer agree on a particular price i. e. strike price, and volume in the CfD. In a situation where the pool price is higher than the strike price, then the seller will pay the buyer for the difference meanwhile the reverse is the case i. e. in a lower situation, the buyer will have to pay the seller for the difference[56].

4. 0How both models differ in market rules and structures?

The features of both market styles indicate some advantages and disadvantages. It is proven that the primary functions of pooling system will usually be needed in one stage or another. One of its key benefits is the ability to provide a market for suppliers/generators who are unable to sell their output through contract to a particular customer or who are seeking for market for more/excess production[57]meanwhile bilateral trading gives more chances for sellers and buyers to trade power/electricity without limiting/restricting them to a particular way[58].

This section examines the conceptual/main differences that occur between pooling and bilateral trading using two modes-market procedures/rules and market structure[59].

4. 1. 0Differences in Market and the role of the independent system operator

The electricity pool and bilateral models differ conceptually in structure. The electricity pool is a greatly centralised market in respect of dispatch supplier/generators and central scheduling whereas bilateral model is decentralised and require self-dispatch. The independent system operator in the pool uses the merit order to dispatch supplier/generators in a lowest cost system but the independent system operator in bilateral system is restricted/constrained in scheduling through the contract price bargain and volumes between the buyers and generators[60],[61].

Both models have a clear role of the independent system operator. The system operator needs adequate information and necessary infrastructure that can help towards maintaining system stability.

4. 1. 1The Role of Contracts

The contract role in dispatching and scheduling of both model differ. In pools, the contracts that operate between the market participants are mainly financial where market participants use this to cope with their financial risk. The independent system operator does not put this into consideration when dispatching and scheduling generators whereas bilateral trading uses contracts as the key instruments through which electricity can be traded. The independent system operator needs to use contracts in dispatch and scheduling process[62].

4. 2Differences in Market procedures and rules

4. 2. 1How to determine the price of electricity in Wholesale

A market is formed whenever there is an arrangement that allows supply to meet demand at an equilibrium/require price. Using this context, then, electricity pool cannot be seen as a market because buyers do not get involved in the process of determination of price and setting of price in a pool will not significantly alter electricity demand[63]. Bilateral model gives a good approximation of market because sellers and buyers are needed in the trading activity.

Under a pooling system both successful bidders and buyers paid a single price that is determined by the pool. As the demand changes, the price also changes throughout the day. Market participants use some hedging instruments, for instance CFDs, to cope with volatility in price. Prices in bilateral system are bargain between a seller and a buyer and this is less volatile compare to electricity pool[64].

There is also a high probability that the independent system operator can impose price caps in a pool mostly during capacity shortage or where we have limited or absent of demand response[65]. The chances of this happening in bilateral trading is very low.

4. 2. 2How to deal with Imbalances?

It is essential for all electricity systems to be balanced at any interval in time in order to maintain stability. In a compulsory pool every generated power and consumed power is taking as imbalance and these are put in final pool price[66]. Spot market can also be an imbalance market. Under bilateral trading, the independent system operator will have to sell and buy using a different balancing market in order to support system stability[67]'[68].

Under pooling, it is very economically and easier to manage congestion but this is complex in bilateral trading[69].

Pool easily integrates imbalances in pricing, management of congestion, and ancillary services together with spot market but the bilateral trading system always wants separation of market activities for those services[70].

Wales and England electricity industry experience i. e. transition from pool to a Bilateral model

Most of the electricity markets have introduced centralised models or use forms of pools in their liberalisation systems[71]. Under the traditional organisational system of electricity industry tight coordination through centralisation can be adopted in the early stage of electricity markets. This focuses on security of electricity supply in a liberalised organisation[72].

The successes that are designed around pooling model in electricity market have reduced worries about security of supply and have enabled the policy makers to start thinking about the demand-side. The designs of electricity market now start to adopt bilateral model and this gave generators and buyers the liberty to trade through contracts[73].

In 1990, the power pool in England and Wales was established and this was the first main attempt towards introducing market for electricity generation. This has created a lot of awareness and serve as a driving force that shape the process of electricity liberalisation in many countries in the world[74].

The difficulties that were experienced in the pool caused the regulatory review of the market and this led to practice of bilateral contract model under the New Electricity Trading Arrangements (NETA) in 2001[75].

The experience of England and Wales served as the first reform of an existing electricity market[76]and this serves as a good reference point for examining the change from pooling model to bilateral model.

Moving Away from Electricity Pool

The Challenges that are encountered by the Electricity Pool

The Pool has faced many critics and one of these is the level of market power that was exercised by the generators[77]. There was an argument that the creation of the pool led to a duopoly system where the two main generators will determine the electricity price for 90 percent of the time[78]. They were known to have misused their market power in determining the pool prices especially in situations where they increase prices instead of price reduction[79].

The pool was mainly a one-sided pool that focused only on the supply-side. This proved that in price setting, there was no input from the demand–side. This made the electricity purchasers to criticize the nature of the one-sided pool as its neglects their needs. The electricity purchasers also argued that the prices were very high and volatile[80].

The pool rules also provide the basis for trading through an auction system that can be used in determining the spot price of the electricity[81]. The generators will send in many bids in order to supply electricity in the pool market on the next day meanwhile the price of electricity in each pool market is being calculated with reference to the bids that are determined to be in merit. In actual practice, the price calculation and bidding rules were not transparent and very complex. This condition, together with non-firm nature of biding will result in incidences of rule gaining and manipulation[82],[83]

The opponent in pool system also brought other critics against administration on how the capacity payment is being estimated. These opponents felt that VOLL and LOLP should not be part of a competitive market. They opined that the capacity payments only rewards loses by giving an incentive that allows the generators to remove plants from the market shortages rather than encouraging new generation as it ought to do[84],[85]. In order to move away from the pool, there must be changes on how the market was designed as well as the operational guiding rules of the market and the action taking by the market participants.

Transition to National Electricity Trading Agreement (NETA)

Under the provision of NETA, the electricity market was able to move from centralisation to being more reliable. There was no existence of centralise market prior to real-time. This market encourages generators and buyers to trade electricity directly without actual involvement of the system operator. This arrangement makes it easier for sellers and buyers to plan on the network and also gives room for generators in determining when to produce electricity i. e. self-dispatch[86],[87].

Likewise, NETA ensured that the auction rules that determined the uniformity of pricing system under the pool was removed and gave more attention to those auction rules that are under NETA, and auctions under the balancing mechanism. The balancing mechanism is done by the system operator and this aims at maintaining system stability by making sure that markets participants pay for their shortfalls or paid for excesses[88].

Balancing mechanism uses dual pricing principle to pay for imbalances. The market participants (i. e. generators, traders, suppliers and other large consumers) pay for or are paid for those imbalances. Participants that are running on deficit, for instance those generators that supply less, and those buyers that consume more than the agreed contract volumes will have to pay the System Buy Price i. e. SBP. Whereas, those participants that are running on surplus, for instance those generators that generate more than what the buyers can consume and those buyers that consume less than the agreed contract volumes will pay the System Sell Price (SSP). The SSP is mostly lower than the SPB in order to allow market participant not to rely on the system operator for balancing[89],[90].

Has Transition been really effective?

The reducing price and advancing competition can be used to determine the success and effectiveness of the transition from Pool to National Electricity Trading Agreement (NETA).

In 2001 when NETA started the number of generators increased to 35 compared to 6 during the pooling system, and this caused a higher reduction in market concentration[91]. Likewise, 8 suppliers have replaced the 14 regional electricity supply monopolies[92], and the liberalisation of retail market that occurred in 1998 enabled these suppliers to operate and compete across every phases of the market[93].

Before NETA implementation, many generators changed from the costly coal-fired plants to a more economic combine cycle gas turbines, and this had a direct consequence of the price of electricity. The price of wholesale electricity was reduced by almost 20 percent from their 1998 system (when the expensive coal contract was ended) and had also reduced further by 25 percent in the first year of National Electricity Trading Agreement, but however, the prices of wholesale electricity can still rise due to increase in the wholesale price of gas[94],[95],[96].

The market also has a greater assurance of security of supply, for instance from few years before NETA and until about 2002, there was an average of at least 20 percent of generating capacity that are over the expected demand. Likewise, reduction in wholesale prices has also caused generators to withdraw capacity, and through generators involvement the potential challenges was averted[97], meanwhile this creates risk for those industries that were minimised under pool systems.

Conclusion

Bilateral trading and Electricity pool system are the two conceptually different types of electricity markets designs. One is a decentralised system that ensured more interaction between the demand and supply network while the other is totally centralised and focused on encouraging more competition between generators.

In asking the question on whether Bilateral trades is superior to Electricity pools or vice versa, there is no clear answer as each of them has its weaknesses and strengths, and likewise different countries have used both market models to address certain issues that were noticed in a specific market at a different situation. It does not matter which model an electricity company uses provided that there is a constant supply. Any of these options can easily be used in by any country for electricity supply for instance the pool models uses Loss of Load Probability (LOLP) which is what is paid to generators in recognition of their contribution to system integrity. In countries where there is a large excess generation capacity, LOLP is likely to be small but in systems with regular capacity shortages, and blackouts countries, the payment is likely to be higher and this could serve as a good motivator for Electricity investor in such a country[98]but however every investor will want a standard cash flow that can back up the investment for instance the long term contract, ability to dispatch, adequate management of imbalances, and a constant flow of revenue. All these are provided by bilateral models[99]and this made Bilateral model the best choice for future power generation in a capacity shortage country.

This study have some limitations such as: it was unable to examine conditions where bilateral trading and electricity pools are traded side-by-side, just as it is in the case of NordPool. Also, it was unable to examine a situation where there was a transition from Bilateral to Pool model.

All these limitations can serve as catalysts for further research.

Things to do base on the comment of Markers/Lecturers that mark my last paper: 1) Structure: This must show argument question and theory to use in the introduction, good conclusions and recommendations. From my last paper, the lecturer indicated that the main body of my report needs restructuring, and avoid dealing with complex issues.-the report doesn't seem too complex, but I'm not sure if it might be considered complex based on the guidelines for the report. However, it appears very straightforward at this time. 2) AnalysisPls help me to check if this new paper shows that. 3) Use of information/sources: this must support the discussion. I did it right in my last paper but pls check if this does that.- I do see your references4)Pls help me to check if I address/answer the question that I pointed out in my introduction.- yes, you did, my comment has to do with the point of introduction of the bilateral method in the introduction, if you can move it up ie introduce it earlier while talking about liberalisation. However, its still ok if you leave the introduction structure as is.

NB: The above points are what lecturers/markers look for, also this is not a business report, it is a law paper. The topic is Downstream Policy and Law.

FULL REFERENCE

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