UNIVERSITY OF PETROLEUM & ENERGY STUDIES

CENTRE FOR CONTINUING EDUCATION

DISSERTATION

FOR

POWER MARKET SCENARIO IN INDIA

BY

ABHISHEK KUMAR SINGH

SAP ID: 500024875

Guided By

AMAN JOSHI

DIRECTOR

FIDATO CONSULTANTS PVT. LTD.

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Signature
Name of the Student: ABHISHEK KUMAR SINGH
Residential Address Vill: Gamhriya
Dis: Madhepura, Bihar 852114
Mobile No: +91 7567621719
E-mail : singhabhishek176@gmail.com

Date:20.10.2015

Place:Delh

FIDATO

FIDATO Consultants Pvt Ltd

Date:6-10-2015

Declaration by the Guide

This is to certify that the Mr ABHISHEK KUMAR SINGH, a student of (POWER MANAGEMENT), Roll No 500024875 of UPES has successfully completed this dissertation report on **"POWER MARKET SCENARIO IN INDIA"** under my supervision.

Further, I certify that the work is based on the investigation made, data collected and analyzed by him and it has not been submitted in any other University or Institution for award of any degree. In my opinion it is fully adequate, in scope and utility, as a dissertation towards partial fulfillment for the award of degree of MBA.

Thanking You
Yours Sincerely,

FIDATO CONSULTANTS PVT. LTD. DEHRADUN

(Aman Joshi)
Designation- Director, Fidato Consultants Pvt. Ltd
Address-209/1 Kishan Nagar Extension, Dehradun
Mobile- 7567628414
Email:amanjoshi@fidatoconsultants.com

Place:Dehradun

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EXECUTIVE SUMMARY/ABSTRACT

Multi buyer and seller model India being a predominantly agrarian economy, some states experience seasonal surpluses of power while some face deficit. Thus inter-state transmission of electricity became the need of the hour. RLDCs were formed to facilitate such transfer of electricity. The Central Government set up Central Generating Stations to assist the state governments in over-coming shortages, and also promoted private participation. However, the contracts were mostly long term for duration of twenty five years or more. To meet short-term demand the states resorted to trading of power through bilateral trading agreements on the basis of mutually negotiated prices. States resorted to energy banking where in a surplus state would supply energy to a deficit state and in deficit situation, it would claim back that amount of energy .But at times, when both states faced deficit and there was no excess electricity to return to the state that banked electricity, lead to compli-cations.

The Electricity Act, 2003, an astutely drafted legislation, ushered in and formalized the concept of trading of electricity within the country and also suggested the development of power markets, governed by appropriate regulations. It created a liberal and transparent framework for power development. Power trading through exchange is at a nascent stage and the volumes of ex-change are small. The power market in India comprises mainly of long-term power purchase agree-ments (PPAs) with a small proportion of short-term (up to 1 year) bilateral contracts. Power is mostly traded between power surplus packets in Eastern Region (ER) and Northeastern Region (NER) on one-hand and deficit areas in Northern Region (NR) and Western Region (WR) on the other. The Electricity Act 2003 paved the way for new trends like Open Access, power trading, etc. This has helped in streamlining power flow from surplus regions to deficit regions and thus attempts to strike a balance. Power Exchanges envisioned to bridge the demand and supply gap by introducing a com-mon bidding platform that brings together various power sector participants to buy and sell electricity through an auction based system.

The demand for power has continually outstripped supply. India currently faces an energy deficit of 9-10%. The power demand, which varies from region to region, creates an ideal situation

for the trading of power, thus enabling better capacity utilization. Following conditions are necessary for competition:

- Responsiveness of demand and supply to price
- Equal access to essential facilities like transmission and distribution
- Efficient marketplaces

CERC issued the Guidelines for setting up and operation of the power exchange in February 2007. The general approach of CERC was to allow operational freedom to the exchange within an overall regulatory framework and deliberately kept a distance from its governance. The participation in the power exchanges was voluntary and no existing Power Purchase Agreements and bilateral contracts were to be disturbed. Issues like allocation of Transmission Capacity for power exchange and application of Open Access charges & trading margin are to be decided by CERC.

Power exchanges emerged as a market based institution for providing price-discovery and price risk management to the generators, distribution licensees, traders and consumers.

Trading of power in power market has emerged as the biggest instrument in facilitating competition in the power market and thereby enabling the electricity market to achieve economic efficiency and higher quality services, as well as lower consumer prices for electricity.

While working upon the project, I found out many interesting cases and mentioned those in a systematic way. The project mentions the initial stages of power trading, power trading market, types of power markets like day-ahead market, intraday market, balancing or real time market. The role of power exchange and the way of power trading through those exchanges are well explained with their volume, price and experiences.

As power trading has emerged as the biggest instrument in the India power market in facilitating competition, hence the future of power trading in India is very bright. The Indian power trading market is rapidly growing both in physical and financial, short and long term size and volume. The implementation of futures, options, forwards and contracts for differences in the process of

hedging in the power market in Indian power market will make the power trading business as the most beneficial trading business for the companies involved in power trading business.

CHAPTER 1

INTRODUCTION

Indian Power Sector has a history of about 125 years only. It has come a long way from one small hydro unit in Darjeeling in 1880 followed up by commercial production and distribution in Kolkata in 1889 to over 700 billion units in 2008 – 09. However, the real thrust in the power sector was initiated with the enactment of Indian Electricity Act at 2003 (EA 2003). The National Electricity Policy 2005 recognises electricity as a 'basic human need' and aims at per capita availability of 1000 units from present level of 704 units per annum by the end of 2012. It calls for a capacity addition of 78,577 MW for the Eleventh Five Year Plan. Under EA 2003, 'Trading' has been recognized as a district licensed activity which is expected to help in resource optimization. Open Access is one of the most important features of EA 2003 which is set to facilitate non discriminatory access over transmission corridors and distribution network. Further to the above, Central Electricity Regulating Commission (CERC) has issued guidelines for setting up Power Exchange to boost further impact in facilitating competition in Power Sector.

1.1 OVERVIEW

The power sector of India has witnessed an impressive growth rate both in terms of size & capacity over the years. The installed generation capacity has grown from 1,362 MW in 1947 to 169748.76 MW as on 31.12.2010. The overall gross generation was 67079.66 Million units in Dec. 10. The Plant Load Factor (PLF) from 72.2 % 2002-03 thermal power plants has reached 78.86% in 2010-11. Despite such growth, the peak electricity supply fell short by 10.5% & there was an overall shortage of 8.2% in supply during 2010.

There are various initiatives which MoP has launched such as Ultra Mega Power Projects (UMPP), to facilitate setting up of new power plants through government & private sector participation.

There are also plans to add about 64000 MW (revised) of generation capacity during the 11th Five Year Plan (2007-12) from various sources including coal, gas, & hydro, nuclear & renewable, which is needed to accelerate at much faster pace to achieve the target of "Power To All By 2020".

Similar growth has been seen in power transmission sector. Transmission systems in India are in the process of restructuring through adoption of advanced technologies such as FACTS (Flexible AC Transmission system), HVDC (High Voltage DC) & advanced SCADA system. There are also plans to build an advanced, self healing automated grid with Wide Area Monitoring System (WAMS), based on Phasor Measurement Units (PMU) & Global Positioning System (GPS). Most of these developments are limited to the central transmission company & a very few state transmission companies. Other state-level transmission companies need to adopt advanced technologies for better operation of the grid & to provide flexibility of connecting upcoming energy sources of various sizes to the grid.

But with all these initiatives, the demand supply gap still widening with time & also the quality of supply to the consumer is not impressive. This is because the final link to the end user & also a vital link of the power sector still struggling to cope up with the losses & hindrances.

Power Sector Overview

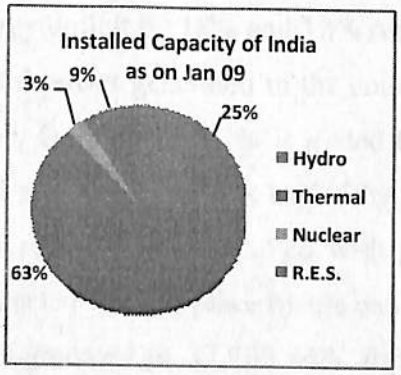

Figure No.1

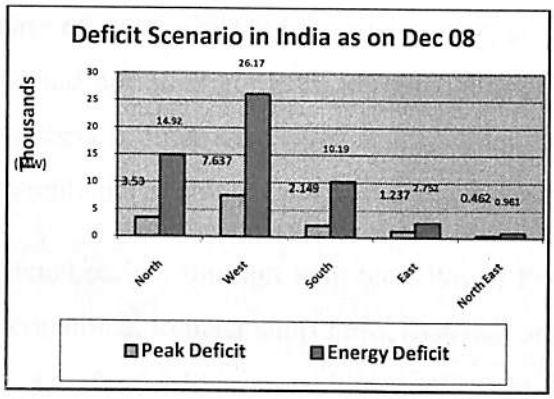

Figure No.2

The installed capacity of India as on Jan 2009 is 1,47,457 MW which is predominantly thermal at about two third of total installed capacity. The country is facing actual shortfall both in peak deficit as well as in Energy deficit by 18% and 12% respectively which is more pronounced in Western Region. Of the total power generated in the country power trading accounts for only about 6.83% of the generation. Only about 3.2% is traded bilaterally, Unscheduled Interchange (UI) comprises about 3% and rest about 0.6% is traded by power exchanges .This can be attributed to the inadequate inter regional links coupled with problems in intra-state open-access. With National Power Grid expected to be in place by the end of Eleventh plan i.e. 2012, the inter-regional capacity would be augmented to 37,700 MW from the present level of 17,000 MW enabling scheduled and unscheduled exchange of power, boost open access and encourage competition in power market.

As per the Electricity Act 2003, open access means the non-discriminatory provision for the use of transmission lines or distribution system or associated facilities with such lines or system by any licensee or consumer or a person engaged in generation in accordance with the regulations specified by the Appropriate Commission. In other words, open access means enabling non-discriminatory sale/purchase of electricity between two parties, utilizing transmission/distribution system(s) of a third party, and not blocking it on unreasonable grounds. Though there has been considerable amount of success in inter-state open-access, a lot needs to be done for intra-state open access so that the investments of smaller players are harnessed properly.

Power in India is transacted mainly through long-term Power Purchase Agreements. However, it is neither feasible nor economical to meet short term, seasonal or peaking demand through long term contracts. Electricity Act, 2003 has promoted competition in the sector by recognizing trading as a distinct licensed activity. The introduction of open access for inter-state transmission as per the Act has facilitated bilateral trading but the market still remains opaque with no clear price signals coming out to promote investment where it is needed the most. Although bilateral trading volumes have

increased, which has led to better resource optimization within an overall deficit scenario but the existing mechanism suffers from some deficiencies like

- Transmission access has to be arranged separately
- Contracts traded are non-standard and non-firm
- Auctioning of surplus electricity is resulting in discriminatory pricing
- There is a pan caking of transmission charges
- There are limited no. of participants for trading
- There are no clear price signals for investment growth

Recognizing the fact that price signals from an organized market promotes competition and can induce investments into the areas where it is needed most, CERC kick-started the process of organizing the electricity market by releasing a Staff Paper for Developing a common platform for trading electricity in July 2006. It followed it up by issuing guidelines for setting-up and operating a Power Exchange in February'07.

The utility electricity sector in India had an installed capacity of 271.722 GW as of end March 2015. Renewable Power plants constituted 28% of total installed capacity and Non-Renewable Power Plants constituted the remaining 72%. The gross electricity generated by utilities is 1106 TWh (1106,000 GWh) and 166 TWh by captive power plants during the 2014–15 fiscal. The gross electricity generation includes auxiliary power consumption of power generation plants. India became the world's third largest producer of electricity in the year 2013 with 4.8% global share in electricity generation surpassing Japan and Russia

During the year 2014-15, the per capita electricity generation in India was 1010 kWh with total electricity consumption (utilities and non utilities) of 938.823 billion or 746 kWh per capita electricity consumption. Electric energy consumption in agriculture was recorded highest (18.45%) in 2014-15 among all countries. The per capita electricity consumption is lower compared to many countries despite cheaper electricity tariff in India.

*Sources of electricity in India by Installed Capacity as of 2013

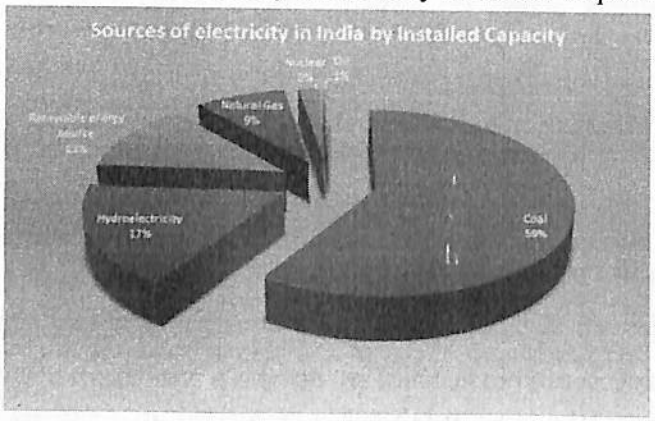

Figure No.3

*Electricity Production in India till 2012

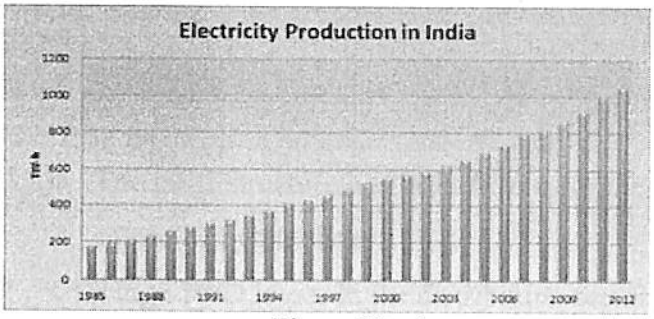

Figure No.4

* Sabarmati Thermal Power Station, Gujarat

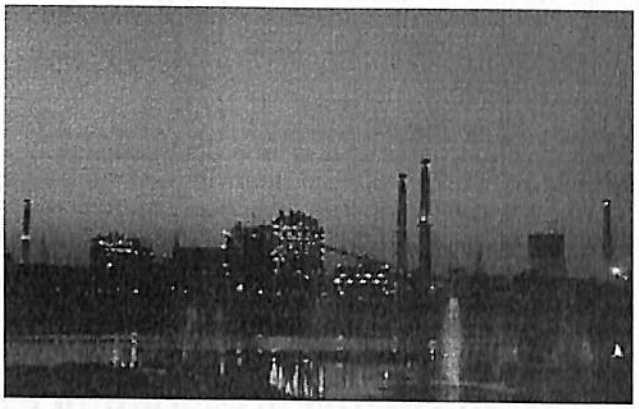

Figure No.5

1.2 BACKGROUND

The financial health of distribution utilities in India is very poor most of them are facing losses & the gap between annual revenue realized & the cost of supply is widening with time. This is despite the efforts made by the utilities to reduce distribution losses. As per the finance commission report which project that today the losses stand at about Rs. 50000 crore without subsidy, & if we do not account for subsidies then these losses are likely to be around Rs. 116000 crore by 2014-15.

The main factors for the financial sickness of most of the distribution utilities are as follows:

❖

- ❖ The tariff structure has been frozen for the last many years leading to unsustainable cross subsidies by the states.
- ❖ Huge T&D losses in the distribution sector which is around Rs. 20000 Crores annually.
- ❖ Lack of accounting & auditing in the distribution sector. Which is not possible until & unless we are not having 100% metering right down the last consumer.
- ❖ Outdated rules & management structure in most of the distribution utilities.
- ❖ Lack of skilled resources & training program to deal with the crucial problem of losses.
- ❖ Aging & poorly maintained system, lack of adequate provision of demand side management & corporate governance challenges.

There is need to address all these factors separately to ensure the financial progress of the distribution utilities through various reform processes. When both the issues losses & financial viability of the distribution sector are considered then only we can achieve the goal set for the distribution sector.

1.3 PURPOSE OF THE STUDY

It has been a constant endeavor of regulatory commission to create liquid, efficient and competitive power markets. Markets keep evolving based on the needs of the market participants the objective of this research paper is to study, analyze and discuss the power market design and the regulations that frames the basic structure of it apart from it fulfills the following :

1. To study the current power market scenario and the regulations that cost it.
2. The challenges and issues related to the various aspects of power market.

To study and analyze the various products that are being offered as well as the future products in line.

Potential of RE resources in India

Renewable Energy Resource	Estimated Potential (in MW)	Achievement so far (in MW)
Wind Power Energy	45,195	10,242.50
Small Hydropower	15,000	2429.67
Solar Power	50000	2 .12
Biomass Based Power	16,881	1,811

Table No-1

1.4 RESEARCH HYPOTHESES

As a student of **University of Petroleum & Energy Studies** and doing my MBA in the stream of Power Management, I got this opportunity to do my dissertation on **"Power market scenario in india".**

Trading of power in power market has emerged as the biggest instrument in facilitating competition in the power market and there by enabling the electricity market to achieve economic efficiency and higher quality services, as well as lower consumer prices for electricity.

While working upon the project, I found out many interesting cases and mentioned those in a systematic way. The project mentions the initial stages of power trading, power trading market, types of power markets like day-ahead market, intraday market, balancing or real time market. The role of power exchange and the way of power trading through those exchanges are well explained with their volume, price and experiences. I have also mentioned the regulatory framework for the efficient and transparent Power Trading.

As power trading has emerged as the biggest instrument in the India power market in facilitating competition, hence the future of power trading in India is very bright. The Indian power trading market is rapidly growing both in physical and financial, short and long term size and volume. The implementation of futures, options, forwards and contracts for differences in the process of hedging in the power market in Indian power market will make the power trading business as the most beneficial trading business for the companies involved in power trading business.

Type of Power Market

On a liberalized electricity market, the participants can act on a variety of markets. Traditionally they can trade electricity bilaterally on the over-the-counter market (OTC), where the bulk of transactions are still being settled. Alternatively, in some countries organized markets (i.e. exchanges) have been established. These organized markets typically comprise one or more of the following markets.

Day Ahead Markets

Generally, exchanges provide at least a day-ahead market, where the bids are submitted and the market is cleared on the day before the actual dispatch. The day to be scheduled is divided into n periods of x minutes each. Each bidding firm makes a price bid for every generation unit for the whole day. Commonly, in the day-ahead market either hourly contracts (for the 24 hours of the calendar day) or block contracts (i.e. a number of successive hours) are being traded. Whereas the former allows the market participants to balance their portfolio of physical contracts, the latter allows them to bring complete power plant capacities into the auction process. Block contract bidding may either be organized for a certain number of standardized blocks (dominant), or for flexible blocks.

Intra Day/Adjustment/Hour Ahead Market

Due to the long time span between the settling of contracts on the day-ahead market and physical delivery, exchanges sometimes offer an intra-day market, sometimes also referred to as hour-ahead or adjustment market. This market closes a few hours before delivery and enables the participants to improve their balance of physical contracts in the short term.

Balancing Services/Real Time Market

To balance power generation to load at any time during real-time operations, system operators use a balancing or real-time market. After the closure of the spot market, participants can submit bids that specify the prices they require (offer) to increase their generation or decrease their consumption (decrease their generation or increase their consumption) for a specific volume immediately. Such balancing services (also referred to as ancillary services), for which competitive

market mechanisms are increasingly sought for, cover the provision of a number of services (e.g. voltage control, frequency response and reactive power support). Some grid operators in Europe have started to procure the capacities and energy necessary to provide ancillary services from other companies via published auctions. This currently still fragmented market is expected to become increasingly integrated in the near future. Therefore, especially the tertiary and minute-reserve market could turn into a liquid wholesale market, as there are many power producers who are able to provide those services and to meet the existing substantial needs of both the grid operators and the suppliers in this direction. Furthermore, as there is no need to make additional investments in technical equipment, the market access barrier is small. CHP plants could basically provide these services, too, given that sufficient capacity is being held in reserve for these purposes when optimizing the unit commitment and/or dispatching. The authority responsible for the bidding at the market has - sometimes simultaneously - to find the best bidding strategy for electricity, reserve capacity, heat, and possibly fuel in order to maximize profits.

The Regulating Power Market (Rpm):

A real-time market covering operation within the hour. The main function of the RPM is to provide power regulation to counteract imbalances related to day-ahead operation planned. Transmission System Operators (TSOs) alone make up the demand side of this market and approved participants on the supply side include both electricity producers and consumers.

CHAPTER 2

LITERATURE REVIEW

The prevailing electricity market designs around the world can be categorized into single-market or two-market concepts. But, before we proceed, it is better to have a look on the two terms 'Power Pool' and 'Power Exchange' widely used to refer competitive electricity markets.

Pool versus Power Exchange

Both the term Power Pool and Power Exchange is used to describe an organized market place where suppliers and consumers (direct or indirect) meet to exchange power. The difference is sometimes defined as the Pool being a tight or mandatory pool, such as was introduced in the first England & Wales market and in South America. All generators sell their power into the pool, and all consumers (distributing companies, retailers and direct consumers) purchase the power from the pool. The pool price is this the overall equilibrium price between generators' offers and consumers' bids. The pool is the only exchange point of power and thus, closely integrated with real-time System Operations. The Exchange, on the other hand is a voluntary market place that coexists with a bilateral market. The exchange is a service provided to the market participants in competition with bilateral markets. The exchange will typically be for energy transactions day-ahead, and leave the real-time balancing responsibility to the System Operator. The balancing mechanism – which can be market oriented or compensation based – is centralized in a "pool" manner (e.g. mandatory participation). In this arrangement, the Exchange and bilateral market can be looked upon the place to trade the energy while the balancing mechanism is the place to operate the system and trade capacity.

Single market concept

The single-market concept is based on real time dispatch of spot contracts. Trade is carried out close to deliver of the contracts and the price determined is the marginal price of real time dispatched contracts. The price corresponds to the marginal of the last unit dispatched during real

time. Price determination algorithms in the single-market concept may differ considerably. The algorithm is based on a simulation model that includes transmission, generation and load. The core of the model is well known in the former regulated power market regime where fuel prices, start/stop costs, reservoir inflow and capacities on transmission are included.

Two-market concept

The two-market concept includes a day-ahead spot market and a real time market. The contracts traded in the day-ahead market are based on price/volume bids from market participants and are reported to system operator for dispatch without any curtailment or changes. This is referred to as de-centralised dispatch or self-dispatch.The real time market is based on bids of increments and decrements of generation and load. The market is an important tool for system operator to balance the system during real time and provides the basis for market pricing of participants' imbalances. Discussions on single vs. two market concepts In the single-market models operating in a liberalised market economic parameters and load are replaced by bids from market participants. Normally, prices are defined in a large number of nodes in the grid. The model balances generation to load in real time and all market participants who have placed bids in the market are committed to follow system operator's instructions regarding dispatch. Since it is a real time concept, prices are defined in rather short interval of times and average values for each ½ hour or one hour form the official spot prices. In the two-market system there is a day-ahead spot market and a real time market.

Prices in the day-ahead spot market correlates better with the predominant fuel applied in generation and are, therefore, a more appropriate reference for derivatives and cross-trade between electricity and other energy carriers like oil and gas. The prices in the real time market indicate the capability of the power system to balance the system in real time. Price level and volatility may be very high but involves minor volumes. With a well functioning spot market the volume in the balancing market is experienced to be less than 4-5 % of total annual generation. The price in the single-market concept is the ultimate marginal real time price. It includes generation costs and costs related to balancing the market. The consequence is that any minor events during

real time influence the total volume in the markets and financial markets derived from the market price. The prices in the market will, therefore, experience a poor correlation with the predominant fuel applied in the system. The single-market models are well known by generators, but normally not for participants on the demand side. The demand side fears that the supply side have a better understanding of the price determination algorithm and is in a better position to predict the prices.

The result is rather poor demand side participation in the market. This statement is based on comments from missions visiting the consultants with the objectives to improve their own single-market concept. The important tool to achieve the objectives of higher efficiency within the power business is competition. Competition requires equal terms for demand and supply side. The simple price/volume bids in the spot market with no technical parameters involved in the price determination algorithm is both for the supply side and the demand side an understandable and transparent price determination algorithm. The single-market system may have the advantage of higher degree of utilisation of the transmission resources. The Consultant is informed that there are some activities to select the best of the one-market and two-market concepts in new models. It is believed that selection of concept is, to a large extent, based on tradition and consultant's advice. However, a concept that provides the best competitive environment both for the supply side and the demand side should be preferred. Globally, the two-market concept seems to be preferred in all emerging markets where a power exchange is established.

2.1 OREVIEW AREA BROAD

- An organized electricity market inspires a lot of confidence amongst people who want to invest in the Indian Power Sector.

- It will not only provide them with a transparent easy to access market but also, going ahead, as the spot market prices get accepted by the market at large, it will also give impetus to development of lot of hedging mechanisms for mitigating the volatility associated with electricity prices.

- Price signals from this market will clearly help identify corridors where augmentation of transmission capacities is needed the most and also act as a catalyst for additional investment into generation.

- To set-up adequate infrastructure for trading, clearing and settlement of electricity contracts for the Indian Power Sector participants: Traditional trading in most markets has been opaque and discriminatory with one set of participants reaping the benefits of information asymmetry which has plagued traditional markets. Modern day trading is totally transparent where all participants are on an equal footing. Electronic exchanges worldwide have provided the platform for traders to move on to such automated, reliable and fair markets.

- To provide single window clearance for traded electricity contracts: The exchange would aim to simplify the trading procedure for the participants and ideally reduce the no. of interfaces for the participants to only one i.e. the exchange.

- To provide a market for the distribution entities for meeting top up demand: The exchange would aim to provide a reliable marketplace for buyers to meet up with any additional demand they have over and above the demand that is being met presently through long term PPAs.

- To augmentation of reducing peaking power deficit by providing equitable market place for the new merchant capacities (including hydro, IPPs co-generation, renewable etc.) and augmenting existing supplies through untapped sources (for ex. Captives) .

- To develop a Transparent and Fair price discovery mechanism which can signal massive potential investments into the sector.

Exchange Operations so far

Indian Energy Exchange was the first exchange in India to start operations with effect from 27th June 2008. Power Exchange India Limited started operations with effect from 22nd October 2008. Both the exchanges have been operating successfully and the volume coming into the ex

change are also showing increasing trend. The Market Clearing Price (MCP) of both the exchanges follow similar pattern and remains at maximum during peak and minimum during off peak. The MCPs during peak of both the exchanges are very close to each other. There are instances of various bilateral transactions taking place based on the hourly MCPs of power exchange.

Presently, both the exchanges provide platform for next day physical delivery. The spot concept is based on bids for purchase and sale of proper contract of one hour duration that cover all 24 hours of the next day. As soon as the 12:00 hrs deadline for participants to submit bids has passed, all buy and sell orders are complied into two curves for each power - delivery hour an aggregate demand curve and aggregate supply curve. The Market Clearing Price (MCP) for each hour is determined by the intersection of the aggregate supply and demand curve. Buy trades are settled at or below the quoted price and sell trades are settled at or above the quoted price thereby ensuring maximum benefits to both buyers and sellers of electricity.

The Indian Power Market is partitioned presently into 10 separate bidding areas that can have separate prices if the unconstrained solution flow between bidding areas exceed the Available Transfer Capability (ATC). If there is no such constraint, the MCP will be uniform across the country. However, in case of constraint, the congestion management is done by market splitting i.e. by increasing price in deficit area and decreasing price in surplus areas so as to facilitate power flow from surplus to deficit area. The market splitting phenomenon is explained at Exhibit I

Matching Philosophy The trading engine may operate either in auction method or in continuous method .Auction Trade System is based on pairs of price/ volume bids that are submitted to PX. PX accumulates all demand and supply bids and form an aggregate demand and supply curve for each hour. A Market Clearing Price(MCP) and corresponding volume is determined for each hour at the intersection of demand and supply curves. Except for UKPX and the inter-day market at Nord Pool Elbas, all major spot markets exchanges in the world are based on the auction concept .In a continuous trade systems, participants place orders / bids on purchase and sale of spot contracts continuously throughout the opening period each day. A trade agreement is

made wherever two participants meet on price. Unlike an auction trade where all trades are based on the same price, trade on a continuous trade systems are based on different prices for each trade.

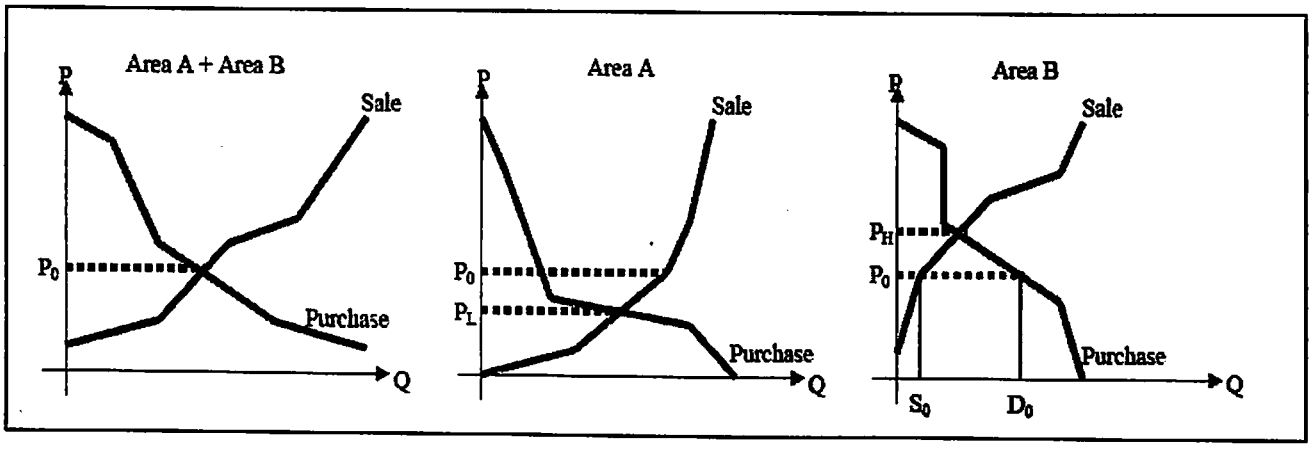

Figure No-6

In line with CERC Open Access Regulations, 2008 effective from 01.04.2008, Collective Transactions are a set of transactions discovered in power exchange through anonymous, simultaneous competitive bidding by buyers and sellers. It mandates

- National Load Despatch Center (NLDC) to be the nodal agency for collective transactions
- Both buyers and sellers to absorb losses with buyer drawing less than contracted power by losses whereas the seller injecting more than contract by losses.
- Transmission charges of Rs 30 /MWh for each point of injection and drawal.
- Operating charges @ Rs 5000/ per day to the NLDC for each state involved and @Rs 2000/ per day for the SLDC involved for each point of transaction.
- State Load Despatch Center (SLDC) concurrence specifying the MW quantity up to which the entity may submit a buy or sell bid

Indian Power System presently operates in Two-market concept. A Day-ahead spot market where the price (MCP) represents the electricity energy price. A real-time market where the price

represents the system capability to balance generation and consumption in real time. The real time market is operated by the RLDCs operated by Central Transmission Utility (CTU).

Products in pipeline

World-wide conventional wisdom has been to initially introduce only those products which already exist in the bilateral market. Secondly the philosophy should be to work within the existing policy and regulatory framework. This existing familiarity leads to easy acceptance of newer products for market participants and system operators.

In line with market aspirations for longer tenure products particularly in view of rising demand in ensuing summer months and anticipated large shortfall both the exchanges propose to introduce month/week and day contracts which can be traded on three (3) months, two (2) months, month ahead and week ahead basis respectively. In addition, PXIL are also proposing to introduce a Day-Ahead Contingency contract for trade of surplus power on a day-ahead basis which has not been successfully matched in the first session.

Derivatives

There is no doubt that financial derivatives are beneficial to the sharing and controlling of risks through properly structured hedging strategies. However it calls for adequate depth and liquidity in electricity markets for achieving economic efficiency. In the present day-ahead market, the two exchanges trade about 10 Mus a day i.e. about 0.5% of the total market share against that of about 20% of average share at the launch of derivatives world-wide. POLPX initiated the launch of financial derivatives at about 1.72% of spot market share but had to stop it due to lack of liquidity. In addition, all the successful markets took about a couple of years of maturity to launch deriva

tives and Power Exchanges in India are barely six months old. PXIL therefore believes that Indian electricity market is not ready yet to launch derivatives.

PXIL looks forward to participation from state utilities and large private players to ensure institutionalization with focus on wide-basing equity participation from state utilities. Its software is continuously evolving to take care of inputs from market participants and regulatory bodies. Introduction of professional Clearing Membership concept for PFC etc. is intended to

cater to liquidity issues related to payment process of state utilities and remittance need to small CPPs

2.2 REVIEW AREA NARROW

Power trading is an activity in which the utility having surplus power transfers electricity to the utility having deficit of power, at some price (mostly Rs /Kwh). Every utility during some or the other season faces the deficit of power in there region, to overcome that deficit they contact to the utilities having surplus at that particular season and enter into agreement for Power Trading either through bilateral contracts, intermediaries or through Power Exchange(PX)In other words we can say that Power Trading is an agreement or contract between buyer (i.e. deficit utility) and supplier (i.e. surplus utility) to provide power at certain date, at certain hour and at certain price through some transmission lines involved in the process of transfer of power from one utility to another utility.

Trading electricity consist of buying and selling electrical energy no matter who is the supply and the demand side. Nowadays in the liberalized structure trading constitutes the same approach but the consumers, more known as customers are free to choose their supplier, furthermore to Change Supplier according to the provider that best meet up their needs. While the supplier can be differentiated regarding the size, technology, prices, etc. electricity cannot be differentiated; all electrons are physically the same, in trading jargon this is known as a "commodity".

Products

- Round the clock
- Evening peak
- Night off peak
- Afternoon off peak
- 19 hours
- 8 hours
- Night hours + morning
- Six hours

Cost involved in trading

- Price at which the seller is ready to sell.
- Price at which the buyer agrees to buy.
- Inter Regional Link charges payable to Power Grid Corporation of India limited (Rs/Mw/Day).
- Regional charges paid to the respective Regional Grids involved. (Rs/Mw/Day).
- Open Access application fees (Rs.5000) Scheduling and System Operation Charges (plus handling charge i.e.2% of S&O Charge) Trading margin.

For better understanding and to reduce the risk on trader the cost can be subdivided in to two parts namely:

- Fixed cost (all the charges accept for energy sale price and trading margin)
- Variable cost (energy cost + trading margin)

Given the demand-supply mismatch in seasonal, time-of-the-day and even on a short term basis, there is immense scope to trade in power. Besides, the trader signs back-to back deals for buying and selling power, which means that it will not be saddled with any liability. Power trading, as a concept, has come to stay. In a free-market environment as envisaged by the Electricity Act,

power traders play a major role as intermediaries between large generation utilities and high tension consumers.

Issues Related To Trading

- Financial viability of Utilities.
- Grid discipline.
- Lack of adherence to contractual commitments.
- No commitment to provide adequate service.
- Disconnection of Supply is the preferred solution to Power shortages.
- Non-payment of Bills not dealt with strongly.
- Reliability of supply and off take.
- Adequacy of transmission capacity.
- Low capacity utilisation factor of HVDC interregional connections due to
- Weaknesses in the downstream transmission system, including the issue of reactive power management.
- Need of adequate inter regional interconnections for Power transfer
- Many of the State transmission schemes face time/cost overruns and the
- Capacity becomes available only after considerable time delay.
- Statutory provisions for direct sale by IPPs/CPPs/ Licensees outside the State.
- No Provision for direct sale of surplus Power to Outside State.
- Regulatory issues
- Regulation unclear on intrastate trading license.
- Open access in distribution yet not cleared.
- Transmission and wheeling charges not based on actual MUs traded.

Risks Involved In Trading

In general terms "trading" can be in two forms Purchase for resale with the trader assuming little of energy delivered by the Generator Broking or match trading Provisions of the Act cover the former category, although there is no bar on the latter Purchase of energy for resale involves significantly greater risks and potentially higher returns. Trades could either be "matched" or "uncovered". Traders could typically go "long" or "short" depending on the risk taking ability.

Key risks in power trading include

- Demand risk
- Market price risk
- Credit risk
- Operations risk(e.g. failure of generator to perform as per expectation)
- Accounting risk (inability to match contracts with underlying product

2.3 FACTORS CRITICAL TO SUCCESS OF STUDY

- Financial viability of Utilities.
- Marinating Grid discipline.
- Lack of adherence to contractual commitments.
- No commitment to provide adequate service.
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- Open access in distribution yet not cleared.
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Regulatory affairs related to Power Market

EA 2003 and enabling provisions on Power Market

- The intent and object of the EA 2003 is to develop power market through increased competition, more players and protect consumer interests
- Development of Power Market – EA 2003, Section 66, "The Appropriate Commission shall endeavor to promote the development of power market...", guided by the National Electricity Policy
- Suitable safeguards to prevent adverse effect on competition
- Recognized Trading as a distinct activity
- Definition under section(2) (47): "Purchase of electricity for resale thereof"
- Adequate and progressive provisions governing open access both :
  - to transmission networks (inter-state and intra-state) and
  - to distribution networks

2.4 SUMMARY

Power Trading Arrangements

Power trading arrangements can be done in following different three types of existing Formats

- 1. Bilateral Contracts
- 2. Through Intermediaries

❖ 3. Power Exchange

Bilateral Contracts

Bilateral contract is an agreement in which each of the parties to the contract makes a promise or promises to the other party. It is an agreement in which the parties exchange promises for each to do something in the future. It refers to the mutual contracts where buyer and seller negotiate. A sales contract is a bilateral contract, since the seller promises to convey a property and the buyer agree to pay a specified sum, given certain conditions. Long term power purchase agreement between C.G.S (Central Generating Station) in India is an example of bilateral contracts. Main disadvantage of bilateral contracts are that there is a huge search costs, asymmetric information, and lack of transparency.

Through Intermediaries

As Power Market is expanding rapidly, more intermediaries are emerging out as a licensed trader. The benefit which the trader gets through intermediaries is that the search costs are reduced. They had not to spend money in finding customers; intermediaries match buyer and seller and act as a facilitator in concluding trading arrangements. Both types of arrangement serve as a symbol of mutual bargaining process where the actual price is not disclosed.

Power Exchange

Power Exchange (PX) facilitates equitable, transparent and efficient trading of power. It bridges the demand and supply mismatch by bringing larger players together for buying and selling. Power Exchange overcomes all the constraints which other two arrangements have, viz, search costs, asymmetric information, transaction costs, and counter-party risk. The development of electricity trading and the creation of electricity power exchanges are one of the most visible results of the liberalization of the electricity industry. Market players (generators, traders and suppliers) come to a market place to trade electricity and make contracts. Market players have needs and obligations to generate or consume a specific amount of electricity at a specific time in the future. These needs and obligations are covered by contracts with committing partners. Contract negotiations will determine the contract conditions like time, place, volume and price.

Major Power Exchanges

Indian Energy Exchange (IEX) is India's first-ever, nationwide, automated, and online electricity trading platform. It has been conceived to catalyse the modernisation of electricity trade in the country by ushering in a transparent and neutral market through a technology-enabled electronic trading platform.

Central Electricity Regulatory Commission (CERC) accorded approval on 9th June 2008, to IEX to commence its operations. IEX is a demutualised exchange that will enable efficient price discovery and price risk management in the electricity market.

On 6th February 2007, the CERC issued guidelines for grant of permission to set up power exchanges in India. Financial Technologies (India) Ltd responded by proposing then tentatively named 'Indian Power Exchange Ltd' and applied for permission to set it up and operate it within the parameters defined by CERC and other relevant authorities. Based on the oral hearing on July 10, the CERC accorded its approval vide its order dated 31st August, 2007. IEX thus moved from the conceptual level to firmer grounds. On 9th June 2008 CERC accorded approval to IEX to commence its operations and 27th June 2008 marked its presence in the history of Indian Power Sector as Indian Energy Exchange Ltd (IEX). IEX's technical infrastructure, systems and processes have materialized from a synergization of the knowledge, expertise, and experience of the companies behind it. As a promoter of IEX, Financial Technologies has leveraged its technical expertise with the commodity exchange domain knowledge and experience of its subsidiary, Multi Commodity Exchange of India Ltd (MCX), as well as the industry grasp of co-promoter PTC India Ltd and of key partners / investors including IDFC, Adani Enterprises, Reliance Energy, Lanco Infratech, Rural Electrification Corporation (REC), and Tata Power Company.

Power Exchange India Limited (PXIL) is a fully electronic, nation-wide exchange for trading of electricity. It has been promoted by two of India's leading Exchanges, National Stock Exchange of India Ltd (NSE) & National Commodities & Derivatives Exchange Ltd (NCDEX). Power Finance Corporation, Gujarat Urja Vikas Nigam, JSW Energy, GMR Energy, Jindal Steel & Power have taken equity stakes in this venture.

NSE is the largest stock Exchange in India and amongst the top 4 Stock Exchanges in the world in terms of number of transactions. The standards set by NSE in terms of market practices, products, technology & service standards have become industry benchmarks and are being replicated by other market participants. NCDEX is the only commodity exchange in the country promoted by national level institutions. The institutional promoters and shareholders of NCDEX are prominent players in their respective fields and bring with them institutional building experience, trust, nationwide reach, technology and risk management skills.

PXIL, like its promoters, will not just be building a Power Exchange, but would also be seeking to play a thought leadership role in shaping Indian power markets in the years to come. PXIL aims to provide transparent and fair price discovery mechanism which can signal massive potential investments into the Indian Power Sector.

The initial products offered for trading are electricity contracts offered on a day-ahead basis with voluntary participation. New products will be introduced after taking feedback from the market & obtaining approval from CERC. PXIL has an independent Board of Directors and professionals who manage the day-to-day operations. The Company is run on commercial principles as an individual business entity, separated from the business of its shareholders.

PXIL received regulatory approval from Central Electricity Regulatory Authority (CERC) on 30th September 2008 to begin operations. After receiving the final nod from the National Load Dispatch Centre, the apex body of the country grid operator, PXIL has successfully started its operations on 22nd October 2008.

Power Exchange Functions Defined In Power Market Regulations As On 2010, January

No Power Exchange shall operate without obtaining registration under these regulations. Provided that the Power Exchanges which have been granted approval / inprinciple approval by the Commission on or prior to the date of notification of these regulations shall be deemed to be registered under these regulations subject to payment of annual registration charge.

Provided further that the Power Exchanges in operation shall realign their Bye-laws, Rules and Business Rules to make the same in conformance with these regulations and shall

submit the same for approval of the Commission within three months from the date of notification of these regulations.

Provided also that the existing approved Bye-laws, Rules and the Business Rules shall remain in force till the Commission gives approval to revised Bye-laws, Rules and Business Rules. Provided further that anything done or any action taken or purported to have been done or taken under the existing approved Bye-laws, Rules and the Business Rules shall, in so far as it is not inconsistent with the provisions of these Regulations, be deemed to have been done or taken under the corresponding provisions of these Regulations.

The eligibility criteria for making application for registration of Power Exchange shall be as follows:

(i) (a) Any company limited by shares incorporated as a public company within the meaning of the Companies Act, 1956;

(b) A consortium of companies having an agreement amongst themselves to set up a power exchange through a special purpose vehicle ("SPV") incorporated as a public company limited by shares within the meaning of the Companies Act, 1956;

Provided that the process for registration may be commenced incase a consortium applies for registration by submitting a copy of such an agreement entered into amongst the consortium members, but registration shall be granted only when consortium has incorporated the SPV as aforesaid.

(ii) The main objects of the applicant company shall be to primarily set up and operate Power Exchange though the other and incidental objects may be to undertake other businesses related to energy sector and its ancillaries with the prior approval of the Commission. Provided that such a company shall maintain separate accounts for separate businesses.

Procedure for filing Application

(i) Application for grant of registration to establish and operate a Power Exchange shall be filed in the form of a petition to the Commission in accordance with the Central Electricity Regulatory Commission (Conduct of Business) Regulations, 1999 and as amended from time to time.

(ii) The salient details of the applicant, proposed transaction platform and website address where the full application is accessible shall be published in all editions of at least two national daily

newspapers including one economic daily newspaper within 7 days of filing of the application inviting public comments/objections, if any, upto a period of 30 days.

(iii) The application as filed and the information as sought by the Commission shall be posted and kept on the web site of the applicant at least for a minimum period of 30 days from the date of publication of notice in newspapers.

(iv) The applicant shall file before the Commission its reply to the objections or suggestions received in response to the public notice within 45 days of its publication in the newspaper.

(v) The Commission after consideration of the objections or suggestions received in response to the notice published by the applicant and his reply may propose to grant registration to the applicant.

(vi) When the Commission proposes to grant registration, it shall publish a notice of its proposal in two daily newspapers, as the Commission may consider appropriate, stating the name and address of the person to whom it proposes to grant the registration with such other details as the Commission considers appropriate, to invite further objections or suggestions to its proposal.

(vii) On consideration of further objections or suggestions received and the reply of the applicant thereto, if any, the Commission may grant registration or reject the application, for reasons to be recorded in writing if the application does not conform to the provisions of the Act or the regulations thereunder. Provided that no application shall be rejected, unless the applicant has been given an opportunity of being heard Applicants seeking registration to set up and operate a Power Exchange shall submit the following documents along with the application:

(i)Memorandum and Articles of Association of the company making the application;

(ii)In case of a consortium of companies, a formal agreement amongst the members of the consortium to set up a Power Exchange shall be submitted;

(iii)Details of the existing business of the consortium members;

(iv)Copies of the Annual Report and/or audited accounts of the applicant for the last three years, to the extent applicable;

(v) A Project Report containing the following details:

(a) Constitution of the proposed Power Exchange;

(b) Funding sources of the proposed Power Exchange;

(c) Management and Administrative structure of the proposed Power Exchange;

(d) Infrastructural facilities available/proposed to be acquired by the Power Exchange;

(vi)The draft rules of the proposed power Exchange relating in general to the constitution of the proposed Power Exchange and in particular, that relating to:

I. The board of directors of the Power Exchange, its constitution and powers;

II. Management of the Power Exchange and the manner in which its business is to be transacted;

(vii) The draft bye laws of the proposed Power Exchange covering the aspects specified in Regulation 24 hereof.

Prudential Norms for establishment of Power Exchange

(i) A Power Exchange shall always have a minimum networth of Rs. 25 Crore

Provided that the Power Exchange shall always maintain the above networth and in case the same depletes due to payment made by the power Exchange to sellers / buyers in default including by the usage of the SGF impacting its networth, the Power Exchange shall increase its networth to comply with the above networth criteria within 3 months from the date of depletion.

Provided that if and when a Power Exchange separates its clearing function to a Clearing Corporation, it shall be required to have a minimum networth of Rs. 5 Crore. Provided further that the Commission may, by general order, review the networth criteria from time to time.

(ii) For an applicant the networth to be considered shall be minimum in three years immediately preceding the year in which the application is made or such lesser period during which the applicant may have been incorporated, registered or formed and on the date of special balance sheet accompanying the application for grant of registration

(iii) The Networth of a Power Exchange in operation shall be as per the last audited balance sheet.

(iv) Settlement Guarantee Fund (SGF)

(a) The Power Exchange or Clearing Corporation shall invest the proceeds of SGF in safe investments and ensure that the principal amount is not at risk. Fifty percent (50 %) of the SGF proceeds shall be kept in safe liquid investments.

(b) The SGF investment returns shall be retained by the Power Exchange till the Settlement Guarantee Fund is maintained by the Power Exchange. In case of hiving off of the Clearing Corporation, the SGF investment returns shall be retained by the Clearing Corporation.

(c) The principles and methods of usage of the SGF shall be clearly communicated to the members and clients of Power Exchange through the bye laws of the Power Exchange.

(d) Details of investment of SGF shall be submitted to the Commission on an annual basis while submitting the Power Exchange's annual report or the Clearing Corporations annual report as the case may be

(e) Additional Prudential Norms, SGF requirements for Power Exchanges and Clearing Corporations as required for financial derivative contracts on Power Exchanges may be notified by the Commission by order and once these are notified, the same shall be complied with in terms thereof.

Shareholding Pattern of Power Exchange

(1) The shareholding pattern for equity holders in the Power Exchange shall be as follows:

(i) Any shareholder other than a Member of the Power Exchange can have a maximum (whether directly or indirectly) of 25% shareholding in the Power Exchange.

(ii) A Member of the Power Exchange can have a maximum (whether directly or indirectly) of 5 % shareholding in the Power Exchange.

(iii) In total, a Power Exchange can have a maximum of 49% of its total shareholding owned by entities (whether directly or indirectly) which are

Members of the Power Exchange

Explanation I – "indirectly" means through an associate where an associate is –

(i) one who owns or controls shares carrying not less than twenty-six percent of the voting rights of the shareholder intending to hold equity in the power exchange; or

(ii) in respect of whom the shareholder intending to hold equity in the Power Exchange owns or controls shares carrying not less than twenty-six percent of the voting rights; or
(iii) one who is under the same management as the shareholder intending to hold equity in the power exchange.

Explanation II: An associate shall be deemed to be under the same management:
(i) if the managing director or manager of the shareholder intending to hold equity in the power exchange is the managing director or manager of the associate; or
(ii) if a majority of the directors of the shareholder intending to hold equity in the power exchange constitute or any time within six months immediately preceding, constituted a majority of the directors of the associate; or
(iii) if not less than one third of the total voting power with respect to any matter relating to the shareholder intending to hold equity in the power exchange and the associate is exercised or controlled by the same individual or body corporate; or

(iv) if any of the directors of the shareholder intending to hold equity in the power exchange while holding the majority of shares of such shareholder also holds the majority of shares in the associate.

(2) The share holding pattern shall be reported to the Commission from time to time .

Notwithstanding Regulation 19, the Power Exchanges granted approval or in principle approval prior to the date of notification of these regulations, shall within a period not exceeding three years from the date of notification of these regulations, ensure the shareholding structure/pattern as specified in Regulation 19.

Grant of Registration to Power Exchange
(i) The Commission may, after making such inquiries as may be necessary in this regard and after obtaining such further information as it may require, grant registration subject to such conditions as deemed fit, for setting up and operation of a Power Exchange.

(ii) The registration of a power exchange shall continue to be in force for a period of twenty five (25) years from the date of commencement of operations unless such registration is revoked or cancelled.

(iii) Notwithstanding clause (ii) above, the Commission may, on an application filed in this behalf, renew the registration for a like period of 25 years. Provided that an application for renewal may be filed at the most 5 years before the expiry of the initial registration.

Ownership and Governance structure of Power Exchange

(i) There shall be a clear demarcation between ownership, management / operations and participation in trading.

(ii) Independent Directors – At least one third of the members of the Board or a minimum of two directors, whichever is higher, shall be independent directors selected from a panel constituted by the Power Exchange and approved by the Commission out of which one person will have professional qualification and experience in finance. The panel shall be constituted of persons of repute and integrity from academics, professionals, industry representatives, public figures none of whom should have any interest in any Member of Power Exchange and any fiduciary relationship with any shareholder of Power Exchange.

(iii) The total strength of the Board shall be in accordance with the provisions of the Companies Act 1956.

(iv) Not more than one fourth of the Board of directors shall represent Members of Power Exchange.

(v) The Board shall appoint a CEO cum Managing Director who shall be solely responsible for running the day to day operations of the Power Exchange. The

Managing Director shall be a professional with adequate qualification and at least 10 years of experience in the relevant field.

(vi) The Managing Director, the Chief Executive or the Director in charge of day-today operations or any employee, of the power Exchange shall not be directly or indirectly associated with any Member of the Power Exchange or client or participant of the Power Exchange or with a holding or subsidiary company thereof.

(vii) Services of any consultant or advisor can be availed of by Power Exchange as long as he is not dealing with price sensitive information of the Power Exchange and there is no conflict of interest between assignments undertaken for other persons served by the consultant or advisor and the Power Exchange

(viii) The Managing Director shall ensure that the individual bids of members of the Power Exchange is not shared with the board of directors.

(ix) The Power Exchanges which has been granted approval or in principle approval by the Commission on or prior to the date of notification of these regulations, shall within a period not exceeding one year from the date of notification of these regulations , ensure that the governance structure as specified in this Regulation 22 is adhered to and complied with Registration Charge.

A Power Exchange shall pay an annual registration charge as specified below:-

Annual Turnover in Power Exchange (Million Units)	Annual Registration Charge (Rs Lac)
Above 10,000	30
Upto 10,000	15
Upto 5,000	5

Table No-2

The Annual registration charge shall be payable through a Bank Draft or Pay Order or by electronic transfer of money in favour of *"Assistant Secretary, Central Electricity Regulatory Commission, New Delhi"*, by 30th April every year.

Provided further that the Commission may, by order, review the quantum of the annual registration charge from time to time.

Provided also that the Power Exchange would declare apriori the category it envisages to be in. In case of any difference between declarations and actual at the end of financial year, the annual registration charge shall be accordingly adjusted.

The Power Exchange shall function according to its Byelaws and Rules as approved by the Commission, which amongst other requirements would cover the following:

(a) Price Discovery and matching mechanism;
(b) Rights and liabilities of its members;
(c) Market surveillance and investigation;
(d) Clearing and settlement procedure;
(e) Risk management;
(f) Default and Penalty mechanism;
(g) Penalty for contractual deviations;
(h) Transaction charge and the mechanism of its determination;
(i) Brokerage and Commission Charges of its members;
(j) Maintenance of records and accounts;
(k) Preparation of annual accounts and audit thereof;
(l) Arbitration, dispute resolution and conciliation;
(m) Mechanism for redressal of grievances;
(n) Opening and closing of transaction hours, transaction and settlement calendar;
(o) Procedure from opening of the platform up to its scheduling by LDC;
(p) Procedure for handling a default, i.e., failure to schedule the transaction finalized;
(q) Details of market splitting methodology for handling transmission congestion; this shall be elucidated with examples Inter-face design with system operator/Regional Load Dispatch Centres;
(r) The details of the Exit Scheme;
(s) Qualifications for membership, exclusion, suspension and expulsion
(t) Indemnification of Central Transmission Utility, National Load Despatch Centre, Regional Load Despatch Centres, State Load Despatch Centres by the Power Exchange.

Provided that Byelaws and Rules may be amended subject to obtaining prior approval of the Commission.

Management of Power Exchange

(i) The senior management of the Power Exchange shall comprise of at least two full-time proficient professionals having, qualifications and experience and

expertise in the following areas –

Discipline	Qualification and Experience
Power system operations	Degree in Engineering with at least 10 years experience in the field
Finance, commerce and accounts	CA/ICWA/MBA(in Finance) with at least 10 years experience in the field

Table No-3

(ii) The Power Exchange shall constitute a Risk Management Committee (RMC) headed by an independent director of the board which shall stipulate risk containment measures and monitor adherence of the same.

(iii) The Power Exchange shall constitute a Market Surveillance committee headed by an independent director of the board and having members from the executive team of the Power Exchange. No member of this committee shall be a Member of the Power Exchange.

(iv) The Power Exchange shall constitute a SGF management committee with adequate representation from the Members of the Power Exchange. This committee shall be responsible for overseeing the management of SGF.

Membership in Power Exchange

(i) Membership in Power Exchange shall be of the following three categories :-

(a) Member who is an Electricity Trader or

(b) Member who is a distribution licensee including deemed distribution licensee or a grid connected entity or

(c) Member who is neither an Electricity Trader nor distribution licensee including deemed distribution licensee nor a grid connected entity

(ii) Member who is neither an Electricity Trader nor distribution licensee including deemed distribution licensee nor a grid connected entity can only provide the following services to its clients:-

(a) IT infrastructure for bidding on electronic Exchange platform or skilled personnel

(b) Advisory services related to power prices and the follow on bidding strategy (e.g. weather related information, demand supply position etc)

(c) Facilitation of procedures on behalf of his client for delivery of power (e.g. State Load Dispatch Centre standing clearances, coordination with National Load Dispatch Centre etc). In no case, such a member shall provide any credit or financing or working capital facility to their clients.

(iii) Member who is an Electricity Trader shall trade and clear on their own account or trade and clear on behalf of their clients. This category of members may provide any credit or financing or working capital facility to their clients.

(iv) Member who is distribution licensee including deemed distribution licensee or grid connected entities shall transact and clear their own account only

(v) The Power Exchange shall submit to the Commission detailed list of its members along with their clients every month as per the format appended to these Regulations.Provided that the Commission may, by order, review the format from time to time.

(vi) In case of any discrepancies found in the transactions of members or contravention of these Regulations, the Commission may, after giving the member of the Power Exchange an opportunity of being heard in the matter, direct, the Power Exchange to revoke the membership of such member. Any such direction will be without prejudice to action against the Power Exchange under these Regulations.

(vii) The Commission may direct Power Exchanges to introduce qualification test for personnel handling electronic trading terminals and trading in electricity.

(viii) A Power Exchange may, at its discretion, stipulate any criteria for membership to the Power Exchange including networth, minimum base capital / security deposit requirement, liquid asset requirement.

(ix) The Power Exchange shall maintain supporting documents provided by the member for obtaining membership including the documents evidencing compliance with any criteria specified by the Power Exchange and furnish it to the Commission on being required to do so. These documents shall be maintained upto a period of five years after the member has surrendered membership or ceases to be a member of the Power Exchange.

(x) The Commission may by order, notify any additional membership criteria for transacting in derivatives contracts.

Member Service Charge for providing services to their clients in day ahead and term ahead markets in Power Exchange shall not be more than 0.75% of transaction value. This ceiling would be an overall ceiling including the service charges of any subordinate service providers. Provided that Member Service charge to their clients in day ahead and term ahead market in Power Exchange for Electricity Traders who are members of
Power Exchange shall be the trading margin only as per CERC (Fixation of trading margin) Regulations 2006 and as amended from time to time. Provided further that the Commission may, by order, review the members service charge criteria from time to time.

Provided also that the Commission may, by order, notify the member service charges separately for derivative contracts. Provided also that member service charge shall not include any charges levied by Power Exchange, transmission (open access) charges, other charges payable to National Load Dispatch Centre / Regional Load Dispatch Centre / State Load dispatch Centre, statutory taxes etc.

Risk Management by Power Exchange

(i) The Power Exchange shall adopt best practices while formulating prudent and dynamic risk management processes based on the changing risk profiles of the market.

(ii) The Risk management Committee (RMC) shall review the risk management framework and process of the Power Exchange on a six monthly basis in January and July each year. The RMC report shall be submitted to the board of directors. The decision of the board of directors on the subject along with the RMC report shall be submitted to the Commission within one month of the risk management review process and not later than end of February and August respectively.

(iii) The Members' risk shall be monitored constantly and margins shall be collected at appropriate time for efficacy of risk management.

(iv) Members shall be subject to margins on a gross basis across clients by the Power Exchange. There shall be no offsetting of positions of different clients of a member in the same market.

Illustration: In case of an Electricity Trader member, if his client A has a buy position of 50 Mwh and his client B has a sell position of 50 MWh in the same contract, the net position of the member in the contract is to be taken as 100 MWh. The buy position of client A and sell position of client B in the contract will not be netted. It shall be summed up to arrive at the member's open position for the purpose of margin calculation.

(v) Members should, wherever applicable, have a prudent risk management and timely margin collection system from their clients. The quantum of margins collected by members from client shall be at the discretion of the members and as per bye laws of Power Exchange.

Power Exchanges may hive off the clearing and settlement function to a separate Clearing Corporation in case deemed fit. The Clearing Corporation shall be mandatory in case Power Exchanges launch financial derivative contracts Provided that the Commission may make the requirement of setting up of Clearing Corporation mandatory for spot and term ahead markets also as and when it deems appropriate

Default remedy mechanism on Power Exchange or Clearing Corporation

(i) A member may be declared a defaulter by direction or circular of the Power Exchange or Clearing Corporation if:

(1) he is unable to fulfill his clearing or settlement obligations; or

(2) he admits or discloses his inability to fulfill or discharge his duties, obligations and liabilities; or

(3) he fails or is unable to pay within the specified time the damages and the money difference due on a closing-out effected against him under the Rules, Bye Laws of Power Exchange or Clearing Corporation ;

(4) he fails to pay any sum due to the Power Exchange or Clearing Corporation which may be prescribe by them from time to time ; or

(5) he fails to pay or deliver all moneys, electricity or other related assets due to a member who has been declared a defaulter within such time of declaration of default of such member in such manner and to such person as the Power Exchange or Clearing Corporation may direct; or

(6) he fails to abide by the arbitration award as laid down under the Rules, Bye Laws and Regulations of Power Exchange or Clearing Corporation ; or

(7) under any other circumstances as may be decided by the Power Exchange or Clearing Corporation from time to time. Provided that Power Exchange or Clearing Corporation may, at its discretion, stipulate any additional criteria to declare defaulter in the Power Exchange or the Clearing Corporation as the case may be

(ii) In the event a member is declared a defaulter and the member fails to meet the clearing and settlement obligations, the Power Exchange shall give precedence to the payment of transmission charges, scheduling and system operation charges from the deposits of the member or client as the case may be. Thereafter the Power Exchange may utilise the Settlement Fund and other monies to the extent necessary to eliminate the obligation of the defaulting member in the following order-

(1) Liquidation of collaterals: Contributions or deposits, including margins in any form, by the defaulting member or client.

(2) Liquidation of security deposit: Membership deposit given by the defaulting member to the Power Exchange.

(3) Insurance money: Insurance taken by Power Exchange of an amount as considered appropriate by the Power Exchange for protection against defaults.

(4) It's Initial contribution as considered appropriate by the Power Exchange towards Settlement Guarantee Fund.

(5) Current year's Profits of the Power Exchange including Fines, penalty
collected from members.

(6) Reserves of the Power Exchange.

(7) Contribution towards settlement guarantee fund by all members or clients: All non-defaulting members or client's contribution in proportion of deposits towards Settlement Guarantee Fund.

(8) Equity Capital of the Power Exchange.

(9) Balance obligations remaining outstanding after above funds will be met by contribution from members or clients in proportion to their contribution to the SGF. Provided that once the Clearing Corporation is hived off, the default remedy mechanism shall be handled by the Clearing Corporation and the Power Exchange shall not be held liable on this account.

CHAPTER 3

RESEARCH DESIGN ,METHODOLOGY AND PLAN

3.1 DATA SOURCES

Power Trading has been recognized as distinct activity vide the Electricity Act, 2003. In order to promote Competitive Power markets and trading of Power in an organized way, Central Electricity Regulatory Commission (CERC) in February'07 had issued guidelines for setting up and operating Power Exchanges. Power Exchange India Limited (PXIL) has been set up in response to these guidelines to provide an on line platform for trading of Power. PXIL has started operations from 22nd Oct'08.

PXIL is promoted by two of India's biggest exchanges

- National Stock Exchange of India Limited (NSEIL)
- National Commodity & Derivatives Exchange Limited (NCDEX)

Key Features of the Exchange

- Nation-wide, electronic Exchange for trading of Power
- Exchange will handle power trading and transmission clearance simultaneously
- Transparent, neutral and efficient electronic platform
- Trading to start with day-ahead contracts (all 24 hours)
- More Contracts to be introduced subsequently
- No separate booking of Transmission Corridor required
- All the participants come to one single platform and get access to each other on a national basis
- Buyers and sellers can participate directly
- Trade Guarantee
- Exchange to guarantee payments to sellers
- Online Buying/Selling of Power
- Inter-State Generating Stations (ISGSs)
- Distribution Licensees/Franchisees
- IPPs, connected on ISTS
- CPPs & IPPs *

- Open Access Customers*
- Electricity traders
- State Generating Stations
- Banks, Financial Institutions (as Clearing Members)
- Increase the depth of participants
- Helping Captive Generation Capacities to bring their surplus on board
- Providing a platform to Independent Power Producers for their surplus sale
- Providing large load consumers access to "on-demand electricity"
- Increasing the liquidity of transactions
- Work towards introduction of products of longer term and hedging instruments
- Wide basing the scope by introducing energy efficiency products, RECs etc
- Knowledge partnership with regulators and policy makers
- Assist and support regulators and policy makers to develop the power market in India
- State Power Utilities

1. GUVNL
2. APTRANSCO
3. MPPTCL
4. WBSDCL
5. CSEB,TNEB,KSEB,PSEB

- Large power utilities

1. JSPL
2. JSW
3. TPTCL
4. GMR

- PXIL has traded to the tune of 32.6 Mu's till 23rd December 2008.
- PXIL was operational even on 27.11.2008, the day of unrest in Mumbai, which even forced capital and commodity markets to remain closed for trading.
- PXIL matching engine has successfully handled congestion on WR-SR and WR-ER-SR corridors.

3.2 RESEARCH DESIGN

Research is an art of scientific investigation. It is basically careful investigation for search of new facts in any branch of knowledge. Research is a systematic effort to gain new knowledge.

Research considers as a movement. A movement from the known to unknown. Research has its special significance in solving various operational and financial problems of business and industry.

In order to accomplish the objectives of the study, it is essential to articulate the manner in which it is to be conducted i.e. the research process is to be carried out in a certain framework.

Scope of the Research

If we look at the recent past of the sector, in mid 1980's the power sector in India started showing signs of financial stress. By the mid 1990's, most of the state electricity boards had incurred heavy financial losses and were unable to function without substantial financial assistance from their respective state governments. Highly subsidized tariff's (for some consumer categories), poor technical and commercial performance, very high transmission and distribution losses, rampant power theft, and excessive interference by politicians in the functioning of SEB's were some of the primary reasons for the crisis.

Apart from separation of generation from distribution companies and privatization there off, a crucial component of restructuring process was the establishment of independent regulatory commissions. Transition to Availability based tariff and implementing UI mechanism to improve performance and introduce merit order are commendable.

After doing all these what more needs to be done to achieve "Reliable and affordable power for all"?? For any industry to be sustainable, one basic requirement is "to allow its all participants to recover revenue equivalent to cost of service". We need to provide a framework which ensures this in power sector. We also need to assure payment security (participants should not be expected to keep waiting in courts of contract just to receive payment of the service they have provided). Any well designed and implemented exchange offers reasonably high payment security and financial discipline. Thus a fully functioning Power Exchange can certainly help in this matter.

But as with any new concept come new challenges, we have sighted certain points of concern that must be taken care of before making power exchange a reality.

The proposed study consists of the following attributes:
Type of research: Exploratory (Qualitative) Research
Source of Data: Secondary data

Data Collection:

The task of data collection begins after a research problem has been defined and the research Design/Plan chalked out. The data are collected in order to get the result of the problem.

Secondary Data:

These are the data which have already been collected by someone else and which have already been passed through the statistical process. In this the researchers have to decide which sort of data he would be going to use. As this study is an exploratory type of research, So in order to attain the objective, the secondary data is also collected. The data collected was from the manuals, from the site of MoP, CEA, CERCs and research papers from CERC and from the reports.

Since the data collected helps in finding a solution for improving the problems faced in the trading & wheeling of Captive & Co-generation Power. Hence it is qualitative research.

Sample Design:

The sample is taken from the various government sites as real time data was not possible to get due to immobility and the time factor. The method used to select sample is Convenient Sampling Method.

In this study I have taken the data from the sites of CEA, CERC. I have analyzed the Charts, latest figures of Indian Power Market stating there Demand, supply and shortages of the power.

Research is an art of scientific investigation. It is basically careful investigation for search of new facts in any branch of knowledge. Research is a systematic effort to gain new knowledge. Research considers as a movement, a movement from the known to unknown. Research has its

special significance in solving various operational and financial problems of business and industry.

In order to accomplish the objectives of the study, it is essential to articulate the manner in which it is to be conducted i.e. the research process is to be carried out in a certain framework

3.3 SURVEY QUESTIONS

A World Bank survey on the state of energy reform in developing countries focused which key steps to electricity sector reforms?

(i) Corporatization or commercialization of the core utility.
(ii) Enactment of an 'Energy Law'.
(iii) Establishment of an independent regulatory authority.
(iv) Restructuring of the core utility.
(v) Private investment in green field sites.
(vi) Privatization.

How is it different from the present bilateral trading?

- No separate booking of Transmission Corridor required
- All the participants come to one single platform and get access to each other on a national basis
- Buyers and sellers can participate directly
- Trade Guarantee
- Buyers - All confirmed trades on the exchange to be scheduled and deviations to be settled through UI
- Exchange to guarantee payments to sellers
- Online Buying/Selling of Power

Who can participate?

- Inter-State Generating Stations (ISGSs)
- Distribution Licensees/Franchisees
- IPPs, connected on ISTS
- CPPs & IPPs *
- Open Access Customers*
- Electricity traders
- State Generating Stations
- Banks, Financial Institutions (as Clearing Members)**

What is the Primary objectives of PXIL ?

- Facilitate direct involvement of power utilities
- Direct membership of state power utilities
- Increase the depth of participants
- Helping Captive Generation Capacities to bring their surplus on board
- Providing a platform to Independent Power Producers for their surplus sale
- Providing large load consumers access to "on-demand electricity"
- Increasing the liquidity of transactions
- Work towards introduction of products of longer term and hedging instruments

- Wide basing the scope by introducing energy efficiency products, RECs etc
- Knowledge partnership with regulators and policy makers
- Assist and support regulators and policy makers to develop the power market in India

3.4 INTERVIEW PROCEDURES

As per the APDRP plan the target is to reduce AT&C losses to 15% by the end of the Xth plan period. But the losses continued to remain high at around 30%. Amongst the few successes WBSEDCL has brought down AT&C losses from 43% in 2003-04 to 25% in 2007-08.

Large scale anti theft drives is being conducted in many discoms.

Few measures are given below-

- Installation of meter outside consumer premises to ensure better access to meter for reading.
- .Rewards given to the people who help track electricity theft.
- Feeder segregation & bifurcation

Technological intervention in Revenue management

As a result of technical & financial support from the funded scheme APDRP, IT application introduced for improvement of the distribution system. Improved metering(TOD, AMR, automated feeder metering), enhance customer services, CRM introduction, call centre, online payment, GIS implementation & MIS system. All these automation is done to improve system realiability, quality, revenue enhancement & ultimately customer utility relation.

Private participation in distribution

Despite of encouragement through EA '03 framework private sector is still not so attracted towards distribution sector except in few states (Orissa & Delhi). Surprisingly franchisee model get acceptance from both utility & private player & from both regulatory & consumer side.

With the help of basic Key question we can start the interview procedures

1. Key Features of the Exchange?
2. How is it different from the present bilateral trading?
3. Who can participate?
4. What are the Primary objectives of PXIL?

3.5 DATA ANALYSIS PROCEDURES

Regulatory Framework

The Regulations for Open Access in Inter-State Transmission were revised by CERC to include Collective Transactions Discovered on a Power Exchange, and the new Regulations became effective 1st April 2008. The Regulator had adopted the approach of light handed regulation while providing an enabling framework for the development of Power Exchange .

The objective was to provide operational freedom to the Power Exchange within a given framework and Regulation would be minimal and restricted to requirements essential for preventing derailment of the process. Private entrepreneurship was allowed to play its role so as to facilitate provision of value added and quality service to the customers.

The CERC Guidelines for Setting up of Power Exchange, however, clearly provided for a de-mutualised form of Power Exchange implementation where ownership, management and participants were clearly demarcated.

The Regulations for Open Access in Interstate Transmission revised in 2008 got amended in 2009.

CERC Open Access Regulations (Amendments), 2009 Made The Following Provisions:

- Transactions were categorized as Bilateral and Collective (through Power Exchange).
- Nodal Agency for the two types of transactions was identified. National Load Despatch Center (NLDC) was designated as the nodal agency for Collective Transactions. The Regional Load Despatch Centers (RLDCs) were the designated agencies for the bilateral transactions.
- Transmission losses were applied at both the points of injection and drawl. The sellers are required to inject more and the buyers draw less than the traded quantum to compensate for the losses.
-

Regulations placed great emphasis on the empowerment of the SLDCs. NOC/Standing Clearance was required to be obtained by State Utilities/Intra-State Entities from the SLDC. The SLDCs are obliged to respond within 3 days to any request for an NOC as per the Regulations. The SLDCs may charge an appropriate fee for such NOC/Standing Clearance (as per SERC or Rs. 5000 if not notified by SERC).

Timeline And Available Margins For Collective Transactions Vis-À-Vis Bilateral Transactions:

The Open Access Regulations provide for a variety of products in the bilateral transactions category which have a pre-defined time line. These are advance, first-come-first-serve, day-ahead and contingency. Collective transactions discovered on a Power Exchange through anonymous bids on a neutral platform result in a transparent price discovery and present a balanced portfolio to the system operator. These transactions are processed before the processing of day-ahead and contingency category bilateral transactions. The total available margins for short term open access are assessed by the RLDCs in advance through simulation studies and made available transparently

to the stakeholders through their respective websites. The balance margin after permitting advance and first-come-first-serve bilateral transactions is the margin available for scheduling of collective transactions. The day ahead and contingency transactions are processed after the collective transactions have been scheduled, using the balance available margins, if any.

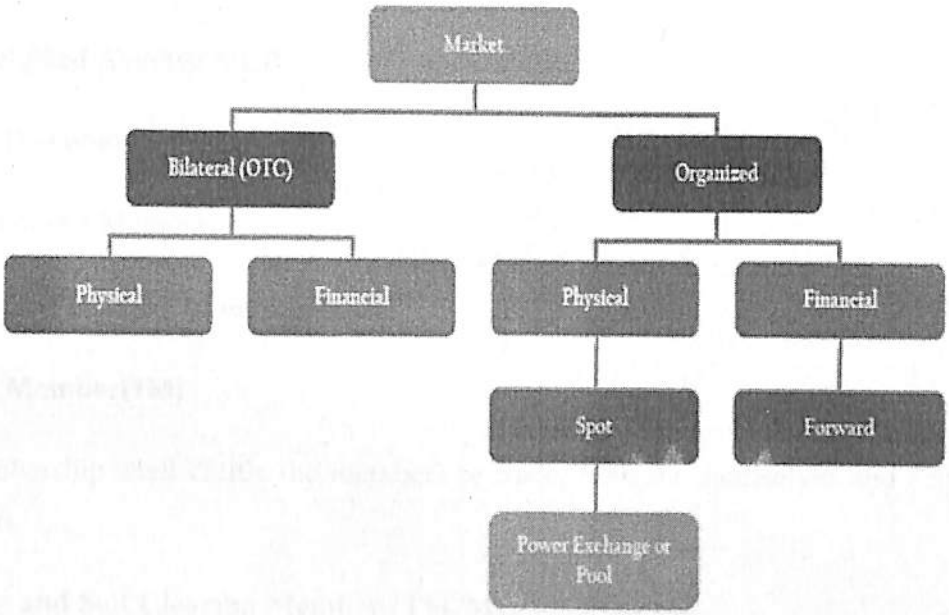

Figure No-7

CHAPTER 4

FINDINGS AND ANALYSIS

4.1 DESCRIPTIVE STATISTICS

Highlights of Market Operations

- PXIL Daily Volume Chart.
- Weighted Average MCP
- PXIL Turnover
- Become a Member

PXIL offers four types of membership:

1. **Trading Member(TM)**

TCM membership shall entitle the members to trade, both for themselves and / or on behalf of their clients.

2, **Trading and Self Clearing Member (TSCM):**

TSCM membership shall entitle the members to trade and clear for themselves only.

3. **Trading cum Clearing Member (TCM):**

TCM membership shall entitle the members to trade and clear, both for themselves and / or on behalf of their clients.

4.**Professional Clearing Member (PCM):**

PCM membership shall entitle the member to clear on behalf of his clients and other TMs.

- **Become a Client of a Member of PXIL:**

To be able to buy/sell electricity on PXIL any Client of a member or the member himself is required to meet the following criteria

o Either the entity (client of a member or the member himself) are connected to the grid and are eligible to buy and sell electricity – Generators, Distributors, Open access customers etc fall under this category or Traders who hold a valid trading license issued by CERC

o All the entities are required to obtain the standing Clearance from the respective SLDCs in the format given under "Procedure for scheduling of (Open Access) collective transactions" by CTU.

• Membership Fee Structure (Rs. in Lakhs)

Type	Annual Fee	Onetime Fee	Interest Free	Security Deposit	Total	Net worth Requirement
Trading Member	1.00	5.00	10.00	16.00	150.00	Smaller captives and representatives of captives
Trading and Self Clearing Member	2.50	10.00	25.00	37.50	150.00	Large captives and utilities
Trading cum Clearing Member	2.50	10.00	40.00*	52.50	150.00	Traders / Active Utilities
Professional Clearing Member	1.00	NIL	50.00	51.00	150.00	Lenders / Large Banks

Table No-4

* For a maximum of self + 5 clients. For every additional Client Rs 2 lakhs per client has to be given as additional interest free security deposit

- Apart from the processing fee of Rs 5000/-, an amount of Rs 1,00,000/- (Rupees One lakh) would be payable along with the application , which would be adjusted against one-time fee on successful grant of membership. In the event that the membership is not approved, the sum of Rs 1 lakh would be refunded to the applicant.

- 50% of the Interest free deposit has to be given at the time of approval of membership. The remaining 50% would be collected one week prior to commencement of trading on the exchange. Based upon volume traded by members, the Exchange may alter the deposit structure in subsequent years and may include options to furnish the same in the form of Fixed Deposit/ Bank Guarantee or other financial instruments as may be considered appropriate by the Exchange.

- Annual Fee for the year 2008-09 would be charged on a pro-rata basis depending upon the date of commencement of operations of the exchange

INTEGRATED BUSINESS FLOW

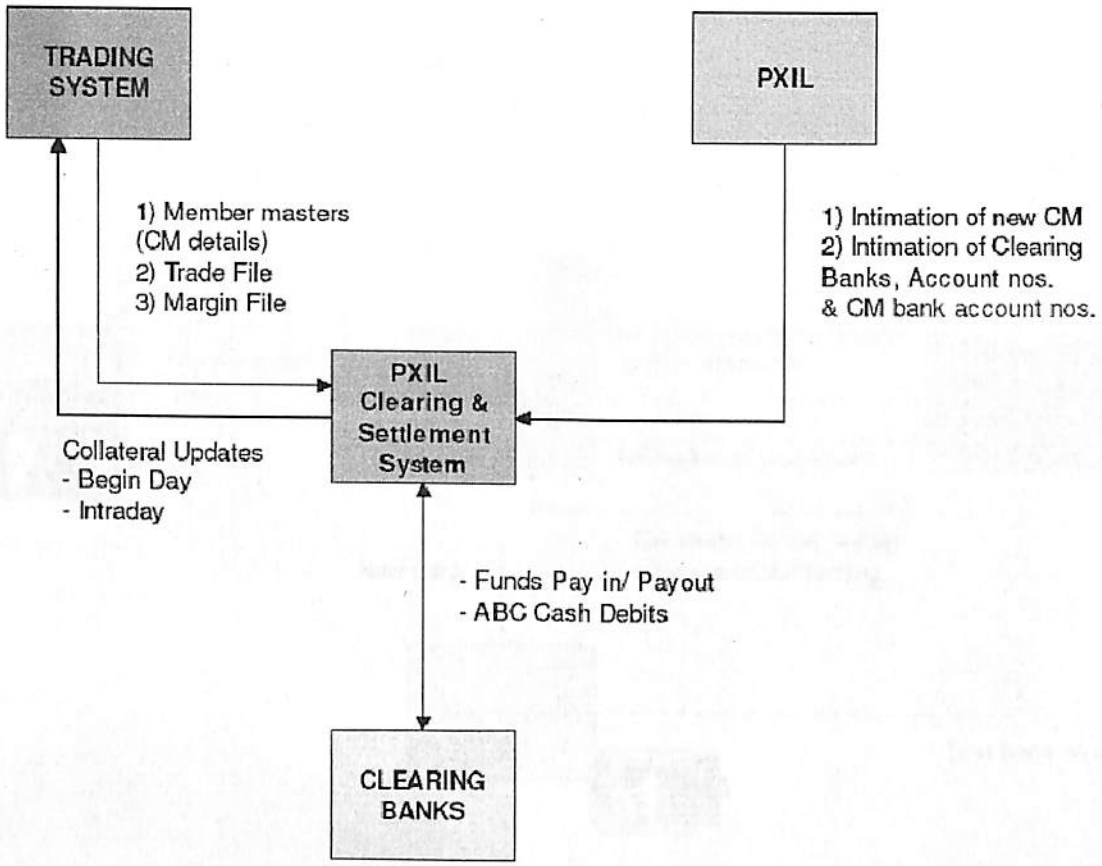

Figure No-8

Exchange – PXIL

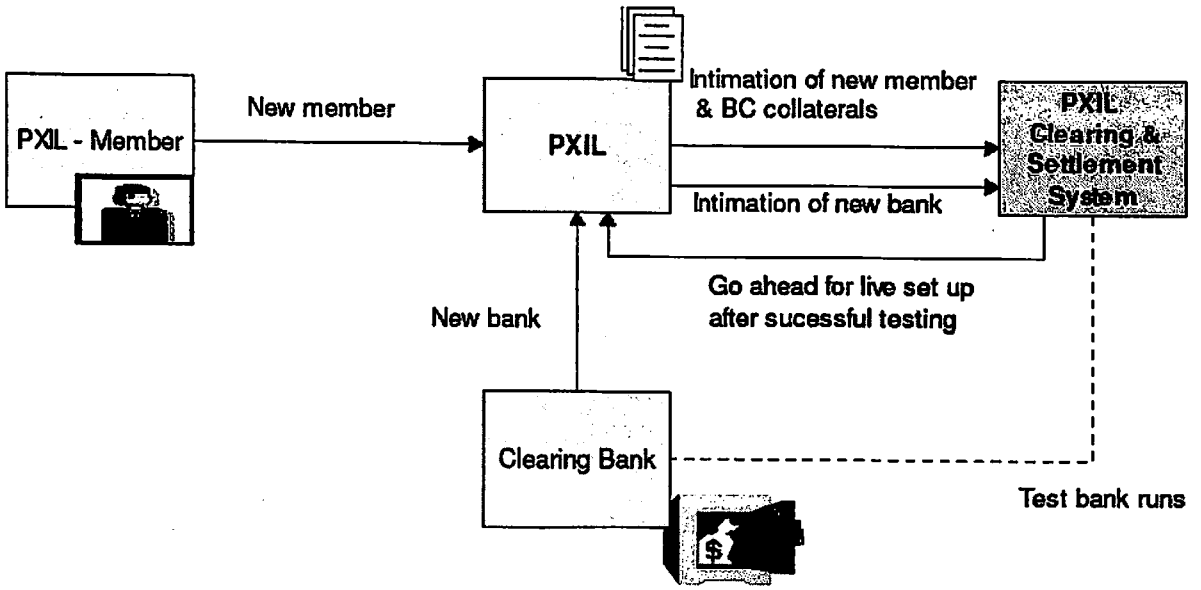

Figure No- 9

Intimation of member collateral The new membership intimation shall contain details about the base capital collateral. PXIL accepts base capital collateral only in the form of cash. The base capital requirement depends upon the type of membership as follows:

Professional Clearing Member Rs.50 lacs

Trading Cum Clearing Member Rs.40 lacs

Trading Cum Self Clearing Member Rs.25 lacs

Trading Member Rs.10 lacs

Hence the intimation shall indicate the base capital cash requirement to be maintained for the new member. Further the members can submit additional base capital collaterals directly to NCCL during business hours. Refer to Annexure 1 for Draft intimation of new membership

Intimation of Clearing Bank

The banks shall facilitate the fund settlement of the trades executed on the exchange. Presently PXIL has empanelled the following clearing banks

HDFC bank

State Bank Of India

PXIL shall maintain the following accounts with the clearing banks:

General A/Cs

Margin Settlement A/C

Settlement Fund A/C

Settlement A/C

PXIL shall intimate the empanelment of the new clearing bank to NCCL via mail. NCCL shall check that an agreement is signed between both the parties before communicating with the said bank.

Trading System

The trading system shall send the following files to NCCL at End of Day: Member Masters – This file shall contain the records of the clearing members maintained by the Exchange.

Trade File – This file shall contain the trades executed on the exchange for the day.

Margin File – This file shall contain the details of the margin amount blocked by the exchange for the member. Margins are equivalent to the Trade Value plus transmission & operating charges. The margin file shall be used by NCCL for generating the obligations.

Collateral Management

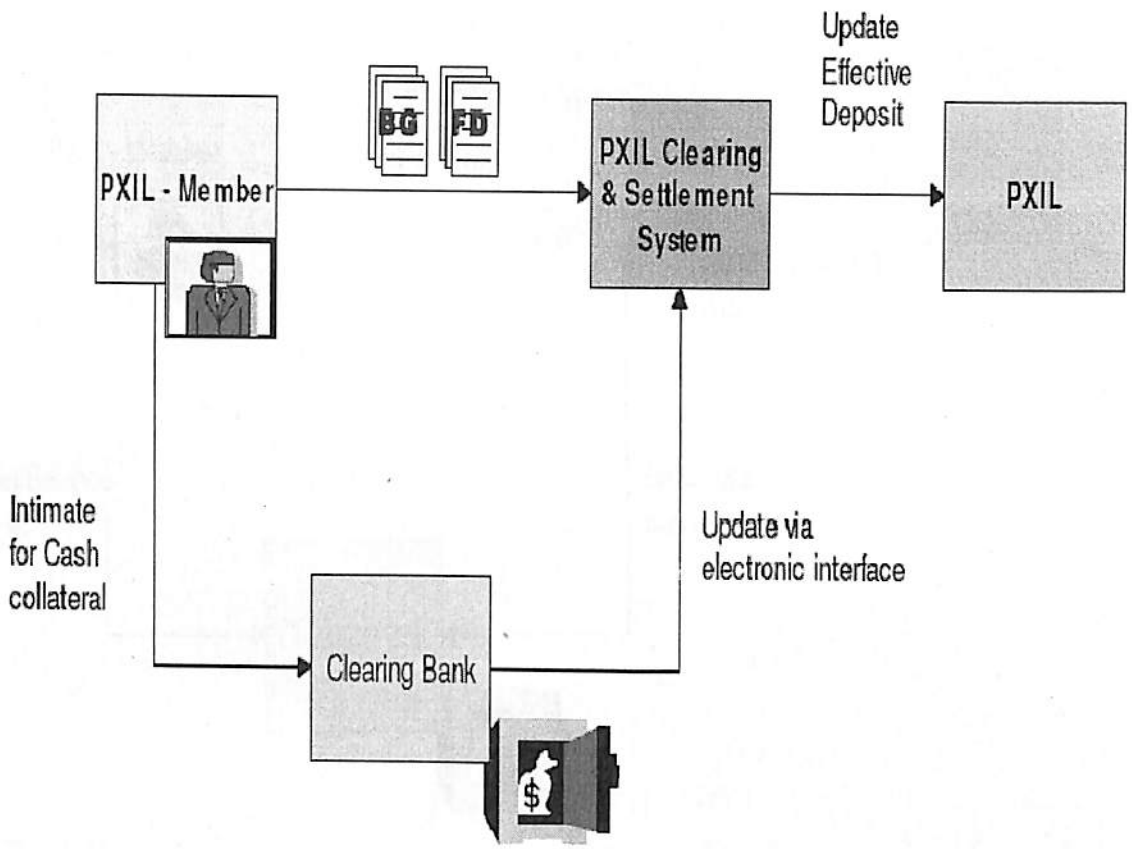

Figure No-10

Funds Management

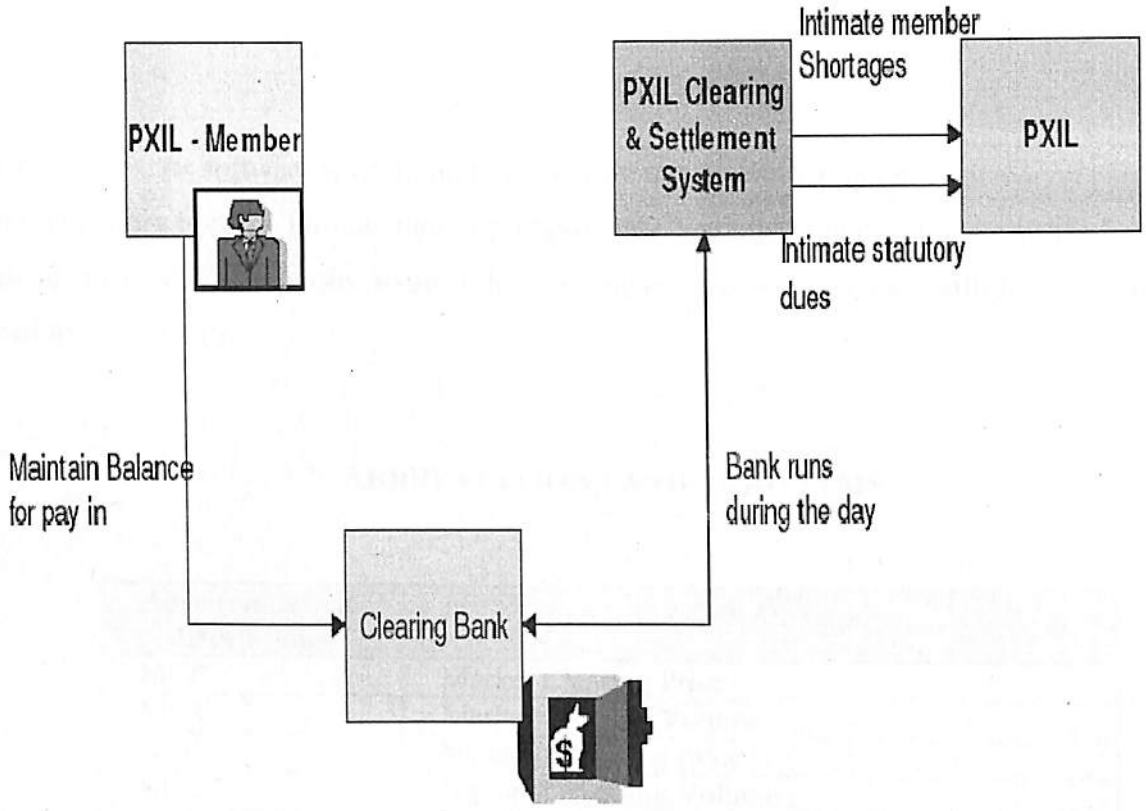

Figure No-11

Clearing Banks

The banks shall facilitate the fund settlement of the trades executed on the exchange. Presently PXIL has empanelled the following clearing banks

HDFC bank

State Bank Of India

All the clearing members/Professional clearing members have to necessarily open accounts with one of the clearing bank. Exchanges looks forward to participation from state utilities and large private players to ensure institutionalization with focus on wide-basing equity participation from

state utilities. Its software is continuously evolving to take care of inputs from market participants and regulatory bodies. Introduction of professional Clearing Membership concept for PFC etc. is intended to cater to liquidity issues related to payment process of state utilities and remittance need to small CPPs.

ABBREVIATIONS AND ACRONYMS

Acronym & Abbreviations	Full Form
MCP	Market Clearing Price
MCV	Market Clearing Volume
NCP	National Clearing Price
NCV	National Clearing Volume
AD	Aggregate Demand
AS	Aggregate Supply
TC	Transmission Constraint (KWh)
UMCP	Unconstraint Market Clearing Price
UMCV	Unconstraint Market clearing Volume
IM	Import Margin
EM	Export Margin
AIQ	Actual Import Quantity
AEQ	Actual Export Quantity
AF	Actual Flow
Afm	Actual Flow (Import/Export Margin)
Afc	Actual Flow (Transmission Constraint)
TF	Theoretical Flow

Table No-5

Up to 50% of the loan's provided under part B (90% for special states) can be converted into grant that to be 5 equal tranches on achieving 15% AT&C loss for a period of 5 yrs as verified by TPIEA.

If utility fails to sustain 15% AT&C loss target in a particular yr, that yr's loan amount to be converted into grant will be reduced in proportion to shortfall in the achievement of target.

2% of the grant for Part- B, has also been allotted as an incentive to the utility's staff (Part D) in project areas where TA&C loss has been brought <15%.

Project sanctioned under APDRP for Tenth plan for the towns or areas shall be considered for XI Plan only either after completion or short closure of the earlier sanctioned projects.

4.2 CORRELATION /REGRESSION ANALYSIS

A decentralised market mechanism is a market with no specialised institutional trading arrangement where generators and purchasers of electricity trade directly with one another through contracts. In contrast, a centralised market involves a special purpose institutional trading arrangement; such as, for electricity, with a system operator in the role of a central auctioneer, who coordinates generators' offers and purchasers' bids to determine the market price and quantity of electricity traded. It is generally agreed that real-time system operation should be centralized and the forward markets beyond a week should be bilateral and decentralized.

ORGANIZATION OF SYSTEM AND MARKET OPERATIONS

There are different ways of organizing the roles of system and market operators. In principle, the system operator has the responsibility for system reliability. The system operator will normally not own generators, transmission lines and is not responsible for electricity supply to customers. To carry out the responsibilities for reliability and quality of supply the system operator must have resources to procure system services from market participants and/or have authority through the regulatory framework to instruct. In the transition time for a change from a regulated regime to a competitive regime, the system operator can have defined responsibilities for supplying non-eligible customers. In some areas, the system operator gets the responsibility for handling prioritized generation such as small hydro and other environmental preferred generation. For an electricity market, it is necessary that the system operator keep the lights on. For this purpose the sys

tem operator needs to have power of attorney from authorities to plan for safe operations and also have the necessary ancillary services available during operations. The system operator will partly use market solutions in his work and partly put mandatory obligations on the participants in the electricity supply business. Normally, the technical requirements of the system operator are described in a grid code for the control area. Establishment of a spot power exchange may not be a necessity. The power market could be operated on pure bilateral basis and with trade brokers or intermediates to facilitate the trade. The power exchanges normally get into a close co-operation with the system operators to be able to make a well functioning market that include trade of long-term contracts as well as trades in short term contracts of duration one hour or less. Globally, various types of combinations between the system operator, the market operator and also the main grid owner have been established. Some of the examples are mentioned below:

• Independent System Operator (ISO)

An ISO shall operate independent from network owners and from market operator. This has been the preferred model in the development in USA up to lately.

• Transmission System Operator (TSO)

A TSO is a combination of a system operator and an owner of the main grid. This is the model that has been preferred in the European market development.

• Independent Market Operator (IMO)

An IMO is a combination of an ISO and a Market Operator.

. SPOT TRADE SYSTEMS

There are two main types of spot trade systems: Auction or Continuous bidding.

Auction Trade System

An auction trade system is based on pairs of price/volume bids that are submitted to the power exchange. Each participant's bids form a stepwise linear bid curve. A bid should be considered as

a price-differentiated plan for how the participant will dispose to the spot market and is a result of the participant's evaluation of prices and risk in the market. Normally, separate bids for all 24 hours the next day are submitted. The power exchange accumulates all demand bids and all supply bids and form a total demand curve and a supply curve for each hour. A market-clearing price (MCP) and corresponding volume is determined – for each hour – at the intersection of demand and supply curves. The participants receive a contractual binding schedule that is in accordance with his price-differentiated plan or bid. All participants' financial settlement is based on the schedule and the clearing prices. Except for UKPX and to some extent Borzen in Slovenia and the intra-day market at

Continuous Trade Systems

In a continuous trade system participants may place orders/ bids on purchase and sale of spot contracts continuously throughout the opening period each day. The trade systems are well known in all financial markets and a detailed description is,therefore, not included here. There are "Market Makers" that (by an agreement with the power exchange) are committed to place orders within a spread agreed upon. This secures that those participants who want to change their portfolio at any time throughout the day can find a counterpart. On-line (real time) communication systems inform the participants on all changes in orders, trades and other relevant information. A trade agreement is made whenever two participants meet on price. Unlike an auction trade where all trades are based on the same price, trades in a continuous trade system are based on different prices for each trade. The official price is in most cases based on an average price of the last traded volumes before the power exchange closes down. An electronic continuous trading system is widely applied in some commodity markets and financial markets.

It is not widely used as trading system in an electricity spot market. Most of the mentioned power exchanges base the trade system on an auction trade system. The trade system in the intra-day (Elbas) in the Nordic market is based on continuous trade in the intermediate period between trade in the spot market and delivery of spot contacts. The last version of the system manages dif

ferent price areas and has been in operation about three years. The experience so far is good. However, the system serves a type of balancing market, not a spot market. Traded volume is very low, about 1% of the spot volume.

Comparison of Auction versus Continuous markets

Both systems have advantages and disadvantages that should be discussed before a decision on type of trade system is made. In the context, the following functionalities should be discussed:

- The systems' suitability as tool to balance participants' schedules.
- Diversity between terms of demand side and supply side participants
- The systems' capability as tool in congestion management
- The systems' impact on price volatility
- Suitability in a start up period with low liquidity in the market
- Simplicity and costs.

The systems' suitability as tool to balance participants' schedules It is essential that there be as close as possible a balance between generation and consumption when schedules are submitted to system operators before time of operation. Participants should, therefore, have a financial incentive to predict their commitments and trade in balance. In an auction trade system, the participants submit a price-differentiated bid that balances power resources to power delivery commitments at all price levels. Regardless of price level in the market, a participant is warranted a trade schedule in accordance to his bids. His plan will always be set up with balance between resources and commitments for all expected price levels. Auction trade systems are, therefore, an excellent tool to balance participants' schedule.

In a continuous trade system, unexpected price movement in the market during the trade period can easily disturb participants' plans. Diversity between terms of demand side and supply side participants The balance requirements imply differences in degrees of freedom of a generator and

the degrees of freedom of a participant that has no generation capacity. A generator may use his generation capacity to meet the balance requirements and reduce costs of imbalances if he has not successfully managed to trade in complete balance. A participant with no own generation capacity must use the markets to meet the balance requirements. During a daily trade, he may be in a "must buy or sell situation" and accepts rather high prices close to termination of the market. Participants in the market may exploit this situation. The systems' capability as tool in congestion management Auction trade systems are excellent tools for execution of day-ahead congestion management. The Elex continuous trade system operated by Nord Pool is to the consultant's knowledge, the only system that operates trades between constrained areas. The systems' impact on price volatility In the Nordic market it is experienced that in some situation unexpected short term variations in the market-clearing price occur. These events may be caused by inaccurate price differentiated bid set up by participants in the auction trade.

In a continuous trade system participants are monitoring all price movements and would probably contribute to reduce the frequency of such events. Suitability in a start up period with low liquidity in the market Regarding liquidity in the market the first period after start up may be critical. The trade system should be capable to manage relatively large volumes from single participants without negative speculative price movement. Continuous trading implies that large volumes from single participants are visible for the market and may move prices considerably unless the volumes are split into smaller parts and traded carefully throughout the trading day. It is, therefore, necessary to apply tactical considerations when trading large volumes to avoid moving prices opposite to participant's intentions. In an auction type of system, large volumes placed by individual participants are not visible for the market and will not have the same psychological impact on the market. Simplicity and costs Auction trade is a very simple model. It is easy to understand, require less staff, and cheap to implement. Continuous trading systems are in most cases electronic system where trades can be executed direct from the participants' computers. At least, a real time information system is required to inform the participants on placed orders and executed trades.

These systems are, in general, more expensive both regarding investments and operation. An electronic continuous trading system is widely applied in some commoditymarkets and financial markets. It is not widely used as trading system in an electricity spot market. Most of the mentioned power exchanges base the trade system on an auction trade. The trade system in the balancing adjustment market at ELEX in Finland is based on continues trade in the intermediate period between trade in the spot market and delivery of spot contacts. The last version of the system manages different price areas and has been in operation about one year. The experience so far is good. However, the system serves a balancing market, not a spot market. Traded volume is very low, less than 1% of the spot volume.

ZONAL VERSUS NODAL PRICING

Zonal Pricing

All markets with the exception of Russia operate zonal pricing in the spot markets. Nord Pool in the Nordic countries, Powernext in France and EEX in Germany operate the same auction spot trade system. Nord Pool is so far the only regional power exchange. Other European spot power exchanges also accept foreign participants. Price forming in all the above markets is easy to understand for all market participants. Price algorithm includes no technical parameters that can give any advantages to professionals with an in-depth technical background. The zonal model applied in the Nordic market is a multi-zonal market model where day- ahead congestion management is based on market splitting. In this regional model the spot price include the transmission capacity fee / costs between the zones.

Nodal Pricing

Some markets calculate the electricity prices in each node in the grid. This model is used in the New Zealand market and in the east coast of USA. This concept was originally a centralised dispatch model that included data for total generation, consumption and transmission system. The model selects units for dispatch and calculates corresponding prices in real time simulation based on economic optimisation of the resources. The core of the model is well known in the former

regulated regimes where fuel prices, start/stop costs, transmission losses, transmission capacities and predicted load are included. The price forming is claimed to be too complex and not understandable for the demand side.

A Standard Market Design worked out by Federal Energy Regulatory Commission (FERC) in the US underlines that a design should include a day ahead spot market with "binding contracts" and a real time market where pricing in both markets should be based on an easy understandable price algorithm. The concept used in the PJM in US has been modified to include a day-ahead market where price forming is based on bids (and easy understandable), but still a nodal model that simulates prices for each node in the grid. In Russia, a modified nodal concept has been introduced and here the model calculates prices in 5200 nodes. Prices at each node include both transmission capacity fee/costs and costs of energy losses in the grid. Discussion zonal vs. nodal pricing In the zonal model the market participants are responsible for balancing their portfolio (i.e. purchased contracts and generation must balance the sold energy within the settlement interval) within each defined area. This is done by utilizing bilateral contracts, spot contracts and scheduling generators. The system operators have the responsibility for the real time balance between generation and consumption and make the necessary rescheduling for this purpose. Congestion management by Market Splitting on the borders between bid areas can result in different zonal prices when transmission limits between the bid areas are over loaded if the MCP is applied in all areas. Within a defined zone, there is no difference in spot prices and bilateral contracts can flow without additional congestion charges. In the Nordic system, different TSOs calculate nodal transmission tariffs for their network. This nodal tariff is calculated such as all participants pay the tariff for grid usage in the node where they are connected to the grid. The tariffs will normally vary in each node, mainly because increased input in surplus areas will increase network losses as well as increased load in deficit areas will increase losses. The nodal tariff is calculated using a method that grant the network users access to transmission in the whole network by paying the nodal fee. The TSOs budget their costs for operating the grid and calculate the nodal tariffs to cover the annual costs according to provisions and guidelines given by the Regulator. In the Nordic area, the network owners are obliged to buy the network losses in the market so the costs for

this has to be taken into account in the budgeting process. Congestion management by market splitting gives an income to the TSOs and contributes to reduce the network tariffs. The income will be the difference between the zonal prices times the energy crossing the constraint. Congestion management within a bid area has to be performed by the TSO and will have some cost connected to it. TSOs have to increase input to the grid on the deficit side of the congestion and reduce the input on the surplus side.

The TSO has to use the Balancing Market for this purpose by buying extra volumes on the deficit side and sell the surplus back to market participants on the deficit side. The purchase will normally have a higher price than the sale in this transaction. The TSO has to take the estimated costs for this type of congestion management into the budget, and is allowed to calculate those costs, in whole or partly, into the network tariff. The congestion costs within each zone is initially carried by the system operator and will be recovered through the grid usage tariffs. The settlement of imbalances is handled after operations. Metered balance for each balance responsible company is compared with the contractual balance and deviations are cash settled at the imbalance price.

In the nodal pricing model the grid losses and congestions are taken into the model. The computer model is very detailed and will result in different prices in each node in the grid. The generator and load schedules in the nodes will be computed on the basis of the bids and imbalances have to be calculated on the basis of each schedule. The market participants will pay or receive the price difference between the nodes for all scheduled bilateral transactions. The possibility of treating several generators in an area together as a portfolio will be very limited. In an open market model liquidity is very important to get reliable market prices. In the zonal model each zone will normally contain several market participants that compete. The market price that is formed in a day-ahead auction will be suitable as a reference price for trading of derivatives based upon electricity. This has been experienced in the European markets. In nodal markets there will be a limited number of competitors in each node, and it will be difficult to establish reference prices for the nodes. Thus, markets that have introduced a nodal model have experienced problems with establishment of derivatives contracts.

In a restructured market, generators themselves are responsible for their finances and profit and should, therefore, have the right to optimize their resources within each zone rather than an optimization of each unit associated to a node. This was an important issue in an early stage of the development of the Nordic market. Electricity is a very important infrastructure commodity. In establishment of a regional market made up of several national markets, the countries involved will hesitate to leave too much authority to a strong central dispatch organization as required in a nodal concept.

BALANCING MARKET

There are different models for balancing mechanism at the various global energy markets. In centralized dispatched markets, the balancing mechanism is integrated in the realtime dispatch. The participants may submit day-ahead offers and real-time offers, or the market/system operator may use the day-ahead offers for the real-time dispatches. In decentralized dispatched markets, a subset of the market participants – the socalled balance responsible participants – submits offers for increment and/or decrements of their generation and/or load capacity. It is, furthermore, possible for the System Operator to procure or tender out requirements for balancing power on a bilateral basis and not expose these and other ancillary services to a competitive bidding market. Some markets, such as the IMO, operate an Operating Reserve market, which provides the System/Market Operator with a capacity reserve for contingencies. Balancing markets based on competitive bidding typically opens after the Day-Ahead auction has been closed. The TSO receive bids and offers for decrements and increments in the evening after the Day-ahead auction is closed. To avoid arbitration between the day-ahead market and balancing market, the balancing market rules typically stipulates that offers for increments must be priced to the spot price or a higher and bids for decrements must be priced to the spot price or a lower. The TSOs are single buyers or sellers for the volumes they need for balancing the system, and the costs for these procurements, i.e., cost for balancing the market is passed on to participants through Transmission Tariffs or similar fees. In regional markets with multiple TSOs, each TSO is responsible for the balancing of its control area. However, TSOs may cooperate and "share" balancing power and other ancillary services. The inter-TSO agreement in the Nordic region is a great example of this.

There are alternatives to competitive priced balancing power also. When the power exchange 'PowerNext' started their day-ahead auction in France, there was no competitive bidding for balancing mechanism. The French TSO had published a tariff for imbalances. This was in the beginning 150 Euro/MWh for extra purchase (top up power) and 0 Euro/MWh for extra sale (spill). As PowerNext showed increasing trade and prices that were trusted as energy prices in France the tariffs for imbalances have been changed to 'spot price + 20 %' for top up power and 'spot price – 20 %' for spill. increments in the evening after the Day-ahead auction is closed. To avoid arbitration between the day-ahead market and balancing market, the balancing market rules typically stipulates that offers for increments must be priced to the spot price or a higher and bids for decrements must be priced to the spot price or a lower. The TSOs are single buyers or sellers for the volumes they need for balancing the system, and the costs for these procurements, i.e., cost for balancing the market is passed on to participants through Transmission Tariffs or similar fees. In regional markets with multiple TSOs, each TSO is responsible for the balancing of its control area. However, TSOs may cooperate and "share" balancing power and other ancillary services. The inter-TSO agreement in the Nordic region is a great example of this. There are alternatives to competitive priced balancing power also. When the power exchange 'PowerNext' started their day-ahead auction in France, there was no competitive bidding for balancing mechanism. The French TSO had published a tariff for imbalances. This was in the beginning 150 Euro/MWh for extra purchase (top up power) and 0 Euro/MWh for extra sale (spill). As PowerNext showed increasing trade and prices that were trusted as energy prices in France the tariffs for imbalances have been changed to 'spot price + 20 %' for top up power and 'spot price – 20 %' for spill. price area to the high price area. However, on the border between Denmark and Germany, it is often experienced that the flow is in the opposite direction.

Congestion Management by Market Splitting

Day-ahead market splitting makes use of the price flexibility of both power supply and power demand and is applied by power exchanges to relieve the major of congested volume prior to delivery. Assume the total market is split in two areas with limited transmission capacity between. In the total market, there is a balance between power supply and power demand for a specific

hour of the next day. First step is to calculate the unconstrained Market Clearing Price (MCP) and the contracted flow between the two areas at price equal to MCP. Contracted flow is the difference between demand and supply in each area at prices equal to MCP. If the contracted flow across the congested section exceeds the available capacity determined by the system operator, then the market has to be split into two price areas. One of the areas is a deficit area and the other a surplus area. Contracted flow direction is always from the surplus area to the deficit area. For the surplus area the price is lowered to reduce generation and increase consumption. For the deficit area price is lifted to increase generation and reduce consumption.

This will reduce the contracted flow between the two areas and the exercise is carried out stepwise until the flow matches the maximum allocated capacity. Thus, in this case there will be three prices:

- A Market Clearing Price (MCP) often referred to as the unconstrained price
- Two area prices - one higher than MCP and one lower than MCP.

In case of more than one congestion in the total area, there will be calculated the necessary number of area prices to relieve all congestions. Market splitting implies an income to the system TSOs involved equal to allocated capacity multiplied with the difference in area prices. This is the capacity fee paid by the market participants and can be compared with the auction costs of market participants in auction of transmission rights.

Congestion Management by Counter Trade

Counter trade is based on principle of re-dispatch during real time operations and is well known in all power system where generation is ordered to be changed to maintain the instantaneous balance in the market. In restructured markets this redispatch are based on a market concept and therefore referred to as counter trade. In the real time market bids are unit-bids. Bids are submitted for each generation unit. If several units are connected to the same connection point in the grid, bids can normally represent the sum of all units. Demand side can also submit bids. The bids placed in the real time market are referred to as price and volumes for increments and

decrements of generation or consumption. In the following only bids from generation is described. Whenever there is a need to change generation caused by congestion that occurs during real time, the system operator activate the generation units that imply lowest costs. He will call for increased generation on the deficit side of the congested section and reduced generation on the surplus side. Counter trade implies a cost for system operator equal to the re-dispatched volume multiplied with the difference in price for increased generation and decreased generation. Unlike the day-ahead market splitting and auction of transmission capacity that implies an income for system operator, counter trade implies a cost.

In counter trade it is the system operator that carries the costs and recovers the costs from the grid company. The grid company will then have a financial incentive to invest in reinforcement of the grid to reduce counter trade costs.

The costs can be high in markets with low transmission capacities and poor competition in the real time market. It should be observed that in an ideal competitive market with no abuse of market power the costs for the total market is to a large extent the same regardless of methodology:

- When applying auction or market splitting the market participants pay the costs through different spot area prices. This is an income to system operator that should justify reduced transmission tariffs.

- When applying counter trade the system operator initially carry the costs and has to recover the costs through increased transmission tariffs.

TRADE IN FINANCIAL TRANSMISSION RIGHTS

In a market with zonal or nodal pricing, there will be costs for transmission between nodes according to the price differences between the nodes. Market participants want to hedge against this basis risk, and this can be done by introduction of Financial

Transmission Rights (FTR).

The purpose of the FTR is to provide the customer with a financial hedge against potential congestion charges between any two points in the electricity system. Whenever congestion is detected as a result of the day-ahead trade, the holder of an FTR will receive a financial compensation equal to the congestion charge between those two points. If the transmission of energy between the two points is exactly equal to the FTR, the income from the congestion charge will be equal to the compensation to the customer. If the scheduled energy is higher than the sold FTRs, the TSO will have a net income of the congestion charge, and if there are sold more FTRs than available transmission capacity, the TSO will have net costs. As the TSO will receive the income from congestion fees, the TSO also will be the one that sells the FTRs. In a system where there exist physical transmission rights, these rights can be transformed to FTRs before opening of a day-ahead market with congestion management. The TSO can also arrange auctions for FTRs passing highly congested power lines or cuts in the grid. The TSO will then define the maximum capacity in MW for the auction and by competitive bidding the capacity will be allocated to the market participants willing to pay the most. If there is willingness to buy FTRs at prices higher than the investment costs for new capacity, the TSO will have incentives to invest in new transmission capacity.

DEMAND SIDE

When discussing Demand-Side Participation it is important to distinguish between Demand-Side Management and Demand-Side Market Participation. In this discussion we are considering Demand-Side Management from the load viewpoint. Demand-Side Management from the System Operator viewpoint is a different, but equally important issue, but will not be addressed here.

Demand-Side Management

Demand-Side Management refers to consumers response to price signals, both long and short term. Depending on flexibility and elasticity of the demand side segment (industrial, commercial and residential), the forward price signals from the market will drive decisions to reduce load at high price periods. Load reduction in this case, is not dispatched from the System Operator (although one may construct mechanisms for centrally dispatched load reduction), but rather self-

Dispatching. Demand-Side Management in not unique to competitive electricity markets. Energy saving and fuel-switching programs is implemented among the industrial and larger commercial consumers, and to a limited degree among suppliers to residential consumers in most countries. However, the drivers for these programs have been to reduce the electricity volume, more than to avoid high electricity prices. Electricity trading and volatile wholesale prices implies a paradigm change for most energy managers and/or commodity procurement managers, and this needs to be addressed in the deregulation process in Turkey. Education, training, software systems and consulting are necessary to prepare the demand side for the new energy market.

The major incentive for consumption management in a competitive electricity market is thus the wholesale ("spot") price – either expressed as the hourly MCP or regularly adjusted averaged end-user tariffs. In order to encourage demand side participation, it is therefore important that the market structure exposes the end users to the wholesale e.g. access to the electricity markets.

Demand-Side Market Participation

Demand-Side Market Participation refers to consumers or electricity buyers actively participating in the various markets in order to manage electricity costs and/or risks. In principle, the demand side should have the same access to the markets, and should be treated on a non-discriminatory and equal way as the supply side. Some analysis have even created the term "negawatt" to describe the "negative capacity" available in an electricity market from the demand side. More specifically, the market rules should not contain any limitations for the demand side participation in the various markets:

- Demand side should have equal access to the Day-Ahead and balancing market, and shall be exposed to the same prices and costs as the supply side.

- Consumers should be able to sell electricity on equal terms as procurement of electricity. A holder of a long term supply contract – even subsidized and/or inherited contracts and PPAs – should be able to sell all or parts of the contract back to the market to the market price. This en

sures that the load has the incentive to reduce load and "supply" the market at high prices. Demand side should have access to the balancing market, the real-time market and to potential ancillary services markets. The access should, to the extent it's technically and practically possible, have access to these markets on equal terms as the supply side34.

CHAPTER 5

INTERPRETATION OF RESULTS

5.1 INTERPRETATION OF RESULTS

DEVELOPING COUNTRIES

Motivation for reform

The motivation for deregulating the electricity industry in developing countries have much of the same elements as for regions discussed above, but there are also some additional considerations:

□ Reducing electricity prices High electricity price levels may be an important driving force. It has been suggested that in the US the states with the highest electricity prices were most likely to implement reform. The main differences in reform issues, in both developing and developed countries, are often rooted in the determinants and driving forces behind reform.

□ Removal of tariff subsidies

In developing countries, the macroeconomic crisis of the 1980s created the need for a regime of fiscal responsibility. A combination of high levels of inflation, increasing debt burden and deterioration of the quality of public services, spurred political support for the liberalization of infrastructure industries. Tariffs kept artificially low for anti-inflationary purposes meant that electricity utilities' self-financing capacity was increasingly eroded during the 1980s, affecting both investment and quality of service.

□ Privatization

Privatization would improve not only the financial health of the sector, but would also increase revenue for state treasuries, so helping to reduce and restructuring public debt.

□ Attract foreign investments in generation and transmission In addition, new investment would be undertaken by the private sector. The need to ensure expansion of capacity is of special importance to less developed countries where there are 1.7 billion people without access to electricity (WRI, 2002), and social and environmental considerations need to be integrated into reform design. The pressure for reform from donor agencies also reinforced the move towards liberalization.

A World Bank survey on the state of energy reform in developing countries focused on six key steps to electricity sector reforms:

(i) Corporatisation or commercialization of the core utility;

(ii) Enactment of an 'Energy Law';

(iii) Establishment of an independent regulatory authority;

(iv) Restructuring of the core utility;

(v) Private investment in greenfield sites; and

(vi) Privatization.

5.2 COMPARISON OF RESULTS WITH ASSUMPTIONS (HYPOTHESES)

Cross border power trading sector is in constant evolution therefore players on the market need to keep up-to-date with the latest development in regional projects and within the regulation framework which will enable power plant operator to trade in a more efficient way. As the market develops and new business opportunities arise, trading across borders is becoming a key interest to more and more companies. Trading across different borders still implies trading with different rules and regulations. Cross border trade and investment are both the end and the means

by which South Asia can achieve energy security. Through investment and cooperation, South Asia will be able to both close its burgeoning supply/demand gap and stimulate further reform, which will in turn open markets for further investment. It will now be possible for Indian companies to import power from across the border and sell it in the domestic market. The Central Electricity Regulatory Commission (CERC) announced significant changes in the power-trading policy, including a regulatory framework for cross-border trading of power. The regulator has made a change in the definition of 'inter-state trading" that will enable trade of power between India and its neighboring countries like Nepal and Bhutan. Cross-border trading forms a part of inter-state trading. There have been very few instances of power import from across the border in the recent past. One of them is the Tala transmission project, which brings power from Bhutan to Delhi. This is being developed by Tata Power for Power Grid Corporation of India Ltd (PGCIL), the country's largest power transmission company. Tata Power has also recently signed a Power Purchase Agreement (PPA) for trading of power through the Dagachu power project in Bhutan. This had to be accommodated through policy changes.

Cross Border Power Trading By PTC

Bhutan Long term agreements in place for purchase of power from Bhutan

Chukha: 335 MW

Kurichhu: 61 MW and Tala: 1,021 MW

From the above mentioned three active projects in Bhutan, PTC purchased 5,229 MUs in Year 2008, 5,580 MUs for 9 month period ended Dec 30, 2008 Nepal Long term agreement initialed for purchase of entire power from 751 MW West Seti hydroelectric power project in Nepal. The purchase of power has not started as yet. Active engagement in the development of Indo - Nepal transmission interconnection for enhancement of power trade.PTC is also a member of Indo-Nepal Power Exchange Committee. With the recent development, PTC is focusing on cross-border power trading and looking at opportunities mainly in the power-surplus Nepal, Bhutan and Bangladesh.

Hedging And Speculation In Power Market

Price volatility introduces new risks for generators, consumers, and marketers. In a competitive environment, some generators will sell their power in potentially volatile spot markets and will be at risk if spot prices are insufficient to cover generation costs. Consumers will face greater seasonal, daily, and hourly price variability and, for commercial businesses, this uncertainty could make it more difficult to assess their long-term financial position. Power marketers sell electricity to both wholesale and retail consumers, often at fixed prices. Marketers who buy on the spot market face the risk that the spot market price could substantially exceed fixed prices specified in contracts. Electricity futures and other electric rate derivatives help electricity generators, consumers, and marketers manage, or hedge, price risks in a competitive electricity market the futures contract is closed by buying or selling a futures contract on or near the delivery date. Other electric rate derivatives include options, price swaps, basis swaps, and forward contracts. Futures and options are traded on an exchange where participants are required to post margins to cover potential losses. Other hedging instruments are traded bilaterally in the "over-the-counter" (OTC) market. Futures are not the only way to hedge electricity price risk electricity options contracts also. Futures and derivatives should not be regulated simply because they can produce losses. Not using futures in volatile commodity markets can also produce losses

A "short hedger" sells futures to hedge a long position in the underlying commodity (electricity), while a "long hedger" buys futures to hedge a short position in the underlying commodity. A generator is long in electric power and will use a short hedge. A marketer who has sold power to a utility is short that power because he cannot produce it. A marketer will buy futures to hedge its short position in the power market. There is, however, no reason that the amount of short hedging will necessarily equal the amount of long hedging. For this reason, speculators are useful. If there is an imbalance of hedgers, then speculators can make money by shouldering the risk of hedgers.

A price swap is a negotiated agreement between two parties to exchange or "swap" specific price risk exposures over a predetermined period of time. A basis swap allows an individual to lock in a fixed price at a location other than the delivery point of the futures contract.

Forward Contracts

Under a forward contract, one party is obligated to buy and the other to sell, a specified quantity of a specified commodity at a fixed price on a given date in the future. At the maturity of a forward contract, the seller will deliver the commodity and the buyer will pay the purchase price If, at that time, the market price of the commodity is higher than the price specified in the contract, then the buyer will make a profit. Conversely, if the market price is lower than the contract price, then the buyer will suffer a loss. The difference between a forward and a futures contract is that the terms and conditions of forward contracts are not standardized. Rather, they are negotiated to meet the particular business, financial or risk management needs of the parties to the contract.

CHAPTER 6

CONCLUSIONS AND SCOPE FOR FUTURE WORK

Conclusion

The Indian power sector is in the path of reaching its adolescence state. When the developed countries have undergone various modern and up-to-date systems to operate and function power sector along with various instruments and products of power trading, India follows them and trying to be one of the leaders in the power market operation. The journey of Indian power sector is definitely a credit worth. The Indian power sector now is growing in the same pace as was the development of the information technology sector in India. Power trading is the biggest instrument of Indian power sector which will unveil the grow the opportunity of the power sector and optimize the natural resources of that lies in India. The growth of Indian power trading will invite many players to come into the operation of power trading and increase the competition in power market thereby achieving the economic efficiency, higher quality services as well as lower consumer prices for electricity

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APPENDIX. INTERVIEWER SCRIPT

1. Key Features of the Exchange?
2. How is it different from the present bilateral trading?
3. Who can participate?
4. What are the Primary objectives of PXIL?