Electricity Exchange in India: A Study of Power Exchange India Limited

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Abstract—Electricity which is the need of the hour because from the lay man to the industrial level without which the progress is not possible in the modern era. It was the time when electricity supply was in short. Due the shortage of electricity the people were suffering a lot. Now, the scenario has changed after the introduction of the electricity exchanges in India and abroad too. In the year 2008, two exchanges came into existence in India. 27th June, 2008 the Indian Energy Exchange (IEX) and on 22nd October 2008 the Power Exchange India Limited (PXIL). In this paper an attempt has been made to explore the role of Power Exchange India Limited, Functions and performance of Indian Energy Exchange in Indian scenario.

Keywords—Electricity Exchange, Power Energy Exchange, Purchase Bids, Sales Bids, MUs

I. INTRODUCTION

Power Exchange India Limited (PXIL) is India’s first institutionally promoted Power exchange that provides innovative and credible solutions to transform the Indian Power Markets. Power Trading has been recognized as distinct activity in the Electricity Act, 2003. 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 online platform for trading of Power.

The mainstay of PXIL is its unassailable integrity and a consummate fervour for commitment, excellence and continued innovation in all activities. PXIL’s unique combination of local insights and global perspectives, aids its stakeholders to make better informed business & investment decisions, improve the efficiency of the power markets and help shape policy and projects and thus helps create for India the power market it deserves. 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.

The initial products offered for trading are electricity contracts offered on a day-ahead basis with voluntary participation. PXIL received further approval from CERC on 31st August 2009 to introduce longer tenure physical delivery products in the form of Weekly and Day-Ahead Contingency products. PXIL has launched the trading of both these products on 15 September 2009. It is a common platform where buyers & sellers of Electricity come together for trade. This is a new concept of Power trading introduced in India under the approved guidelines of CERC.

II. FEATURES OF INDIAN ENERGY EXCHANGE

- Nation-wide, electronic Exchange for trading of power.
- The exchange handles 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.
- Reliable, effective and impartial management.
- Computerized trading system.
- Efficient clearing system and guarantee system.

III. VISION OF INDIAN ENERGY EXCHANGE

Vision

To create a significant difference and remain the benchmark of unquestionable integrity and excellence for our stakeholders by continually innovating and offering credible solutions to transform the Indian Power Markets.

Mission

To constantly demonstrate our core values – Integrity, Excellence, Commitment and Continued Innovation – and to remain non-partisan, unbiased and fearless in our functioning, even in the face of uncomfortable conclusions.

To nurture our talented workforce and continually strengthen our local insights and global perspectives so as to bring about a paradigm shift in the functioning of our power markets.
To aid our stakeholders to make better informed business and investment decisions, improve the efficiency of the power markets, and help shape policies and projects.

IV. RATIONALE FOR POWER EXCHANGE

To set up adequate infrastructure for trading, clearing and settlement of electricity contracts for 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. Modern-day trading is totally transparent, with all participants 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 exchanges aim to simplify the trading procedure and, ideally, reduce the number of interfaces for participants to only one, that is, the exchange.

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

To help reduce peaking power deficit by providing an equitable marketplace for new merchant capacities (including hydro, IPPs, cogeneration and renewable) and augment existing supplies through untapped sources (for example captives).

To develop a transparent and fair price discovery mechanism that can signal massive potential investments.

The power exchange is the crucial part of energy exchange because of the following reasons. It has three aspects mainly connected; short term, medium term and long term.

Short Term

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. 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. PXIL would be set up as a fully automated exchange with tried and tested clearing systems.

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.

Medium Term

The Exchange will provide equitable market place for the new merchant capacities (including hydro, IPPs cogeneration, renewable, etc.)

The Exchange will try to augment existing capacities by providing an easy-to-access market for untapped sources (e.g. Captives)

Long Term

The Exchange would seek to provide transparent and fair price discovery mechanism which can signal massive potential investments into the sector, especially in the transmission sector, because the prices would clearly identify the corridors where investments are needed the most. Be a catalyst for the Power Sector – to move from scarcity-based pricing to a competition-based pricing structure.

V. PROMOTERS ND STAKEHOLDERS

Promoters

The Promoters bring in strong expertise in setting up and running of electronic exchanges, a deep understanding of domestic and global financial and commodity markets. For power market exchange there are mainly two promoters i.e., National Stock Exchange of India Limited (NSE) and National Commodity and Derivatives Exchange Limited (NCDEX).

National Stock Exchange

The National Stock Exchange of India Ltd. (NSE), known for its dynamism and for being the pace setter in the Indian Capital market, was incorporated in 1992 as a tax-paying company and it commenced operations in 1994. It operates three market segments, the Cash Equity, Debt Market and the Derivatives segment. NSE is the largest stock exchange in India in terms of traded value in equity and derivatives products. NSE’s share to the total equity market turnover in India averages around 68% whereas in the futures & options market this share is around 97%.
In the global market, NSE ranks 1st in the world in terms of number of contracts traded in Single Stock Futures and 3rd in the world in terms of Index futures and in volume of transactions. In Asia, NSE has the second largest number of contracts traded in equity derivatives instrument.

National Commodity and Derivatives Exchange Limited


It is a professionally managed online multi-commodity exchange promoted by Life Insurance Corporation of India (LIC), National Bank for Agriculture and Rural Development (NABARD) and National Stock Exchange of India Limited (NSE). Canara Bank, CRISIL Limited, Goldman Sachs, Indian Farmers Fertilizer Cooperative Limited (IFFCO), Intercontinental Exchange (ICE) and Punjab National Bank (PNB) by subscribing to the equity shares have joined the initial promoters as shareholders of the Exchange.

NCDEX is the only commodity exchange in the country promoted by national level institutions. This unique parentage enables it to offer a bouquet of benefits, which are currently in short supply in the commodity markets. 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.

Stakeholders Equity Partners

The following are the Equity partners of PXIL:
1. Power Finance Corporation
2. Gujarat Urja Vikas Nigam Ltd
3. JSW Energy Ltd
4. GMR Energy Ltd
5. WBSEDCL
6. MP Power Trading Company Ltd
7. Tata Power Trading Company Limited

Membership of Associations
1. World Energy Council
2. Association of Power Exchanges

MEMBERSHIP OF PXIL

Eligibility

The following persons are eligible to become Members subject to the provisions, applicable legislations, rules, circulars, notifications, guidelines, etc., prescribed there under and any other applicable law in force and the Rules, and Byelaws of PXI or directives and guidelines issued there under : -
1. Individuals/ Sole proprietors
2. Partnership Firms
3. Companies or Institutions or Statutory Bodies incorporated under Companies Act, 1956 or under any central or state legislation and permitted under their Memorandum of Association or applicable constitution document for engaging in generation / trading / distribution of electricity and / or engage in any activity relating to the participation on the Exchange. However, such membership will be effective only upon completion of the aforesaid process to the satisfaction of PXI.

1. Central / state electricity utilities including franchisees thereof / Organization engaged in various activities of the power sector including power generation, distribution, trading etc.
2. Such other persons / entities as may be permitted by the relevant authority of PXI.

Membership Fees

The following is the fees structure for membership:
- One-time Fee
- Annual Fee
- Interest-free Security Deposit
- Processing Fee
- Net worth Criteria

How to Apply

The admission procedure shall consist of appraisal of valid applications and other documents annexed thereto and subject to process prescribed by PXIL from time to time. For the purpose the applicant has to see the rules and regulation for trading and has to fill desire forms made mandatory by it. The final acceptance / rejection of any membership / recommendation for membership by the membership committee shall be at the absolute discretion of the Relevant Authority of PXI and the decision of the Relevant Authority is final and binding.
VI. ELECTRICITY TRADING AT PXIL

Electricity Transacted (Volume Wise)

Purchase Bids

<table>
<thead>
<tr>
<th>Months</th>
<th>Year-2009</th>
<th>Year-2010</th>
<th>Year-2011</th>
<th>Year-2012</th>
<th>Year-2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>NA</td>
<td>220.75</td>
<td>364.27</td>
<td>769</td>
<td>1199</td>
</tr>
<tr>
<td>February</td>
<td>NA</td>
<td>209.63</td>
<td>368.69</td>
<td>1396</td>
<td>862</td>
</tr>
<tr>
<td>March</td>
<td>NA</td>
<td>205.05</td>
<td>404.6</td>
<td>2406</td>
<td>985</td>
</tr>
<tr>
<td>April</td>
<td>55.08</td>
<td>261.05</td>
<td>NA</td>
<td>1809</td>
<td>1002</td>
</tr>
<tr>
<td>May</td>
<td>22.14</td>
<td>156.64</td>
<td>207.92</td>
<td>1168</td>
<td>585</td>
</tr>
<tr>
<td>June</td>
<td>138.51</td>
<td>269.06</td>
<td>175.4</td>
<td>1066</td>
<td>291</td>
</tr>
<tr>
<td>July</td>
<td>170.66</td>
<td>248.82</td>
<td>242.88</td>
<td>695</td>
<td>442</td>
</tr>
<tr>
<td>August</td>
<td>199.12</td>
<td>324.96</td>
<td>151.39</td>
<td>491</td>
<td>476</td>
</tr>
<tr>
<td>September</td>
<td>144.83</td>
<td>206.099</td>
<td>NA</td>
<td>500</td>
<td>537</td>
</tr>
<tr>
<td>October</td>
<td>197.37</td>
<td>192.66</td>
<td>NA</td>
<td>765</td>
<td>587</td>
</tr>
<tr>
<td>November</td>
<td>164.57</td>
<td>136.73</td>
<td>NA</td>
<td>1096</td>
<td>1036.61</td>
</tr>
<tr>
<td>December</td>
<td>141.496</td>
<td>245.88</td>
<td>182.41</td>
<td>1172</td>
<td>963.88</td>
</tr>
</tbody>
</table>

The Purchase bids (MUs) at PXIL has wide fluctuation throughout the given period. The data has been taken from the 2009 to 2013. It shows that in the initial year it was just 55.08 MUs and meanwhile it reach to 2466 MUs in the year 2012.

It was the highest bid of the unit during the 2009 to 2013. On the contrarily the lowest bid was 22.14 MUs in the year 2010. Till the year 2011 the bids were between the 100 to 400 MUs. However it increased during the last two years i.e. 2012 and 2013.
Sales Bids

<table>
<thead>
<tr>
<th>Months</th>
<th>Year-2009</th>
<th>Year-2010</th>
<th>Year-2011</th>
<th>Year-2012</th>
<th>Year-2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>NA</td>
<td>318.58</td>
<td>378.2</td>
<td>736.51</td>
<td>887</td>
</tr>
<tr>
<td>February</td>
<td>NA</td>
<td>320.72</td>
<td>435.6</td>
<td>980.79</td>
<td>779</td>
</tr>
<tr>
<td>March</td>
<td>NA</td>
<td>173.67</td>
<td>429.84</td>
<td>1120.40</td>
<td>826</td>
</tr>
<tr>
<td>April</td>
<td>60.45</td>
<td>128.61</td>
<td>NA</td>
<td>912.85</td>
<td>649</td>
</tr>
<tr>
<td>May</td>
<td>95.85</td>
<td>177.42</td>
<td>448.72</td>
<td>979.72</td>
<td>811</td>
</tr>
<tr>
<td>June</td>
<td>123.57</td>
<td>234.78</td>
<td>308</td>
<td>778.47</td>
<td>729</td>
</tr>
<tr>
<td>July</td>
<td>492.3</td>
<td>289.62</td>
<td>338.98</td>
<td>716.08</td>
<td>1293</td>
</tr>
<tr>
<td>August</td>
<td>188.77</td>
<td>415.46</td>
<td>298.78</td>
<td>901.00</td>
<td>1568</td>
</tr>
<tr>
<td>September</td>
<td>242.09</td>
<td>532.895</td>
<td>NA</td>
<td>1051.4</td>
<td>887</td>
</tr>
<tr>
<td>October</td>
<td>221.16</td>
<td>257.01</td>
<td>NA</td>
<td>492.65</td>
<td>924</td>
</tr>
<tr>
<td>November</td>
<td>479.39</td>
<td>478.73</td>
<td>NA</td>
<td>757.92</td>
<td>1336</td>
</tr>
<tr>
<td>December</td>
<td>388.26</td>
<td>389.93</td>
<td>70.72</td>
<td>1151.5</td>
<td>1122.79</td>
</tr>
</tbody>
</table>

The sales bids (MUs) at PXIL have also wide fluctuation throughout the given period. The data has been taken from the 2009 to 2013. It shows that in the initial year it was just 60.45 MUs and meanwhile it reach to 1122.79 MUs in the year 2012. It was the highest bid of the unit during the 2009 to 2013. On the contrary, the lowest bid was 60.45 MUs in the year 2009. Till the year 2011 the bids were between the 100 to 500 MUs. However, it increased during the last two years i.e. 2012 and 2013.
PERFORMANCE ANALYSIS OF PXIL

T-Test: Two-Sample Assuming Unequal Variances

<table>
<thead>
<tr>
<th></th>
<th>sales mean</th>
<th>purchase mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>553.7925278</td>
<td>496.1365611</td>
</tr>
<tr>
<td>Variance</td>
<td>122036.2579</td>
<td>174846.2606</td>
</tr>
<tr>
<td>Observations</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Hypothesized Mean Difference</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>df</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>t Stat</td>
<td>0.236612099</td>
<td></td>
</tr>
<tr>
<td>P(T&lt;=t) one-tail</td>
<td>0.409451835</td>
<td></td>
</tr>
<tr>
<td>t Critical one-tail</td>
<td>1.859548033</td>
<td></td>
</tr>
<tr>
<td>P(T&lt;=t) two-tail</td>
<td>0.818903669</td>
<td></td>
</tr>
<tr>
<td>t Critical two-tail</td>
<td>2.306004133</td>
<td></td>
</tr>
</tbody>
</table>

**Interpretation:** The significance level at 95% confidence level is more than 0.05 indicate that there is no significance difference between purchase bids and sales bids. We accept the null hypothesis and reject the alternative hypothesis.

**Correlation**

<table>
<thead>
<tr>
<th></th>
<th>sales mean</th>
<th>purchase mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correlation</td>
<td>0.914006252</td>
<td></td>
</tr>
</tbody>
</table>

**Interpretation:** Here the value of correlation coefficient is 0.028702369 which lies between -1 to 1 and there is partial positive relationship between the sales and purchase according to month wise.

VII. CONCLUSION

In the nutshell it can be conclude that the performance of PXIL has improved gradually in both purchase and sales bids. It has emerged as a very good platform for the electricity seekers to fill the bridge of demand and supply of electricity in India.

REFERENCES

[1] www.bee-india.nic.in