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Operational Performance of Power sector in Punjab: An Analysis of Pre and Post Corporatisation

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ABSTRACT

The power sector is one of the most critical growth drivers for any country. The power sector in India is highly regulated by the government and is dependent on the policies framed regarding bidding for power projects, regulations regarding transmission of power between states and pricing of power supply to consumer is also decided by the government. As in the case of power sector in Punjab, the unbundling of this sector was initiated under the Electricity Act 2003. After the restructuring in power sector of Punjab, it was divided in to two corporations named Punjab State power Corporation Limited (PSPCL) and Punjab State Transmission Corporation Limited (PSTCL) from erstwhile Punjab State Electricity Board (PSEB).The main aim of this reform was to enhance the operational and financial performance of power sector in Punjab.

1. Introduction

The economy of every country depends to a larger extent on consumption and affordability of power. Power becomes the important part in industrial growth which contributes directly to the country's GDP and helps in minimising CAD (current account deficit) with the increase in industrial exports. The main public utility among all is the electricity utility, which cannot be stored for marketing purpose but it can be generated when load is created. The operational performance is the major aspect for development of power sector **(Rajkumari, 2018)**. The financial and operational performance is the viable aspect of every power sector. The most important indicators of operational performance consist of total installed capacity, diversification of sources of power generation, purchase of power, transmission and distribution of losses, and utilization of installed capacity **(Singh, 2000& kumara, 2006)**. In this chapter researcher has attempted to analyse the performance of operational indicators with the comparison of two periods named as pre reform period and post reform period. The pre reform period ranges from 2002-03 to 2009-10 and post reform period ranges from 2010-11 to 2017-18.

2. Methodology

In this paper, comparative analysis method is used to analyse the operational performance variables in power industry. Averages were computed to know the average performance of respective variables in both the periods. The independent sample T test is used to calculate the averages then the comparison was done between the pre reform and post reform period at five per cent significance level. This test is used to know the significance of difference between the averages of both the period **(Healey, 2012 & Gerald, 2018).** The Levene's Test for equality of variance is also used to identify the difference in variance of particular variable between the period and within the period **Gatswirth, Gel and Miao, 2010, Nordstokke, 2009 &Carroll and Schneider, 1985).**This study seeks to achieve the following objectives:

- To study the performance of total installed capacity in Punjab
- To examine the growth of power generation in Punjab
- To illustrate the trends in plant load factor

3. Hypotheses

- H0: There is no significant difference in total installed capacity between the pre reform and post reform period.
- H0: There is no significant difference in total power generation between the pre reform and post reform period.
- H0: There is no significant difference in plant load factor between the pre reform and post reform period.

4. Findings and Discussion

4.1 Performance of Total Installed Capacity in Punjab

The development of power sector is mainly dependent upon installed capacity. There is a positive correlation between the growth of IC and development of power sector. Power sector of Punjab has witnessed the different sources of power generation from last few years. The change in owned installed capacity is not uniform in all the years. It has varied from year to year.

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Table 1 Performance of Total Installed Capacity in Punjab

Serial. No.	Tools and Techniques	Pre- Reform Period	Post- Reform Period
1	Average of Total Installed Capacity in MW	4595.75	7002.50
2	The t-test for Equality of Means	The T test Value: 3.46185**	
		Significant at: 0.003814	
		Degree of Freedom: 14	
3	Levene's Test for Equality of Variance	The F Ratio value: 30.8394**	
		Significant at: 0.000071	
		Degree of Freedom: (1,14)	

Source: Annual reports of Power Finance Corporation Ltd and Punjab State Power Corporation Ltd from the year 2002-03 to 2017-18.
**Significant at 5 per cent level

The power sector of Punjab has undergone through the structural reforms in the year 2010, where generation sector has transferred to PSPCL. In this part of analysis an attempt has been made to evaluate the performance of owned installed capacity in Punjab.

It is observed that the maximum IC was 5043 MW in the pre reform period and 9928 MW in the reform period, which is higher than the maximum of pre reform period. The average IC during the pre and post reform stood at 4595.75MW and 7002.50MW respectively. The difference between the averages of the two periods is 2406.75MW and this difference is significant with the T value of 3.46185 at five per cent level. Therefore, the null hypothesis, that there is no significant difference in total installed capacity between the pre reform and post reform period is rejected. Hence the performance of installed capacity has significantly improved during the reform period. The Levene's Test for Equality of Variance revealed that the difference in installed capacity variance between the period and within the period is significant with F value of 30.8394 at five per cent level.

4.2 Growth of Power Generation in Punjab

The power sector of Punjab has always catered the increasing demand of power in the state. For this analysis, data has been collected from the year 2002-03 to 2017-18 regarding power generations from the owned sources and power purchased from different sources. It has been observed from the data that power sector of Punjab is reducing generation of power from owned sources and increases its purchase from other sources like import from central units, independent power producers and renewable projects under PEDA.

Table 2: Trends in Total Power Generation

Serial. No.	Tools and Techniques	Pre- Reform Period	Post- Reform Period
1	Average of Total Power Generation in MKWH	24369.50	21582.12
2	The t-test for Equality of Means	The T test Value: 1.1764**	
		Significant at: 0.2590	
		Degree of Freedom: 14	
3	Levene's Test for Equality of Variance	The F Ratio value: 15.29023**	
		Significant at: .00157	
		Degree of Freedom: (1,14)	

Source: Annual reports of Power Finance Corporation Ltd and Punjab State Power Corporation Ltd from the year 2002-03 to 2017-18.
**Significant at 5 per cent level.

It is revealed from the above table 2 that the highest power generation was recorded during the reform period with 28875 MKWH in comparison with maximum generation before the reform period was 27762 MKWH.The average of total power generation from owned sources whether it is from thermal or hydro projects was higher in pre reform period with 24369.50 MKWH and average during the reform period has decreased to 21582.12 MKWH. The difference among the averages of both the periods is 2787.38 MKWH and this difference is not significant with T value 1.1764 at five per cent value. Therefore, the null hypothesis, that there is no significant difference in total power generation between the pre reform and post reform period is accepted. Hence we can say that average generation from owned sources before the reform period is slightly better than the average during the reform period.The Levene's test for equality of variance has revealed that the difference in total power generation variance between the period and within the period was significant with F value of 15.29023 at five per cent level.

4.3 Trends in Plant Load Factor

It is one of the performance parameter of power plant, in which degree of plant utilization capacity for a period of time is measured. To generate more power at less cost per unit (KWH), it is required to have higher plant load factor ratio. It can be calculated by dividing the average power generated by the plant to the maximum power that could have been generated in a given period of time.

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Table 3 Trends in Plant Load Factor

Serial. No.	Tools and Techniques	Pre- Reform Period	Post- Reform Period
1	Average of PLF in Percentage	80.80	55.89
2	The t-test for Equality of Means	The T test Value: 2.72068**	
		Significant at: 0.016571	
		Degree of Freedom: 14	
3	Levene's Test for Equality of Variance	The F Ratio value: 30.36687**	
		Significant at: 0.000077	
		Degree of Freedom: (1,14)	

Source: Annual reports of Power Finance Corporation Ltd and Punjab State Power Corporation Ltd from the year 2002-03 to 2017-18.
**Significant at 5 per cent level

It is comprehended from the data that the plant load factor maximum percentage was 88.61 and it was 83.08% during the reform period, which is less than the maximum utilization of plant in pre reform period. The average plant load factor was 80.80% in pre reform period and 55.89% during the reform period. The difference between the averages of both the periods is 24.91%, this difference is significant with T value 2.72068 at five per cent level. Therefore, the null hypothesis, that there is no significant difference in plant load factor between the pre reform and post reform period is rejected. Hence the performance of plant load factor has reduced during the reform period. The main reason for reduction in plant load factor can be the inclination of power sector more towards the purchase of power from independent power producers. The Levene's test for equality of variance revealed that the difference between the plant load factor variance between the period and within the period was significant with F value of 30.36687 at five per cent level.

5. Conclusion

At the end of this paper it can be summarized as given below.

There is an overall increase in installed capacity of power sector in Punjab during the reform period in comparatively to pre reform period. The major reason of increase in IC is the participation of private investment in thermal installed capacity. During the reform period renewable power source has significantly increased but if we talk about hydro power generation being a second largest source of power generation has not improved during the reform period.

In power sector of Punjab, the availability of power has increased during the reform period but due to the major portion of power purchased from independent power producers. The plant load factor of owned thermal projects has drastically reduced during the reform period, which in turn increases the dependency of power sector on IPPs. The performance of power sector depends majorly on its transmission and distribution of losses. There were expectations from reforms to reduce these losses, indeed the outcome of reforms has reduced these losses significantly and there is a much scope for further reduction of T and D losses. With the increase in overall installed capacity these losses are significantly reducing, which means weare passing the benefit of increased power availability and unrestricted power flow to our consumers.

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