

A Power Sector Scenario of Punjab

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Abstract: In Punjab economy the electricity played an important role in development. Electricity is most convenient and versatile form of energy. The number of electricity is rising very sharply and demands of electricity. The main objective of this study to analysis the growth and structure of power sector in Punjab. The secondary data has been used in this study. Data is collected from Statistical Abstract of Punjab, Electricity Statistics of Punjab, Central Ministry of power, Central Electricity Authority (CEA) etc. Percentage has been used to present the data analysis.

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I. INTRODUCTION

In the process of economic development and growth, various economies are critically dependent on energy resources. Among all forms of energy, electricity is the most versatile and its unique feature lies in the ease of transmission and its high efficiency of conversation for utilization. Electricity, the man made source of energy, help directly by running consumer durables the services of which satisfy human wants and by running machines that help either directly or indirectly to produce consumer goods. The demand for electricity is basically a derived demand, derived demand from goods and services, which are directly consumed by human being and produced with its help. (Bhargava, Singh and Gupta 2009) Electricity is the good in which generation and the consumption are simultaneously done but cannot be stored economically. Electricity has extremely versatile nature. It is proved that energy requirements are increased day by day but sources of energy are not increased in the same way as demand increases. In modern times, demand forelectricity is increased more rapidly as compare to another form of energy because it is the main source of mechanical power. Electricity is the clean energy source compared to other source of energy (Mathur, J.K, and Mathur, D. 2005). There are many methods to produce the electricity like wind energy, solar energy, thermal energy etc. It has been observed that despite of large hydro-generation capacity, most of electricity generation is from thermal origin- which is a great hazard to our environment. In this context, the work is an attempt to analyse the growth of power sector in Punjab with respect to installed capacity, energy generation and sale of electricity.

Objectives of the study

- To analyse the growth of power sector in Punjab.
- To suggest some policy prescription for better working of electricity sector in Punjab.

Data source and methodology

Main source of data are Statistical Abstract of Punjab, Electricity Statistics of Punjab, Central Ministry of power, Central Electricity Authority (CEA) etc. Percentage has been used to present the data analysis.

II. REVIEW OF LITERATURE

Phadke (2001) explained the recent trend in Liquefied Natural Gas (LNG) based on power generation in India. The author compared the three competing option for generating electricity like Liquefied Natural Gas (LNG) domestic and imported coal. This study concluded that coal generating was cheaper than the Liquefied Natural Gas.

Abraham (2003) has studied India's reform process. The author concluded that instead impressive growth of electricity industry, the quality of supply is poor. There are various shortcomings in the power sector have made it a big failure and caused consumer dis satisfaction. The author also outlines the international experience so that some lessons can be learnt by the reforming states in India.

Jain, V.(2004) examined thatreform in Punjab is mainly guide by the World Bank from which the Punjab government is aspiring to taken a loan of Rs. Five thousand crore. This study concluded that there are many weakness of the board are due to its internal reforms are required despite of privatization.

Ghosh, S. (2005) in his article “Demand Forecasting and Draft National Plan” described the merits and demerits of commonly used forecasting technique. This study examined that a ting that curse in Indian power sector is that electricity demand has seldom been scientifically estimated it was due to unreliable data, poor management and inappropriate technique for the forecasting. This study also explained that in long run should be updated after incorporating factual information.

Bhargava, N. (2014) in his book “Some Dimensions of Electricity Economics: Important aspect of the Punjab region” identify that Punjab power sector which was experienced a remarkable growth till 1980 but after that many problems faced by the power sector. This study described that there are many factors which is responsible for crisis but the main factor was politicization of the sector. Many reforms were introduced to remove these crises,even PSEB was bifurcating into two parts but the condition was not improved. The author suggested that despite of ownership issue, more stress should be given on generating capacity, solar power generation should be encourage,improving efficiency of power system and decrease the political interference in the power sector.

The review of literature is indicative of the fact a vast literature exist on electricity sector reform and demand and supply of electricity and little work is done on growth of power sector. Growth of electricity sector is unexplored area so; this study is an attempt to fill this gap.

Installed Capacity of Electricity:

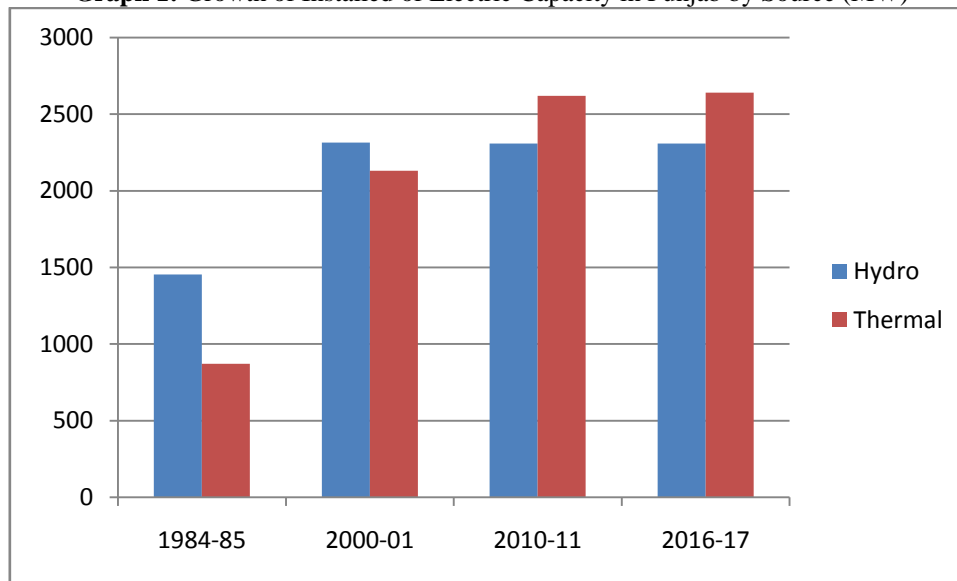
In Punjab, installed capacity of electricity from hydro and thermal sources increase from 2352 MW to 4949 MW. The share of hydro power is decreased from 62.54 percent in 1984-85 to 46.66 percent in 2016-17 (Graph1; Table 1). The main cause of reduction in hydropower is there was no new hydro power is there was no hydro power project constructed since 1990. The share of thermal power plant rises day by day. Almost all installed electric power is under the control by public sector. Entry of private plants in Punjab power sector is of beginning from year 2011-12.

Table 1: Installed Capacity for Electricity Supply in Punjab. (MW)

Year	Hydro	Thermal	Total
1984-85	1454	871	2325
%	62.54	37.46	100.00
1989-90	1770	1280	3050
%	58.03	41.97	100.00
2000-01	2314	2130	4444
%	52.07	47.93	100.00
2007-08	2258	2370	4628
%	48.79	51.21	100.00
2010-11	2309	2620	4929
%	46.85	53.15	100.00
2013-14	2309	2630	4939
%	46.75	53.25	100.00
2015-16	2309	2640	4949
%	46.66	53.34	100.00
2016-17	2309	2640	4949
%	46.66	53.34	100.00

Source: Electricity Statistical of Punjab.

Graph 1: Growth of Installed of Electric Capacity in Punjab by Source (MW)



Electricity generate/ available in Punjab:

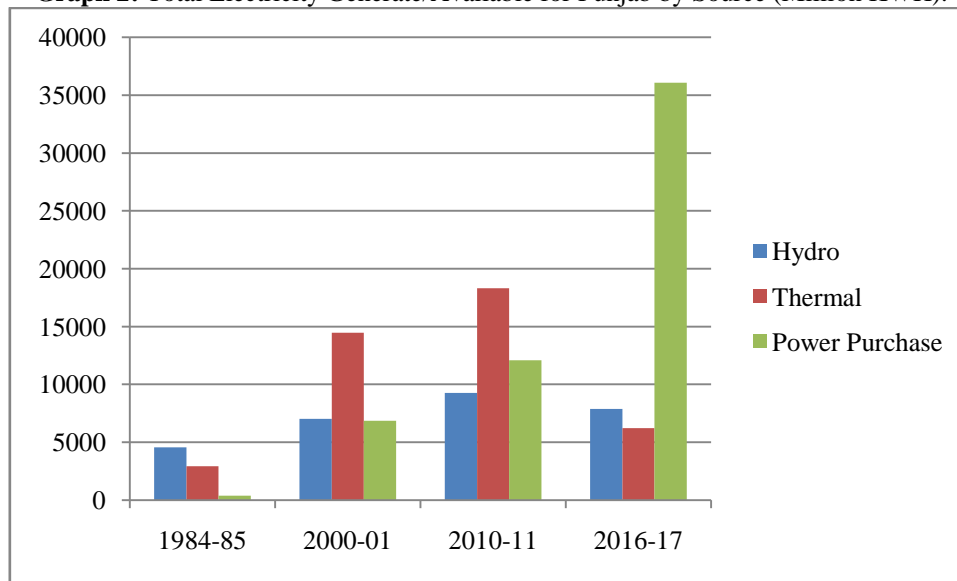
Table 2 & graph 2 depicts the total electricity available for Punjab sources. In year 1984-85, the energy available in Punjab is 7876 million Kwh and it increases six times in 2016-17. During 2016-17, out of total electricity generation available in the state, 15.74 share contributed by own hydro plants and 12.38 per cent by thermal plants another 71.89 per cent came from net imported from other state. It showed that Punjab own power plant contributed only 28.12 per cent and the rest of the energy needs were fulfilled by purchased from outside resources. It means that Punjab faced shortage of electricity supply compared to demand.

Table 2: Electricity Available for Punjab by Source. (Million KWH)

Year	Hydro	Thermal	Power Purchase	Total
1984-85	4558	2938	380	7876
%	57.87	37.30	4.82	100.00
1989-90	6761	6514	2324	15599
%	43.34	41.76	14.90	100.00
2000-01	7019	14457	6861	28337
%	24.77	51.02	24.21	100.00
2007-08	8911	16456	16569	41936
%	21.25	39.24	39.51	100.00
2010-11	9262	18326	12087	39675
%	23.34	46.19	30.47	100.00
2013-14	8433	18014	19161	45608
%	18.49	39.50	42.01	100.00
2015-16	9124	7269	32488	48881
%	18.67	14.87	66.46	100.00
2016-17	7897	6211	36073	50181
%	15.74	12.38	71.89	100.00

Source: Electricity Statistical of Punjab.

Graph 2: Total Electricity Generate/Available for Punjab by Source (Million KWH).



Transmission and Distribution System:

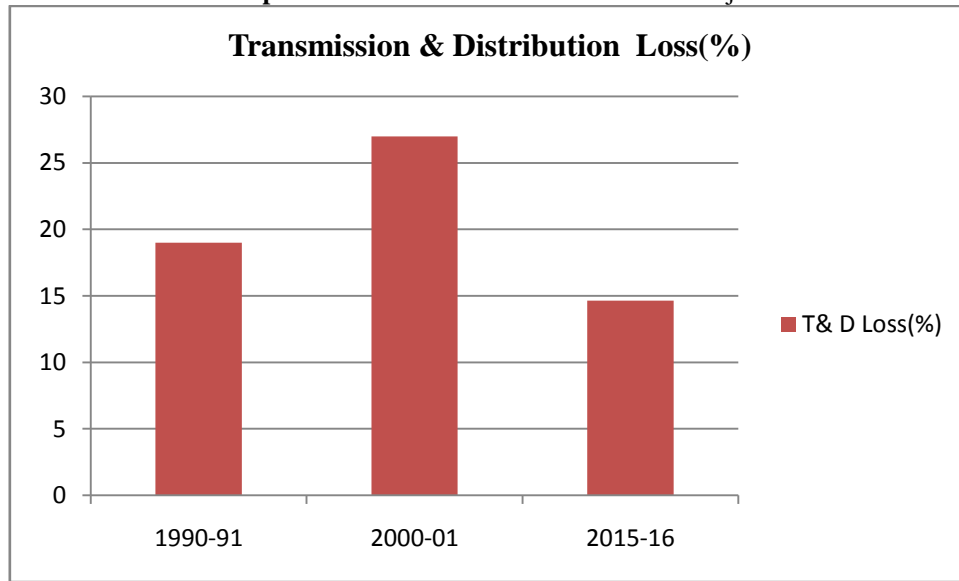
The power system includes generation, transmission, transformation and distribution systems. The high transmission and distribution losses was one of the main reasons responsible for poor performance of the State electricity board in Punjab. In the process of transmission and distribution a part of the energy has been lost on account of technical losses due to inherent characteristics of the equipment's. The transformation process of energy from one voltage to the other also consumes some energy. But energy losses have also been caused due to pilferage, defective meters, unmetered supply etc. The total losses on account of both the above stated components constitute commercial losses of the system. T&D losses have been an inseparable component of any power transmission and distribution network, and take place at various stages of the system right from the generating station down to the consumer end. Transmission and distribution losses recorded in the Punjab power system are presented in table 3 and graph 3. It shows that in year 1990-91 the transmission and distribution losses is 22 per cent and in year 2015-16 it is 15.25 per cent. The transmission and distribution losses have come down due to loss reduction target fixed by regulatory. Most important question is the reliability of the projected data. Since one-third of the power supply to agriculture sector is un-metered, there is no way to assess the actual technical and commercial losses in the system. Moreover the growth in the connection load in different sector is 25934 MW in 2009-10 and it rises to 34303 MW in 2016-17. Still 387797 applications and 1562071 KW were pending by 31 March 2017. The connection load increases from 25934 MW to 34303 MW in 2009-10 and 2016-17 respectively.

Total 3: Transmission and Distribution System in Punjab.

Year	T& D Loss (%)
1990-91	19
2000-01	27
2010-11	18.71
2013-14	16.95
2014-15	15.19
2015-16	14.63

Source: Electricity Statistical of Punjab.

Graph 3: Transmission and Distribution in Punjab.



Household and Domestic Electric Consumer in Punjab:

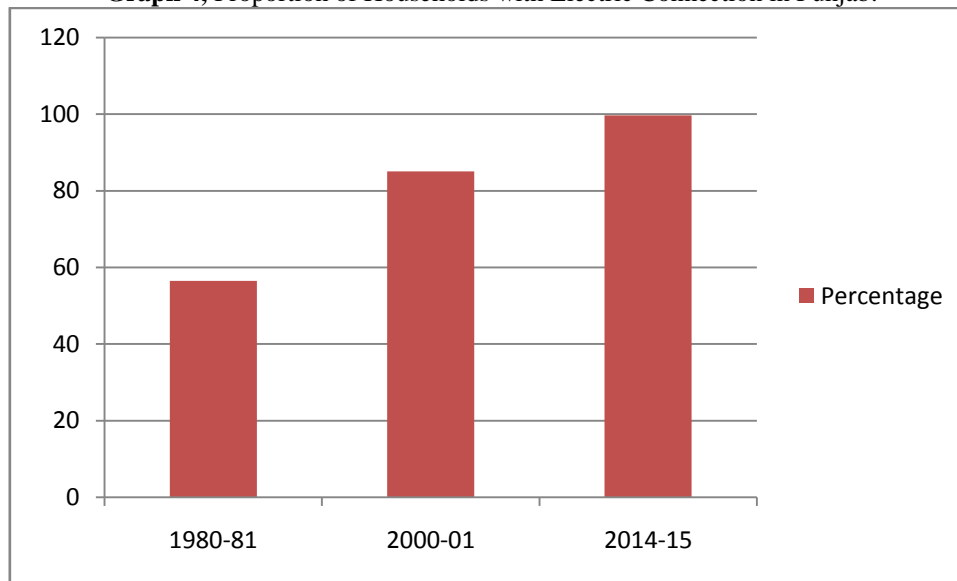
In Punjab, due to raise in income and education, the standard of people also raises therefore demand of domestic electricity also rises tremendously. The table 4 depicts the total number of household and domestic electric consumer in Punjab. In year 1980-81 only 56.53 per cent household have electricity connection but with the passage of time it increases at very high speed. In year 2000-01 it rises to 85.08 per cent and in year 2014-15 it raises up to 99.66 per cent. Per capita consumption of electricity is also rise from 1383 Kwh in 2015-15 to 1466 Kwh in 2016-17.

Table 4: Number of Households and Domestic Electric Consumers in Punjab.

Year	Number of Households (Census Data)	Number of Domestic Electric Consumer	% age share
1980-81	2748453	1553629	56.53
1990-91	3424666	2754312	80.43
2000-01	4348580	3699739	85.08
2007-08	5139939	4494822	87.45
2011-12	5812857	5642850	97.08
2012-13	5901169	5820606	98.63
2013-14	5901169	5820606	98.63
2014-15	6027427	6006790	99.66
2015-16	6186385	6207589	100.34

Source: Electricity Statistical of Punjab.

Graph 4, Proportion of Households with Electric Connection in Punjab.



Electricity Consumers by Category:

In Punjab, the green revolutionary influences the consumption pattern of electricity, during 1970's. The demand of electricity in agriculture sector in increase rapidly because the state sponsored policies which lead to manifold increase in production as well as productivity in agriculture. Consequently, it enhanced purchasing power of the masses, which contributed to increase in domestic demand that in turn gave a boost to the commercial activities in the state. The accelerated growth in the wide range of economic activities was made possible by a very high growth in energy consumption by several categories of consumers. The table 5 shows that the number of electricity consumer rise very sharply. In 1984-85 it was 2754968 and it increases to 8590146 in year 2016. In agriculture sector, the customer rise very high rate as compared to other sector i.e. 410519 in 1985-86 to 1254081 in 2016 it was because free tube well connections together farmers. Agriculture consumers do not pay any charge till March/April 1997. In nineteen, when rural electricity program started in Punjab, there was only a small number of irrigation pump set in the state and it did not adversely affect the finance of the board. But with the passage of time the number of irrigation pump increase continuously. The share of agriculture in total sale is electricity is 10223.57 MU in 2013-14 but the share of revenue from agriculture sale was -0.79 crore.

Table 5: Number of Household Consumer in Punjab.

Year	Domestic	Commercial	Industrial	Agriculture	Public lighting and Bulk Supply	Total
1984-85	19,89,507	285505	68532	410519	905	27,54,968
%	72.22	10.36	2.49	14.90	0.03	100.00
1989-90	2600914	372226	93148	565092	1048	36,32,428
%	71.60	10.25	2.56	15.56	0.03	100.00
2000-01	3699739	603908	110910	794475	1885	52,10,917
%	71.00	11.59	2.13	15.25	0.04	100.00
2007-08	4494822	784416	110531	981157	2964	63,73,890
%	70.52	12.31	1.73	15.39	0.05	100.00
2011-12	5420916	895949	121207	1163274	3298	76,04,644
%	71.28	11.78	1.59	15.30	0.04	100.00
2012-13	5642850	923854	123430	1191407	3535	78,85,076
%	71.56	11.72	1.57	15.11	0.04	100.00
2013-14	5820606	938576	124023	1225066	4015	8112286
%	71.75	11.57	1.53	15.10	0.05	100.00
2014-15	6006790	967714	125940	1235722	4192	8340358
%	72.021	11.603	1.510	14.816	0.050	100.000
2015-16	6207589	995942	128029	1254081	4507	8590146
%	72.26	11.59	1.49	14.60	0.05	100.00

Source: Electricity Statistical of Punjab.

Consumption of Petroleum Product:

Petroleum is used in everyday life like fuelling, domestic and commercial use, means of transportation, factories, manufacturing goods and many more products and by products. In year 1990-91 the consumption of petrol is 212442 MT in year 2015-16 it increases to 745243 MT. The table 6 also revealed that the percentage of high speed diesel increase very high in year 19091 its share was only 8.75 per cent and it increases to 77.83 per cent in year 2015-16, it is due to rising number of diesel operated transport vehicle agriculture, implements and industrial machinery. Further the share kerosene which is mostly used in kitchen is decreased from 13.25 per cent to 1.57 per cent in year 1990-91 and 2015-16 respectively. The share of furnace oil decreases at very high rate from 28.31 per cent and 2.91 per cent. The share of LPG is rising from 8.33 per cent to 18.38 per cent in year 2000-01 to 2015-16.

Table 6: Distribution of Total Consumption of Petroleum Products in Punjab by Product type.

Year	Petrol	High Speed Diesel	Kerosene	Light Diesel	Furnace Oil	LPG	Total
1990-91	212442	1186288	321712	20530	687586	NA	2428558
%	8.75	48.85	13.25	0.85	28.31		100.00
2000-1	423196	2073089	336679	37727	858905	310561	3729596
%	11.35	55.58	9.03	1.01	23.03	8.33	100.00
2008-09	508037	2703565	236188	15440	261588	540696	3724818
%	13.64	72.58	6.34	0.41	7.02	14.52	100.00
2010-11	589816	2936445	223021	5363	761778	617678	4516423
%	13.06	65.02	4.94	0.12	16.87	13.68	100.00
2011-12	490594	3109249	213148	847	713339	649601	4527177
%	10.84	68.68	4.71	0.02	15.76	14.35	100.00
2013-14	608611	3212694	68657	13461	102805	661722	4006228
%	15.19	80.19	1.71	0.34	2.57	16.52	100.00
2014-15	662728	320822	71573	7748	93916	719609	1156787
%	57.29	27.73	6.19	0.67	8.12	62.21	100.00
2015-16	745243	3302011	66485	5264	123386	779712	4242389
%	17.57	77.83	1.57	0.12	2.91	18.38	100.00

Source: Electricity Statistical of Punjab.

Recent State Government Initiatives for Power Growth

- Punjab is first State in the country to provide unique phone number 1912 for registration of complaints across the State thus reducing the consumer/utility inters face physically.
- Many measures have been taken to reduced theft of poor by introducing electronic meter.
- New technology likes remote control of transformers, remote meter reading and HVDS system for the AP/Industries introducing.
- Free electricity consumption of up to 200 units per month to the SC and BPL consumers has been allowed for connected load up to 1 kW since 12 October 2006.
- Online registration & clearance for release of connections for Industrial Consumers above 100KW as well as online registration & clearance of application for granting NOC and approval of electric schemes of Residential colonies/building complexes/Shopping Malls/Commercial Complexes.
- Multiple bill payment options introduced – e-payment by Mobile App, Punjab SuvidhaKendras, Retail outlets, Common Service Centres (CSC, Centre Govt.), PayTM, RTGS/NEFT, Spot billing & collection and Bill Payment Machines.
- One stop solution for all consumers for information regarding supply schedules, scheduled power cuts & breakdowns etc. through website and PSPCL APP (on mobile). • Customer care Centers& Centralized Electricity call centre functional for main cities has been rolled out for consumer based services.
- 24x7 Nodal Complaint Centres have been made operational at Divisional level for prompt redressal of complaints.
- Centralized online Consumer complaint/grievances handling system & GRMS (Grievances Redressal Mechanism) are placed.
- IT initiative taken for 47 towns under R-APDRP project has been completed. Additionally 97 more towns are being integrated under IPDS scheme.
- Under Govt. of India sponsored R-APDRP (Part-B) scheme, work for improving the distribution and sub transmission system in 46 towns with an approximate cost of Rs 1632.70 crore has been undertaken. The work of 16 towns has already been completed. The remaining will be completed by the end of this financial year.

- E-payments through Rupay Card, Cash Cards & Money Wallets PAYTM, RTGS/NEFT have also been introduced by PSPCL.

III. CONCLUSION

There was remarkable growth in power sector since independence like installed in capacity of electricity, no. of consumer, agriculture connections. But, now the demand of electricity rising very sharply and number of consumer also increases but the structure of electric consumers did not change very much Punjab installed capacity of electricity increases however the share of hydro power is decreases because no new hydropower project is established since 1990. There are many steps to raise the quality of power like free electricity to SC/ST, decrease theft of power by electronic meter etc. The suggestion are political interference in the working of the board should be minimized and government should establish new hydro, nuclear and renewal energy resources, mini hydro plant is established, increase in transparency in working of PSEB, solar power generation should be encourage etc. It may be revealed that giving free power to farmers is not a rational policy decision. There are many effective ways of giving relief to the need famers like subsidising other inputs, giving concessions on timely payment of bills or by providing efficient pump sets to the farmers. The cost of pump set can be recovered through the electricity bills in instalments. Direct subsidies are better than the open subsidies. All irrigation pump set should metered and tariff should be rationally.

Implications of the study:

- Small hydroelectricity plants in the state must be restarted with this the efficiency can be increased. There is serious need to develop new and more energy efficient environment friendly technologies.
- Reducing political interference in working sector
- It is viable to invite private players to generation only if it is done through competitive bidding routes so that a company which is generated the cheap power is given contract to generate the cheap power is given contract to generate power.
- It is even better to encourage joint venture between public and private sector so public control still remains.
- High losses are major concern and have crippled the financial health of the Board. Concerted effort should be made to reduce transmission losses in time bound manner.
- For increasing renewable energy resources both centre and state government should allocate sufficient funds to improvement in renewable power resource in the state.
- It may be revealed that giving free power to farmers is not a rational policy decision. There are many effective ways of giving relief to the need famers like subsidising other inputs, giving concessions on timely payment of bills or by providing efficient pump sets to the farmers. The cost of pump set can be recovered through the electricity bills in instalments. Direct subsidies are better than the open subsidies. All irrigation pump set should metered and tariff should be rationally. It is widely recognised fact that green revolution is already Past its prime in Punjab and second revolution is on the cards, which should emphasis on diversifying of crop and economising the use of power as well as of water.

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