Power Reformation with Financial Impact in M.P.

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Abstract— **The Power is a key industry, as it promotes growth in different sectors of the Indian economy such as agriculture, manufacturing, railways, etc. India currently has the fifth-largest capacity in the world to generate electricity. The growth of the economy is expected to increase the demand for electricity in the next few days. For the smooth operation of the economy, the power sector is a critical infrastructure feature. An effective, stable or financially sustainable energy sector is vital to promote state prosperity. Here the financial impact of power sector reforms in reference to Madhya Pradesh state electricity board is being discussed and research performed to show the financial impact on the state through reforms and new schemes for MP. Analysis demonstrates that the power sector can be divided into three vertical products, including AT& C losses. DISCOMS playing a vital role in the power sector is to improve power supply quality or improve service to customers. Specific objectives of a research work focus on the impact of losses (in reduced percentage) from previous to the recent year in form of technical loss, transmission loss, generation loss, AT& C on revenue loss. Also the impact of transmission loss, technical loss on power distribution. Main concern to our work in to make the power sector more financially viable by channelizing the power distribution system. Studies conducted in the field shows that transmission losses reduced from 3% to 2.71%, distribution losses reduced from 17.64 % to 15.91 %, State continues to undertake projects on time to make sure accessibility of 24x7 transmission systems, in support of Madhya Pradesh's power industries, that have increased funding. Help for various measures or goals that utilities as well as other development agencies involved in the energy sector adopt.**

Keywords— Madhya Pradesh (SEB), Power Sector, Reforms, DISCOMS, AT &C losses, Financial Impact.

I. INTRODUCTION

The power sector (PS) may be classified into 3 verticals having Distribution, Generation & Transmission business. According to Madhya Pradesh Vidyut Sudhar Adhiniyam (MPBSA), 2000 previous integrated Madhya Pradesh State Electricity Board (MPSEB) was reorganized into MPPGCL, Jabalpur (Madhya Pradesh Power Generating Co. Ltd.) vested by Power Generation function within State MPPTCL, Jabalpur (Madhya Pradesh Power Transmission Co. Ltd.): vested by Power Transmission function within State MPPKVVCL or East Discom Jabalpur (Madhya Pradesh Poorva Kshetra Vidyut Vitaran Company Ltd.): To assume electricity distribution in Eastern part of MP MPPKVVCL or West Discom, Indore (Madhya Pradesh Paschim Kshetra Vidyut Vitaran Company Ltd.): To accept electricity distribution in Western part of MP MPMKVVCL or Central Discom, Bhopal (Madhya Pradesh Madhya Kshetra Vidyut Vitaran Company Ltd.): Initiating electricity distribution in Central part of Madhya Pradesh. These companies have entered into an operational management agreement by MPSEB & operated as MPSEB agents from July 2002-May 2005. Since June 2005 on these businesses began to operate independently. 6th company to purchase bulk electricity from manufacturing companies/trader companies within & outside of State & to supply electricity in bulk to distribution companies in the state of Madhya Pradesh was also established, namely MP power trading company Ltd. (TRADECO). In addition, MP Tradeco's name was changed to MPPMCL (Madhya Pradesh Power Management Company Limited). [1]

Power sector reforms in India are more than two decades old and had initially focused on getting about structural changes such as the unbundling of SEBs (State Electricity Boards), the formation of independent generation, distribution & transmission companies. Afterward, the focus shifted to power generation and power distribution. [2] During last two decades, GOI (Government of India) introduced various programmes to support the power sector, the significant initiatives being Accelerated Power Development Programme (APDP), Accelerated Power Development and Reforms Programme (APDRP) and Restructured Accelerated Power Development and Reforms Programme (R-APDRP). [3].

So as to accomplish the purpose of 24x7 power to all, State will require to completely meet an increase in peak demand with 9598 MW (at state periphery in FY 15) to 12,643 MW in FY 19 by subsequent enhance in energy necessity by 55,622 MU in FY 15 to 80,847 MU in FY 19. [4] Future demand was determined by an estimate of urban & rural consumption of households based on, on one hand, the growth in the number of electrical households and, on the other, the increase in average household consumption per day. For all non-domestic consumer groups, individual growth level equivalent to CAGR of recent years has been considered. [5]

A shared initiative between the Government of India (GoI) & State Government, aimed at providing 24x7 powers to all industries, households, public requirements, companies, additional consuming electricity entities & sufficient power to agriculture by FY19. 24x7 Power to All (24x7 PFA) is a joint plan by the government of India and GoI. The aim of this roadmap is for Madhya Pradesh to achieve the above goals for the State of MP. MP is one of India's largest countries. The per capita electricity consumption in State increased by a CAGR of 7.95% from 544 kWh in FY 11 to 739 kWh in FY 15. But, it residues well below the national average of 1010 kWh per capita in FY 15. The main reason for low per capita consumption is the vast tribal region in State.[6]

II. DISCOMS IN MADHYA PRADESH

1. M.P Power Management Company Limited, Jabalpur.

The name of MP Power Trading Company Ltd. was modified as MP Power Management Company Ltd. in compliance with the GoMP decision. For all DISCOMS MP's, MP Power Management Company was established. A certificate of incorporation following a name change was issued by the Registrar of companies MP on 10.04.2012.

2. MP Power Generating Company Limited

Madhya Pradesh Power Generating Co. Ltd. (MPPGCL) is a completely MP Government-owned company occupied in electricity generation in MP state. This is a successor of the former MPSEB organization. The company also builds new

power plants to build capacity in MP State while operating & maintaining its current units.

3. MP POWER TRANSMISSION COMPANY LTD.

MPPTCL (MP Power Transmission Company Ltd.) is one of India's leading state-owned carriers. The journey began in 2002 as well as the performance of the company was applauded year after year, over several functional horizons in search of excellence, as shown by the recognitions & awards given to the company below.

4. MP POORV KSHETRA V.V.CO. LTD

MP kshetra for east region Vidyut vitaran the with this region it is one out of 4 DISCOMS.

5. MP MADHYA KSHETRA V.V.CO. LTD

MP kshetra for Madhya region Vidyut vitaran are managed with this region it is out of 4 DISCOMS.

6. MP PASCHIM KSHETRA V.V.CO. LTD

MP kshetra towest region Vidyut vitaran are controlled with this region it is out of 4 DISCOMS.[7]

III. LITERATURE SURVEY

L. Kishore and S.G. Varun Kumar (2018) The study makes three significant contributions to performance evaluation and benchmarking of PDUs in India. This study is the first to propose a conceptual model for performance optimization of PDUs in India based on DEA methodology, considering all the operational and financial parameters as defined by MoP. To best of our knowledge, there is no such multi-variable study conducted in India considering the variables defined by MoP for performance evaluation of PDUs. [8].

Geetanjali Singh (2017) PS is one of the key drivers in every country's growth. PS in India has extremely government-led policies and is focused on bidding policies for energy projects; power-transmission regulations between countries and consumer price pricing are also decided by the Government. Adoption in India of Electricity Act in 2003 provided an impetus for the sector to pave way for new electricity reforms. This paper offers an insight into Indian PS as well as an overview of the growth of PS as regards installed capacity, loss of transmission and distribution, energy usage, no of electrified villages, length of T&D lines per capita power consumption using a yearly compound growth rate.[9].

VISHAL PAWAR et al. (2016) Discusses an energy meter and a fraud detection system based on GSM. This Energy Meter has the capability to monitor & control remotely, to read automated meters, to detect theft, to alert the message, to automatically disconnect and connect if the fare is not payable. The Energy Meter uses the GSM network since communication with consumers is the fastest and easiest way. Consumers would receive SMS concerning electricity, warning & billing. Increasing energy conservation, energy efficiency, and incorrect billing are also addressed through this initiative. The automatic billing system monitors real-time consumption and makes little difference. This project will benefit the energy supplier, IT Park, householder. [10].

Ninad P. Totare and Shubha Pandit (2015) In the area of fuel, policies & cost-effectiveness, Indian PS is facing challenges. Therefore, in order to face these new challenges, a country needs a major change. The challenges are found in Indian Green Building Scenario, peak power plant & electricity costs. A regional method to policy and inventive finance methods is proposed and conversed with Green Building promotion. A provision is made to a peak power plant & requirements to choosing gas-based plants & captive power plants. Power cost structure as well as various new steps to reduce cost is being developed. [11]

Shubha Pandit and Ninad P. Totare (2014) The Indian power industry is now at the 3rd phase of change, whereas energy security is necessary to build a 21-century power system & advanced operation & control through new technology. Being part of the National Climate Change Action Plan, GoI set Smart GridVision. The Accelerated Power Development Program is backbones of the Smart Grid Transitional Accelerating Power Development Programme. Smart Grid vision of India is expressed through a range of policy and regulatory steps taken and milestones achieved through a series of efficient, reliable and sophisticated distribution systems and load shedding solutions. Historical development is also presented in the institutionalization of the process. Indian Scenario proposes major performance indices & scope of work that match grid intelligence. [12]

IV. PROPOSED METHODOLOGY

The research study will be descriptive in nature. The research explores whether income or distribution variables are typically more apparent and have the most difficult to implement and whether they have a direct impact on customers. Electricity is key to achieving sustainable human development cultural, environmental and social objectives. Electricity is the most significant but vital input of the cycle of economic development in the current digital era. It is not possible to develop different sectors of the economy without balancing the electricity sector growth. It has become a key factor in improving the quality of life as well as its lack is usually linked to deprivation or poor quality of life. As we know, the approach of science is a way to resolve the issue systemically. In science, before they are applied we must submit study decisions to assessment. Which decision must be defined very clearly and precisely. The R-APDRP (Ministry of Power (MoP)), Government, will also be studied. In the 11th Five Year Plan, R-APDRP (GoI) and FEEDER SEPARATION SCHEME IN RURAL AREA were implemented by the Indian Government (GoI), which would be responsible for analysis of various measures taken by the MPSEB in order to improve the structural situation. Secondary sources would include twitter, journals of study, newspapers and journals etc.

The research study is essentially concerned with analyzing Madhya Pradesh's power sector after reforms. The study is therefore descriptive and methodology has been used to carry out this research:-

YEAR	ENERGY				PEAK			
	Requirement (MU)	Availability (MU)	Surplus (+)/ Deficit (-)		Demand(MW)	Availability (MW)	Surplus(+)/ Deficit (-)	
			(MU)	%			(MW)	%
2014-2015	59,776	62,814	3,038	5.1	10,703	12,457	1,754	16.4
2015-2016	65,675	70,890	5,215	7.9	10,489	11,672	1,183	11.3
2016-2017	74,199	83,052	8,853	11.9	11,481	12,439	958	8.3
2017-2018	74,386	84,183	9,797	13.2	11,595	12,537	941	8.1
2018-2019	81377	82424	1047	1.3	12536	13606	1070	8.5

A. PRIMARY DATA

The officers or employees of former MPSEB or their successor companies collected basic information by way of a questionnaire to gather their opinions on the reforms.

B. SECONDARY DATA

Secondary data were gathered from MPSEB / successor offices, published statistics in various journals, books, periodicals, reputed websites or central or state government publications/reports.

C. SAMPLING PLAN

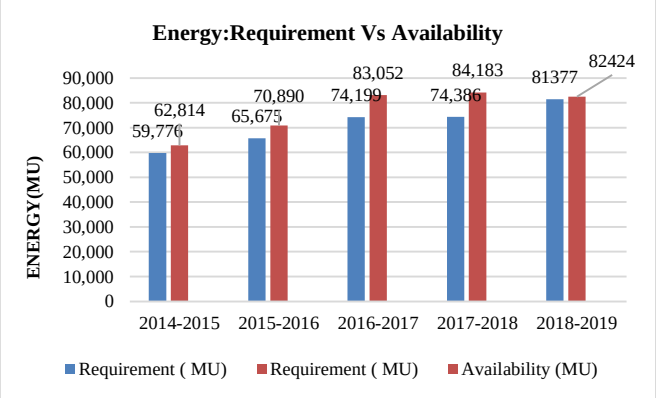
Since the topic of this research is primarily descriptive in nature, it provides the financial impact of power sector reforms directly and indirectly for evaluating information collected at MPSEB locations.

V. RESULT AND ANALYSIS

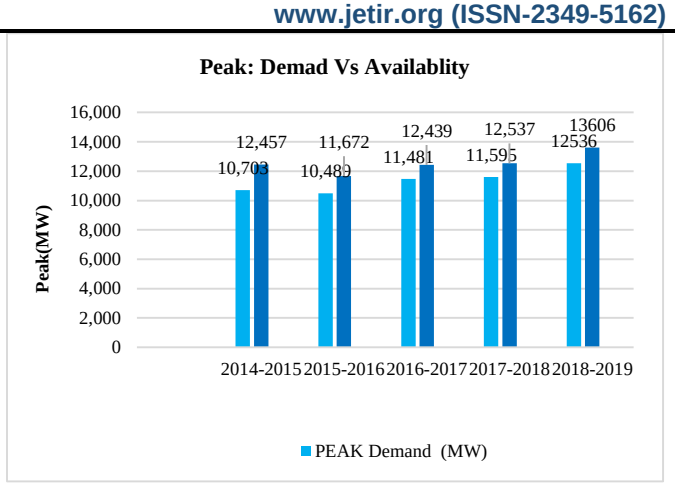
We have performed simulations on MS-EXCEL to generate the graphs to analyze the research. Evaluation of the anticipated surplus/shortage was carried out and discussed in the lead-up of the regional power committees; the anticipated energy supply position was developed in every country. As obtainable in table below, MP's estimated power supply position in region appears Below table shows about the power supply position in MP from year 2014-2019 which illustrate the availability and requirement in million units (MU) of electricity this year for energy whereas PEAK demand and availability in MW Which Stands For Megawatt. Surplus (+) /deficit(-) shows the Excess power is excess energy to be discarded (or shut off) by failing to support batteries or motors. Whereas 'Power shortage' is deficit power because power is in shortage to serve a load.

During 2014-2015 the total availability of electricity from ex-bus services rose from 62,814 to 82424 in 2014-2019 and the peak increased from 10 703 in 2014-5015 to 12536 in 2018-2019. The above graph shows that the energy requirement, as well as peak demand, is also less than the energy availability as well as peak availability. Peak demand shows the amount of electricity required at peak hours.

Table I. Anticipated Power Supply Position in Madhya Pradesh (MP) during 2014-2019.



Graph 1: Anticipated Power Supply Position in terms of Energy



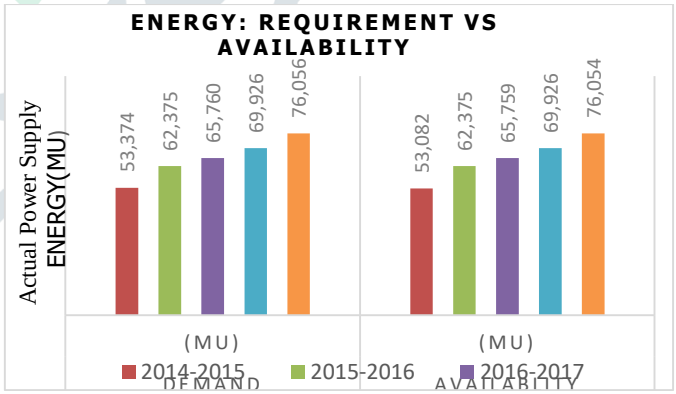
Graph 2: Anticipated Power Supply Position in terms of Peak

a) Actual power supply position

The LGBR indicates a possible monthly position of power in terms of demand or availability and at the same time describes States of surplus power to be acquired/ contracted in deficit states. the study also identifies states with surplus power. The CEA-led LGBR also studies the current position of energy supply in the country in the past year.

Table II: The status of energy supply with regard to MP's energy availability in 2014-2019 energy demand

YEAR	REQUIREMENT (MU)	AVAILABLITY (MU)	SURPLUS (+) DEFICIT (-)	
			(MU)	%
2014-2015	53,374	53,082	-292	-0.5
2015-2016	62,375	62,375	0	0.0
2016-2017	65,760	65,759	0	0.0
2017-2018	69,926	69,926	0	0.0
2018-2019	76,056	76,054	-2	0.0

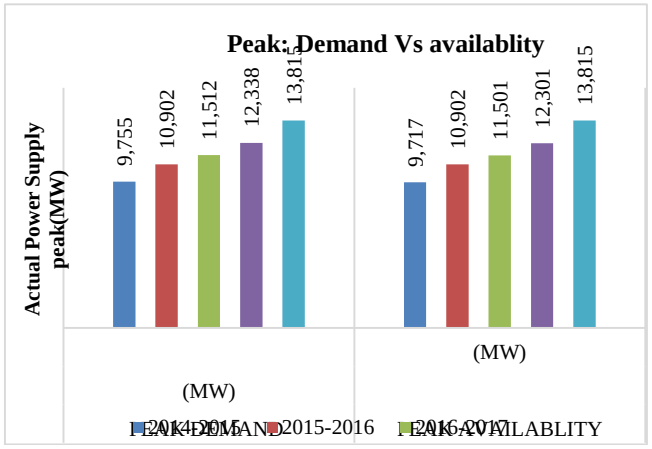


Graph 3: Actual power supply position in terms of Energy Requirement vis-à-vis Energy Availability.

Table III: Current power supply location in terms of peak demand for different states/systems in 2014-2019

YEAR	PEAK DEMAND (MW)	PEAK AVAILABLITY (MW)	SURPLUS (+) DEFLICIT (-)	
			(MW)	%
2014-2015	9,755	9,717	-38	-0.4
2015-2016	10,902	10,902	**0**	**0.0**
2016-	11,512	11,501	-11	-0.1

2017				
2017-2018	12,338	12,301	-37	-0.3
2018-2019	13,815	13,815	0	0.0



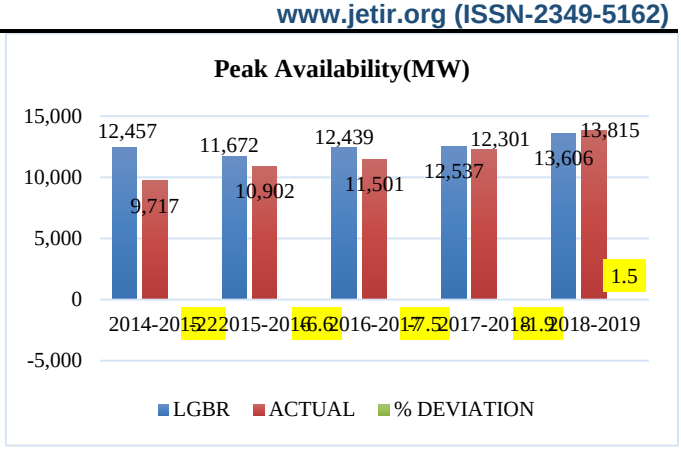
Graph 4: Current position of power supply in terms of peak demand versus peak meter

b) Comparison Of LGBR Vs. Actual Power Supply Position

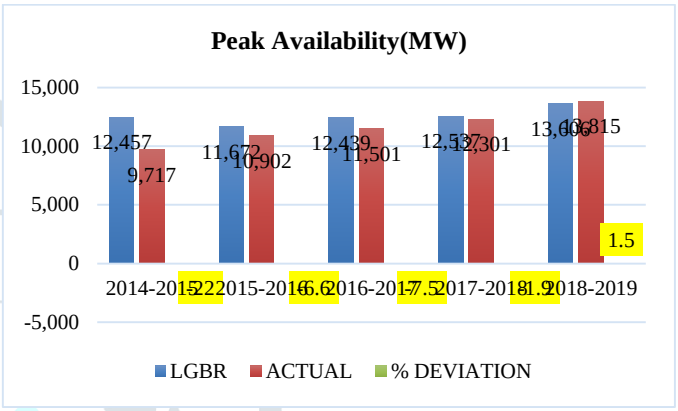
LGBR is predicted to have slightly high energy consumption and peak consumption. Where only the high demand has shown us. Though, because of fuel constraints, distribution constraints, etc., actual energy provided & peak met were considerably lower. A comparison of the actual position of electricity supply in terms of peak demand for 2014 to 2019 and usable relative to the prediction in different regions is shown. During the time 8:00 am to 10:00 am, the peak was attended in the morning.

Table IV: Comparison Of LGBR Vs. Actual Power Supply Position

YEAR	PEAK DEMAND (MW)			PEAK AVAILABILITY (MW)			SURPLUS(+)/DEFLICT(-)			
							(MW)		%	
	LGBR	ACTUAL	% DEVIATION	LGBR	ACTUAL	% DEVIATION	LGBR	ACTUAL	LGBR	ACTUAL
2014-2015	**10,703**	**9,755**	-8.9	**12,457**	**9,717**	-22.0	1,754	-38	16.4	-0.4
2015-2016	10,489	10,902	3.9 -	11,672	10,902	-6.6	1,183	**0**	11.3	0.0
2016-2017	11,481	11,512	0.3	12,439	11,501	-7.5	958	-11	8.3	-0.1
2017-2018	11,595	12,338	6.4	12,537	12,301	-1.9	941	**-37**	8.1	**-0.3**
2018-2019	**12,536**	**13,815**	10.2	**13,606**	**13,815**	1.5	1,070	**0**	8.5	0.0



Graph 5: LGBR Vs. Actual Power Supply Position of peak demand

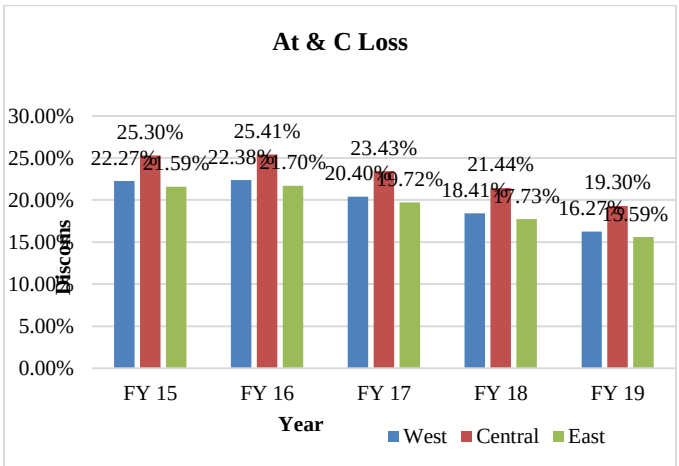


Graph 6: LGBR Vs. Actual Power Supply Position of peak Availability

a) AT&C LOSS TARGETS FOR DISCOMS

Table V: AT & C loss targets for DISCOM of Madhya Pradesh

Discoms	AT & C Loss				
	FY 15	FY 16	FY 17	FY 18	FY 19
West	22.27%	22.38%	20.40%	18.41%	16.27%
Central	25.30%	25.41%	23.43%	21.44%	19.30%
East	21.59%	21.70%	19.72%	17.73%	15.59%
Total	23.07%	23.15%	21.15%	19.15%	17.00%



Graph 7: Representation of AT & C loss % of the year 2015-2019

b) PROJECTED FIRM SHARE ALLOCATIONS FROM VARIOUS SOURCES

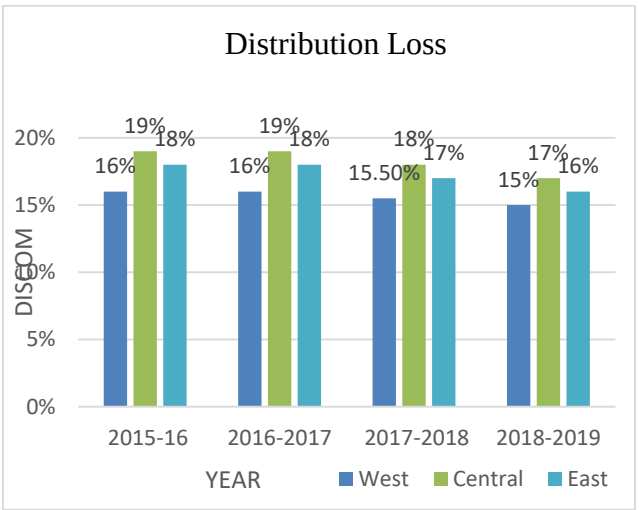
Following table précises available power with different sources, including current and future supply of power until FY 19:

Table VI: Projected firm share allocations from various sources (MW)

Source	Capacity Available (MW)				
	FY 15	FY 16	FY 17	FY18	FY 19
Genco Hydel of MP	917	917	917	917	917
Genco Thermal of MP	4320	4320	4320	4320	5508
Private Generating Stations (apart from UMPP)	1291	1921	1921	1921	1921
JV and Other Hydel	2427	2427	2427	2427	2427
Sasan UMPP	1485	1485	1485	1485	1485
Central Generating Stations	3731	3731	4065	5184	5250
Wind	685	2485	3485	3485	3485
Other renewable	30	227	297	297	297
Solar	305	1055	2105	2105	2105
Total	**15190**	**18567**	**21021**	**22140**	**23394**

c) DISTRIBUTION LOSS FROM 2015-16 TILL 2018-2019

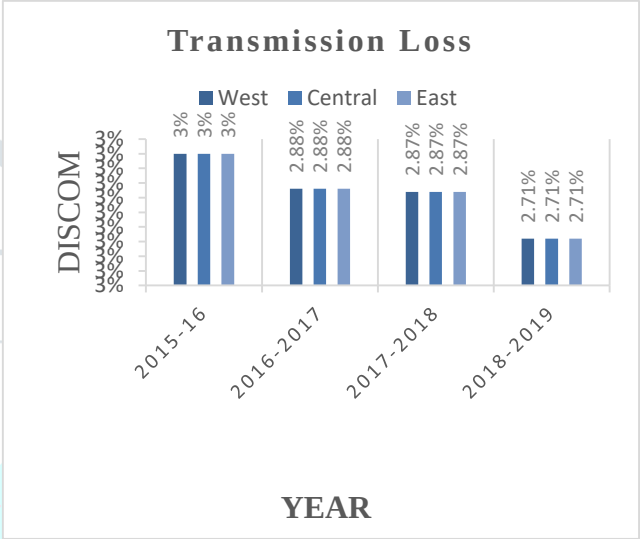
When considering Madhya Pradesh the state is divided into three DISCOM for the three regions east-west and central part where we can see that for west region from the year 2015 to 2019 the loss reduced to 2%, similarly for other two regions viewing for the state being reduced from 17.64% to 15.91% which is an achievement.



Graph 8: Comparison of Distribution loss in % of the year 2015-2019

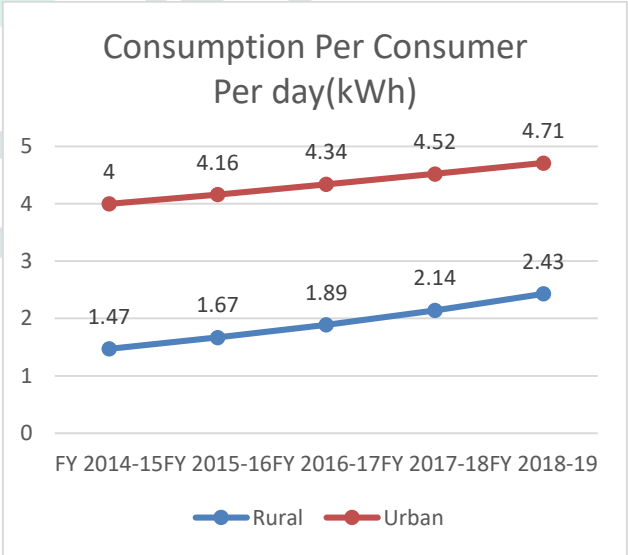
d) Comparison of Transmission Loss

The engineering losses are owing to dissipated energy in conductors, transformers and another power transmission, storage, transmission and distribution equipment. Such technological errors are inevitable in a defined program and it can be minimized to some degree. The main causes of commercial loss when commercial losses added to T&D loss are pilferage by hook, bypassing meters, defect meters, errors in the meter reading and estimation of unmatched energy sources. Below showing the graphical illustration of transmission loss gives the view that loss percentage is reducing from the year 2015 to 2019 from 3% to 2.17% this is achievable due to the reforms and schemes working for the power sector of Madhya Pradesh.



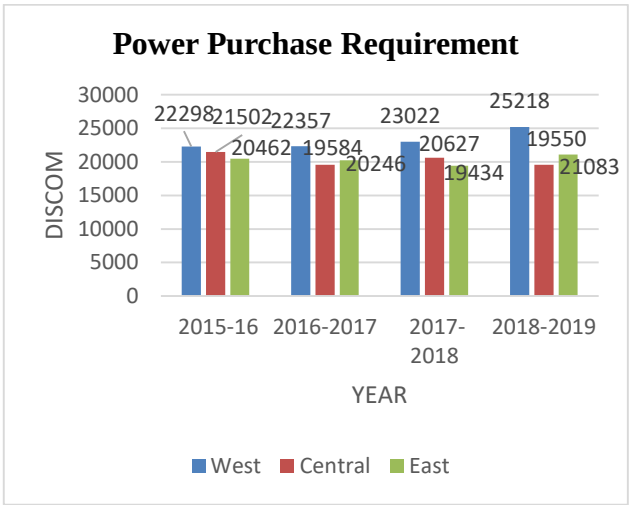
Graph 9: Comparison of Transmission loss in % of the year 2015-2019

e) Projected Household Consumption



Graph 10: Comparison of consumption per consumer /day of the year 2015-2019

f) Power Purchase Requirement



Graph 11: Comparison of Power Purchase Requirement of the year 2015-2019

g) Financial Impact Of Power Sector Reforms

The availability of electricity at a cheaper rate is a must to the socio-economic development of the country. Since independence, the generation of electricity in India has increased manifold, but still, 40% of the Indian population lives without electricity. An electricity supply chain consists of the following stages according to me –

a) Generation.
b) Transmission.
c) Distribution.
d) AT&C losses
e) Usage.

The above losses are the terminology that affects the financial loss/gain of power sector reforms for MPSEB, as Transmission and distribution losses (T&D losses) were initially used as a measure of the total electricity losses.

Transmission and Distribution remain the weakest link in the supply chain. India loses nearly 20%-40% of its generated electricity while transmitting it to the end customers. In most of the developed countries, the losses are not more than 5%.

In most of the Indian states, State Electricity Boards have a monopoly in the distribution network. State discoms' financial health is in poor condition and they lack resources to invest in technology to improve the distribution network to tap the enormous losses. Lack of competition in distribution is also one of the factors that have made state agencies inefficient. The Government of India has issued a one-time bailout package to the state discoms and is coming out with schemes to incentivize the state boards who are able to reduce the losses. GoI has also directed the state government to pull in private players in the distribution network (Especially in the big cities) to bring in competition & effectiveness in the sector.

We will end up wasting our limited national resources if we don't fix the distribution and transmission losses and focus solely on increasing the generation capacity. Of course, the end-user should be in control too. That depends on the user, switching off fans, lights, ACs is mandatory. But, plugging the leakages is much more important, but the government is busy focusing on installing more and more thermal, nuclear and hydel plants that are destroying the environment.

Summarizing the whole scenario the analysis shows that as there is a reduction in the distribution, transmission, AT& C losses, whereas the usage of electricity in every area for rural and urban parts of the state is increased when compared to the previous years.

- India has taken significant steps to increase electricity access.
- Since 2013, over 13 people have joined the grid.

Government initiatives such as 24x7 electricity, household power, and UDAY have increased the feasibility of disputes to buy more energy to customer support by March 2019.

This results in financial costs for the good cause of the privatization of the electricity distribution sector. India's coal, thermal, hydro-, solar or renewable energy markets are expected to draw Rs 11.56 billion of investment from 2017 to 2022.

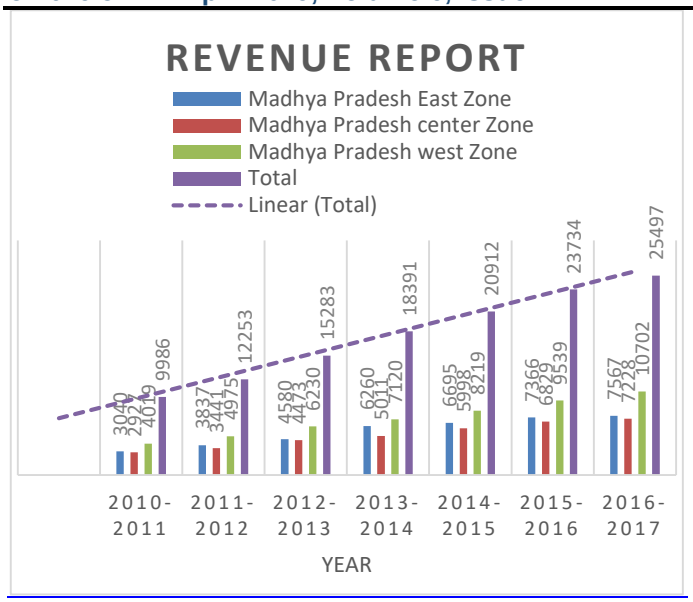
To further improve the industry, reforms on basis of efficient allocation or distribution of coal, promotion of competition in coal or electricity supplies, rationalization of energy prices and incentives to encourage the more effective generation and transmission of power are urgently needed.

Revenue Report

Table VII: Financial Impact Of Power Sector Reforms

Financial year	Madhya Pradesh East Zone	Madhya Pradesh center Zone	Madhya Pradesh west Zone	Total
2010-2011	3040	2927	4019	9986
2011-2012	3837	3441	4975	12253
2012-2013	4580	4473	6230	15283
2013-2014	6260	5011	7120	18391
2014-2015	6695	5998	8219	20912
2015-2016	7366	6829	9539	23734
2016-2017	7567	7228	10702	25497

Serious efforts are being made by the distribution companies at the field level to control the revenue recovery as well as overall technical and commercial losses to increase the revenue realization of the power utilities, the results of which have started to be reflected in the current financial year 2010. - Year-wise year-to-date revenue receipts from 2011 to the financial year 2014-2014 as shown in the following table



Graph 12: Comparison of Financial Impact Of Power Sector Reforms of the year 2010-2017

VI. CONCLUSION

India is the world's 3rd biggest electricity producer or 4th largest consumer, having installed capacity as in December 2017, trying to reach 330,860,58 gw. Under the 13th Five-Year Plan (2017-2022), the government aims to increase efficiency by some 100 gw. Research shows that while the government remains committed to the target power supply or loss reduction, it still needs to be 8.09% of the high tariff growth from FY 17 to FY 19 in order that overall retail companies are able to earn a total profit from FY 19. The accrued losses will remain at Rs. 41,160 crores at end of fiscal year 19. Cumulative financial losses will also be raising distribution losses from Rs. 28,777 Crores of FY 15 to Rs. 55617 in FY 19. Also, annual operating loss will range from existing Rs. 4950 Crores to Rs. 9174 Crores. From the above, it is clear that the financial turnaround also needs a strong tariff increase. Concluding the analysis. It can be seen that the reduction in AT& C losses provides a better supply for electricity in rural and urban areas of Madhya Pradesh.

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