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Evaluating the Operational Efficiency of Power Distribution Utilities (DISCOMs): A Case Study of Haryana

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ABSTRACT

Purpose: *This paper evaluates the operational efficiency of distribution utilities of Haryana's power sector during 2013-14 to 2023-24, following the prolonged sectoral reforms.*

Methodology: *The study is based on secondary data from the publications of Power Finance Corporation and the Haryana Electricity Regulatory Commission, employing year-on-year growth rate, compounded annual growth rate, exponential growth rate, and Pearson correlation techniques to assess billing, efficiency, collection efficiency, AT&C losses and consumer growth.*

Findings: *The analysis shows uninterrupted growth in the consumer base, improvement in billing productivity, virtually complete revenue collection, and a remarkable decline in AT&C losses over the study period. Correlation results point to strong associations among operational indicators, indicating that efficiency gains tend to coexist with lower AT&C losses.*

Implications: *The study highlights improved administrative processes, technological advancements, and better system discipline and the positive trends indicate a trajectory towards deeper operational reforms, improved service quality and lasting financial sustainability.*

Keywords: *Operational Efficiency, DISCOMs, AT&C, Operational Indicators, Financial Sustainability.*

Introduction

The transition in Haryana's power sector began with the major reforms followed in 1998 and 1999, when Haryana State Electricity Board (HSEB) was unbundled into Haryana Power Generation Corporation Limited (HPGCL), Haryana Vidyut Prasaran Nigam Limited (HVPNL) and the distribution companies Uttar Haryana Bijli Vitran Nigam Limited (UHBVNL) and Dakshin Haryana Bijli Vitran Nigam Limited (DHBVNL). These reforms aligned with broader national restructuring initiatives advocated by World Bank recommendations and were formalised under the Haryana Electricity Reform Act, 1997 and the Electricity Act, 2003.

These reforms aimed at improving operational efficiency, system reliability and service delivery constituting key prerequisites for a modernised power supply system.

In the light of this context, the present study examines Haryana's operational performance over 2013-2024, evaluating key indicators such as billing efficiency, collection efficiency and aggregate technical and commercial (AT&C) losses and the number of customers served. The study contributes empirical evidence on the long term operational efficiency of distribution reforms at the state level-utility by integrating and offers policy implications on operational sustainability. The objective of this study is to

examine the impact of reform-driven restructuring on the operational efficiency and revenue related performance for distribution utilities of Haryana.

Objectives

- To analyse the long-term trends in billing efficiency and assess how improvements in metering and billing systems have contributed to operational growth in Haryana's power sector
- To analyse the progression of collection efficiency over the study period and examine its role in strengthening the revenue realisation and financial health of the distribution utilities in Haryana's power sector
- To analyse the trajectory of aggregate technical and commercial (AT&C) losses and determine their impact on the overall operational performance in Haryana's power sector
- To analyse the growth in the number of customers served and evaluate how consumer expansion reflect changes in the operational capacity and service outreach in Haryana's power sector
- To analyse the statistical relation among billing efficiency, collection efficiency, AT&C losses and the consumer base to understand their combined influence on operational growth in Haryana's power sector

Research Methodology

This study employs a quantitative and analytical research design to examine the operational performance of Haryana's power distribution sector from 2013-2024, analysing trends in billing efficiency, collection efficiency, aggregate technical and commercial (AT&C) losses and the number of customers served. The analysis is based on secondary data.

This study draws secondary data from the Power Finance Corporation's 'Performance of State Power Utilities' and publications of the Haryana Electricity Regulatory Commission (HERC). These sources deliver consistent and officially reported data required for analysing emerging operational trends.

To examine long-term operational indicators, the paper employs various analytical tools such as year-on-year growth, compounded annual growth rate (CAGR) and exponential growth rate. Further, Pearson correlation analysis is used to determine the strength of relationships between billing efficiency, collection efficiency, aggregate technical and commercial losses and the number of customers served.

The scope of this study is held within operational parameters. As the study is based on secondary data, its findings depend on the accuracy of the published reports. Considering this limitation, the methodology adopted provides a structured framework for examining the operational stability in Haryana's power distribution utilities.

Key Findings and Interpretations

Table 1: Number of Customers Served by Haryana Discoms- UHBVNL and DHBVNL

Customer category	General		Industrial		Agricultural		Others		Total	
Years	Customer served	Growth (%)	Customer served	Growth (%)	Customer served	Growth (%)	Customer served	Growth (%)	Customer served	Growth (%)
2013-14	4682904	-	93839	-	582934	-	21452	-	5381129	-
	(87.02)		(1.74)		(10.83)		(0.40)		(100)	
2014-15	4838710	3.33	96657	3.00	604146	3.64	22506	4.91	5562019	3.36
	(87.00)		(1.74)		(10.86)		(0.40)		(100)	
2015-16	5018182	3.71	98961	2.38	611738	1.26	20289	-9.85	5749170	3.36
	(87.29)		(1.72)		(10.64)		(0.35)		(100)	
2016-17	5193014	3.48	101148	2.21	621441	1.59	24086	18.71	5939689	3.31
	(87.43)		(1.70)		(10.46)		(0.41)		(100)	
2017-18	5464644	5.23	104124	2.94	630867	1.52	24902	3.39	6224537	4.80
	(87.79)		(1.67)		(10.14)		(0.40)		(100)	
2018-19	5803450	6.2	109076	4.76	638617	1.23	25915	4.07	6577058	5.66
	(88.24)		(1.66)		(9.71)		(0.39)		(100)	
2019-20	6075152	4.68	111569	2.29	643999	0.84	26889	3.76	6857609	4.27
	(88.59)		(1.63)		(9.39)		(0.39)		(100)	
2020-21	6324566	4.11	113773	1.98	651256	1.13	27789	3.35	7117384	3.79
	(88.86)		(1.60)		(9.15)		(0.39)		(100)	
2021-22	6570061	3.88	118801	4.42	665375	2.17	28568	2.80	7382805	3.73
	(88.99)		(1.61)		(9.01)		(0.39)		(100)	
2022-23	6827669	3.92	123119	3.63	684078	2.81	30009	5.04	7664875	3.82
	(89.08)		(1.61)		(8.92)		(0.39)		(100)	

CAGR (value in %)	4.28	-	3.06	-	1.79	-	3.80	-	4.01	-
Exponential Growth Rate (value in %)	4.19	-	3.01	-	1.77	-	3.73	-	3.93	-

Source: www.herc.gov.in

Note: The figures in parentheses show the percentage share in total.

The consumer growth analysed from Table-1 shows a solid uninterrupted rise in the total number of electricity consumers, increasing from 53,81,129 in 2013-14 to 76,64,875 in 2022-23. It is evident that the general category constitutes the largest share of annual incremental growth and exhibits a sustainable growth trajectory. The year-on-year growth confirms steady annual growth across all categories, with total consumer served ranging between 3-5 percent. The long term performance is confirmed by the CAGR and exponential growth rate results, where the total consumer base rose at 4.01and 3.93 percent respectively, contributed primarily by the general category with a CAGR and exponential growth rate at 4.28and 4.19 percent respectivey. The findings conclude a mature yet steady expansion of the distribution network with robust power requirements from commercial and domestic consumers. However, the industrial and agricultural consumers are growing at substantially slower growth.

TABLE 2: Billing Efficiency. Collection Efficiency and Aggregate and Technical (AT&C) Losses

(Value in %)

Years	**Billing Efficiency**		**Collection Efficiency**		**At&c Losses**	
	Efficiency	**Growth**	**Efficiency**	**Growth**	**Losses**	**Growth**
2013-14	72.47	-	90.65	-	34.33	-
2014-15	73.02	0.76	92.64	2.2	32.52	-5.27
2015-16	72.43	-0.81	93.4	0.82	32.35	-0.52
2016-17	74.28	2.55	99.06	0.06	26.42	-18.33
2017-8	78.46	5.63	99.7	0.65	21.78	-17.56
2018-19	81.92	4.41	100	0.3	18.08	-16.99
2019-20	83.67	2.14	97.7	-2.3	18.26	1
2020-21	82.95	-0.86	100	2.35	17.05	-6.63
2021-22	86.28	4.01	100	0	13.72	-19.53
2022-23	89.03	3.19	98.84	-1.16	12.01	-12.46
2023-24	89.51	0.54	99.1	0.26	11.3	-5.91
CAGR	2.13	-	0.9	-	-10.52	-
Exponential Growth Rate (value in %)	2.11	-	0.9	-	-11.12	-

Source: Power Finance Corporation Ltd. (2016-2025)

As shown in Table-2, billing efficiency witnessed significant improvements over the years, rising from 72.47 percent in 2013-14 to 89.51 percent in 2023-24. The year-on-year growth trends in Table-2 represent positive annual progress, with substantial rise in 2017-18 and 2021-22 driven by system upgrades and digitalisation processes. The long run viability of these gains is reflected by the 2.13 percent CAGR and 2.11 percent exponential growth rate in Table-2, demonstrating consistent, strengthening of billing systems. Overall, it can be concluded that billing efficiency has improved by accurate metering, reduced operational errors and enhanced digital billing infrastructure.

Collection efficiency has persisted at high levels, as illustrated in Table-2, by achieving a perfect hundred percent recovery over a decade. The year-on-year trend represented in Table-2 shows rare declining and limited magnitude. This confirms robust performance recovery, and occasional improvements in 2016-17. The CAGR and exponential growth rate of 0.90 percent as shown in Table-2 reveals modest growth, solely due to high efficiency from the beginning. These findings can include that the distribution utility has insured, reliable revenue realisation with effective billing-collection integration.

AT&C losses as logged in Table-2, have dropped dramatically from 34.33 percent in 2013-14 to 11.30 percent in 2023-24. The year-on-year trends as shown in Table-2 presents overwhelming negative loss growth rates, with major reductions such as negative 18.33 percent and 19.53 percent in 2016-17

and 2021-22, illustrating the outcomes of loss reduction measures. The CAGR of negative 10.52 percent and exponential growth rate of negative 11.12 percent in Table-2 presents strong evidence of consistent long-term decline in both technical and commercial losses. These progress are associated with better metering coverage, anti-theft drives and overall system strengthening.

Table 3: Correlation Table

Variables	Correlation Value
Billing Efficiency vs Collection Efficiency	0.711525812
Billing Efficiency vs AT&C Losses	-0.977431867
Collection Efficiency vs AT&C Losses	-0.843745159
Total Consumers Served vs AT&C Losses	-0.97050258
Total Consumers Served vs Billing Efficiency	0.9813283
Total Consumers Served vs Collection Efficiency	0.753031428

The correlation among operational metrics observed in Table-3 highlight strong interdependence within the power distribution system. Billing efficiency shows a remarkable negative correlation with AT&C losses, measured at negative 0.977, implying better billing efficiency is strongly associated with lower AT&C losses. Further, collection efficiency has also shown a strong negative correlation with AT&C losses, measured at negative 0.844, confirming that improved revenue collection reduces technical and commercial losses. Total consumers project a strong positive correlation with billing efficiency measured at 0.981 and a strong negative correlation with AT&C losses measured at negative 0.970, signaling that consumer base expansion is interconnected with better billing practices and decreased losses due to better metering and regularisation of connections.

These correlations establish that operational efficiencies are associated with gains in billing and collection efficiency dramatically lowering the technical and commercial losses, meanwhile, the growth of metered and formalised consumer base facilitate efficiency improvements.

Conclusion

The decadal analysis of Haryana's power sector from 2013-14 to 2023-24 highlights significant operational and financial improvements alongside steady consumer expansion. The consumer base has grown steadily, as shown in Table-1, with the general category aiding the most to long-term growth and facilitating a stable revenue base for the utility. Synchronous improvements in billing efficiency reflect successful digitalisation, improved metering accuracy, and structured system strengthening. Collection efficiency has remained exceptionally high throughout the years, signifying strong revenue assurance and rising reliance on digital payment systems.

The AT&C losses declined substantially from over 34 percent to nearly 11 percent (Table-2), coinciding with feeder metering, better monitoring and anti-theft initiatives. This reduction has been closely associated with improved financial stability and operational reliability of the utilities. The correlation results, as shown in Table-3, confirm that these performance indicators are strongly interlinked— higher collection and billing efficiencies exhibit strong correspondence with lower AT&C losses, while an expanding consumer base is associated with improved operational performance and reduced inefficiencies.

Largely, the data reflects a decade-long transition identified by improved administrative processes, technological advancements, and better system discipline. These positive trends indicate a trajectory towards deeper operational reforms, improved service quality and lasting financial sustainability.

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