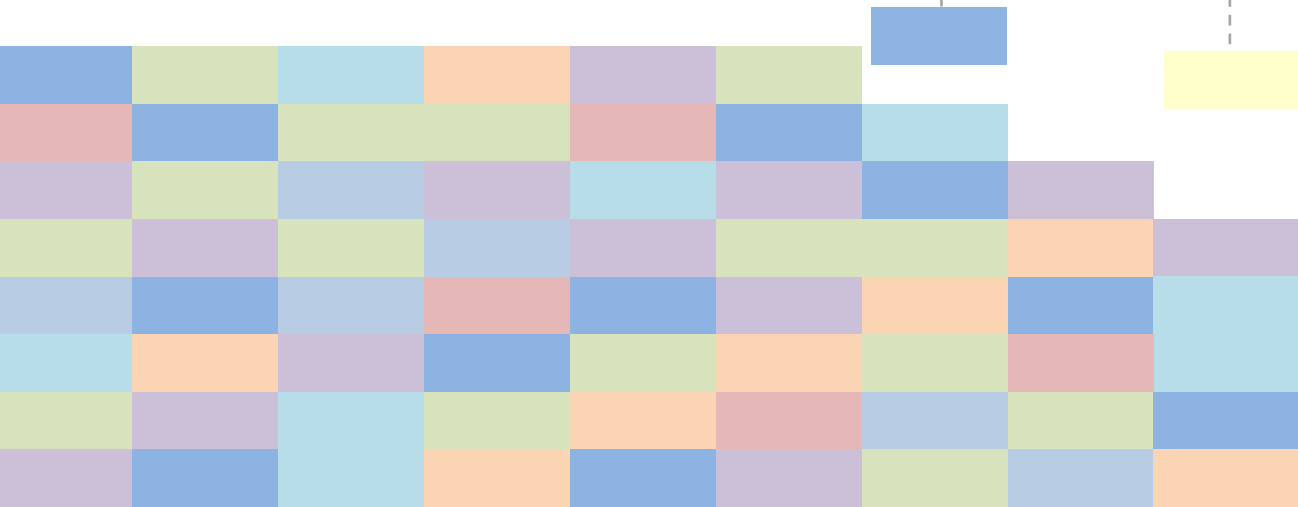


Bricks without Clay

Crucial data formats required for effective tariff processes



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April, 2018

Ann Josey | Manabika Mandal | Shantanu Dixit



Prayas (Energy Group)

About Prayas

Prayas (Initiatives in Health, Energy, Learning and Parenthood) is a non-profit organisation based in Pune, India. Members of Prayas are professionals working to protect and promote the public interest in general, and interests of the disadvantaged sections of society, in particular. Prayas (Energy Group) works on theoretical, conceptual, regulatory and policy issues in the energy and electricity sectors. Our activities cover research and intervention in policy and regulatory areas, as well as training, awareness, and support to civil society groups. Prayas (Energy Group) has contributed to the development of energy sector policy as part of several official committees constituted by ministries, the erstwhile Planning Commission and NITI Ayog and advisory committee of many regulatory commissions. Prayas is registered as a SIRO (Scientific and Industrial Research Organisation) with the Department of Scientific and Industrial Research, Ministry of Science and Technology, Government of India.

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Executive Summary

The tariff determination process for electric utilities, especially distribution companies is a consultative, public process in most states, where electric utilities are held accountable for their performance and costs incurred. Therefore, as part of the process, substantial information is shared to aid regulatory assessment and decision making. In fact, tariff orders and petitions are among the few comprehensive, regularly updated sources of information on the state power sector. Sharing crucial data also helps consumers, researchers, and consumer groups understand the constraints of the utilities and engage more effectively in the power sector. Further, it helps central and state governments, policy makers, banks, and investors gain important insights into emerging issues that affect the sector. This can enable agile and appropriate policy responses to prevent build-up of critical issues.

However, in many states, tariff orders and petitions do not contain enough information to understand the functioning and constraints of utilities (especially electricity distribution companies or DISCOMs) in a comprehensive and easy manner. This includes information on agricultural demand estimation, estimation of distribution losses, AT&C losses and progress under various central and state government schemes. The need for information is relevant for emerging trends which include:

- Migration of cross-subsidising consumers and sales of DISCOMs to open access, captive options, and rooftop solar systems.
- Sustained surplus power in many states and the consequent backing down.
- Increase in liabilities, especially short-term working capital loans.
- With the national commitment to add 175 GW of renewable capacity by 2022 and revision of renewable purchase obligations, DISCOMs are adding significant renewable energy capacity. However, unlike thermal and hydro capacity, there is no detailed information concerning renewable energy power procurement, tariffs and power purchase agreements (PPAs) in tariff orders.
- The major cost components and performance parameters need to be studied to identify reasons for the rising thermal generation costs including inefficiencies in operations, issues with coal quality and availability, coal transportation, changes in coal prices and applicable cesses.
- For over a decade, the efforts towards rural electrification have seen an investment of about ₹ 60,000 crores. This has resulted in a steady increase in the number of electrified households and improvements in the rural distribution network. However, despite the political commitment to 24x7 'Power for All', the progress of electrification efforts and the supply and service quality provided by DISCOMs is not tracked by SERCs.

Based on the information reported in tariff petitions and orders, in all states and union territories, it is clear that these data gaps persist in many states. However, some of the information is being reported to central government agencies like the Central Electricity Authority (CEA) and the Power Finance Corporation (PFC). Thus, it is quite possible for DISCOMs and State Electricity Regulatory Commissions (SERCs) to provide this information.

This report captures crucial data formats which can be used during the tariff determination process for information sharing by utilities, especially DISCOMs. Some of these formats include:

- month-wise merit order stack, with net generation and quantum backed down for every station
- detailed information on coal quality, transportation and availability

- sales migration based on duration, using conventional and renewable energy via captive and open access as well as the revenue obtained from sales migration charges
- details of category-wise, slab-wise historical demand and reasons for deviations in assumed demand growth from past trends
- details for renewable energy power purchase based on RPOs, levelised tariffs and power purchase agreements
- information on working capital requirement as well as delays in scheduled payments to lenders and generators
- supply and service quality indicators on a disaggregated basis.

Such information will not only help informed decision making during the tariff determination process but can also enable quicker and improved analysis on sector trends. There are critical formats which are currently not part of most tariff processes. In this report, the pages with these formats are highlighted with a *blue margin*.

SERCs and DISCOMs should adapt these suggested formats to suit their state realities and provide information as part of the upcoming tariff determination processes. The focus of data provision should not only be future projections but also for past data to enable analysis of crucial trends. This may involve SERCs ensuring that utilities provide this information by establishing and using appropriate penalties and incentives. Information provided in these formats should be clearly explained so that a diverse set of stakeholders can understand the terminologies employed and utilise the data provided.

Provision of data in these suggested formats is just one of the steps towards informed, participative decision making in the sector. There is a need for a comprehensive and collaborative exercise to ensure standard data collection and reporting formats across states, along with third party verification of information submitted on a regular basis. Despite varying state-level realities, the data should enable intra-state comparisons and agile policy making.

Many efforts such as the Regulatory Information Management System (RIMS) and uniform recording and maintenance of information practices have been attempted in the past by central and state sector agencies. Given several changes in the sector, the standard reporting formats should be revisited to capture crucial trends. To this end, the **Forum of Regulators** can take the lead in suggesting formats as well as the processes, frequency, and the conventions for reporting. Many of the suggested formats can be adapted for this exercise as well. Further, **SERCs** can adopt the standardised formats and formalise reporting in the given formats by notifying regulations. The **Ministry of Power** can collate information provided in these formats and publish annual analysis reports, taking into account key trends in the sector. Such reports should include financial and performance indicators and should ideally also provide analysis and policy suggestions.

The formats themselves can be reviewed every five years to account for trends in the sector through a consultative process. Such an exercise can go a long way in ensuring informed participation in policy and regulatory processes and aid decision making.

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*"It is a capital mistake to theorize before one has data.
Insensibly one begins to twist facts to suit theories, instead of theories to suit facts"*

-Arthur Conan Doyle (A Scandal in Bohemia)

1 Background and Context

Tariffs for electric utilities are determined by the State Electricity Regulatory Commissions (SERC) on an annual basis during a tariff determination process. In many states such a process includes avenues to encourage informed public participation and public accountability of the electric utilities, especially electricity distribution companies (DISCOMs). This is enabled by information in petitions submitted during the process. A lot of the information is provided in formats stipulated by the Commission. Along with the reported information, the tariff orders also capture crucial information on costs, performance trends and details of the SERCs decisions on many matters which affect consumers.

Though most tariff orders and petitions have important details, they are also bulky publications (approximately 300 to 600 pages) which are difficult to navigate¹ and which concerned and interested citizens find onerous to follow. It is essential for such information to be provided in a clear, understandable manner in the orders and petitions and it is desirable that such information is used by consumers and consumer groups. Public accountability and discourse can be strengthened if key information is provided in easily understandable, standardised formats.

In this context, many states already have good practices in terms of reporting information in tariff orders and petitions. However, it is also a fact that in most states, some or the other crucial data is missing or is reported in a manner that is complicated to understand or analyse². This makes informed participation in tariff processes challenging.

Many states have taken steps to ensure that there are standard formats for collating and publishing data which can inform the tariff determination process. The Maharashtra ERC notified the Uniform Recording, Maintenance and Reporting of Information Regulations in 2008, which specified formats for submitting relevant information to the ERC across licensees (MERC, 2008). The report on

¹ Some SERC orders more so than others. Tariff orders for Odisha, Rajasthan, and West Bengal have neither a table of contents nor a list of tables and orders in Haryana, Jammu and Kashmir, Kerala, and Punjab do not have a list of tables. Previous years' tariff orders in Karnataka have each chapter recorded in separate documents on the website which impedes access. Karnataka also uses roman numerals in its tariff orders, which makes navigation cumbersome. Meghalaya and Karnataka do not report the case number in their tariff orders.

² For example, there are cases where terms are used without explanation, data is reported without corresponding units and the nature of the data is unclear (whether it is figures approved by the ERC or is audited actuals or utility estimates).

standardisation of regulatory accounts, prepared for the Forum of Regulators, prescribed standards and practices for licensees across states to record, collate, prepare, maintain, and submit information to regulatory authorities (FoR, 2012). The exercise also aimed at introducing regulatory accounting regulations or guidelines across states to ensure a uniform information recording system.

However, there have been no recent efforts to revisit these formats and practices. In addition, data formats provided by SERCs to the utilities have been the same for years and do not account for recent changes in the sector. Some examples of such changes, which have cost and revenue implications, include:

- a. ***Increase in sustained surplus power:*** Many states in India claim to have sustained surplus power. Most of this capacity is not sold due to its high cost of generation. Instead, the capacity lies idle or is backed down. In most surplus states, about 15% to 30% of the capacity they have contracted is backed down and the costs incurred for this idle capacity is comparable to 50% to 100% of the agricultural subsidies given by the state (Josey, Mandal, & Dixit, 2017 a). With capacity addition and falling demand, backing down is bound to increase.
- b. ***Migration of cross-subsidising consumers due to cheaper alternative sources of power:*** In many states, especially surplus states, cross-subsidising consumer categories such as HT (High Tension) industrial and commercial have been showing a steady contraction in sales. This is because many high paying consumers are shifting to alternative sources to meet their electricity needs in whole or part. The migration of sales via captive or open access options will increase in the coming years with the availability of cheaper power in the market and given the falling price of renewable energy.
- c. ***Increase in short-term liabilities:*** Since 2012, the power sector has already seen two financial bailouts, mostly due to accumulating liabilities with banks. These liabilities are due to short-term working capital loans at high interest rates, taken to meet day-to-day requirements of the financially stressed DISCOMs. In fact, one of the conditions of the last bailout, the Ujjwal Discom Assurance Yojana (UDAY), was that banks are not to advance short-term loans to participating DISCOMs. However, even after UDAY, losses are increasing and it is quite likely that DISCOM liabilities are also on the rise.
- d. ***Increased capacity addition of Renewable Energy:*** Capacity addition by DISCOMs has increased significantly with the national commitment to add 100 GW of solar and 60 GW of wind by 2022. Since the quantum of renewable energy contracted was marginal in the past, there are no detailed reporting formats for renewable energy power procurement as there is for thermal power procurement.
- e. ***Flux in the coal sector and rising cost of generation:*** Coal based thermal generation accounts for more than 70% of the total generation and 75% of the cost of procurement for distribution companies. Most of this capacity is cost-plus, with regulators determining tariffs annually, based on cost and performance trajectories. The variable cost of thermal power plants has been increasing at about 4-5% per annum, due to inherent inefficiencies in operations, issues with coal quality and availability, rising coal transportation costs, and changes in coal prices.

Additionally, due to high cost of capital for new plants and the accruing interest during construction due to delays, the fixed costs for newly commissioned units is about ₹ 2/kWh or more. Thus, the cost of generation from recently commissioned plants is about ₹4/kWh.

f. Status of household electrification: Over three crore households have been electrified since 2005 and significant investments have been made to ensure rural network strengthening. Further, the political commitment has increased from ensuring universal access to connections to providing 24x7 ‘Power for All’. However, in spite of the huge political commitment and large scale public expenditure, no SERC has been systematically reviewing the status of electrification, progress under schemes, or the supply and service quality for households.

The objective of this report is to compile useful formats in which crucial data can be shared during the tariff determination process. Provision of such information enables various stakeholders, including policy makers, investors, financial institutions, and civil society organisations, to perform timely, periodic analysis, based on latest available data, thus encouraging more informed public participation and agile decision making. Another objective of this report is to aid researchers to understand the data that is available in tariff processes and also to document what critical information is missing. This will help researchers better understand the data available and the limits of the information provided in tariff orders. This will enable improved and quicker analysis. Table 1 lists the key actors for whom this report is intended.

Table 1: Key actors that the report is intended for

Actor	Relevance of report
Central and State Governments	<ul style="list-style-type: none"> - Aids inter-state, inter-sectoral comparisons and analysis of key trends - Evaluation of the financial health and efficiency of utilities - Track progress under schemes such as UDAY, ‘Power for All’ etc.
Electricity Regulatory Commissions	<ul style="list-style-type: none"> - Assessment of status in other states, and identification of key gaps in state - Track emerging trends of sales migration, and increasing renewable energy penetration, increased market operations, surplus management - Assessment of financial health of DISCOMs
Appellate Tribunal for Electricity, High Courts and the Supreme Court	<ul style="list-style-type: none"> - Provide additional insights especially to inform the macro-sectoral perspective
Banks and Financial Institutions	<ul style="list-style-type: none"> - Clearer picture of financial health to assess early warning signs of crises - Assessment of avenues for cost increase, loss of revenue, and liabilities
RTI activists	<ul style="list-style-type: none"> - Understanding of crucial information, available and required - Aids effective use of the RTI process in power sector
Civil Society Organisations	<ul style="list-style-type: none"> - Demand disaggregated key statistics related to performance and costs - Highlight gross inefficiencies and demand better supply and service quality
Researchers	<ul style="list-style-type: none"> - Track key emerging trends across states - Access relevant data on a periodic basis as opposed to data reported by agencies such as CEA, Planning Commission, which is relevant for two to three years in the past and which is available only for some parameters

Based on the analysis of tariff orders and petitions from all thirty-four states and union territories covered by ERCs, the report also documents good practices across states. The focus is primarily on critical data and information for distribution companies (DISCOMs) as these utilities are the primary interface with consumers and as their performance and efficiency is interlinked with the viability of the entire power sector. In addition, some formats are specified for the state-owned generating companies. The formats for transmission companies are beyond the scope of this report. The identification of crucial formats is based on regulatory engagements of Prayas (Energy Group) as well as discussions with consumer groups across states over the past decade.

2 About the Formats

The report looks at a specific cost and performance parameters described in Table 2.

Table 2: Performance and cost areas for which data formats are provided

Performance/Cost Area	Description for data to be provided in key formats
Power Procurement Cost	<ul style="list-style-type: none"> - Station-wise net generation, costs, nature and extent of backing down, Renewable Purchase Obligation (RPO) compliance, procurement of RE. Details of capacity addition for power procured. - Fuel availability, cost and quality, and fixed cost estimation for state generating company - Energy banking, transactions via short-term market operations
Demand and Sales Estimation	<ul style="list-style-type: none"> - Historical sales and projections, hourly load data - Sales migration due to open access, captive sources as well as rooftop solar. - Estimation of unmetered consumption and feeder-wise energy audits.
Energy Balance	<ul style="list-style-type: none"> - Assessment of energy availability, energy requirement, applicable losses. - Assessment of surplus power or shortages, if any
Surplus Management	<ul style="list-style-type: none"> - Estimation of surplus generation, backing down and sale of surplus - Estimation of cost impact from sale of surplus and backing down.
Revenue estimation	<ul style="list-style-type: none"> - Category-wise revenue from fixed, energy charges, electricity duties etc. - Revenue from sales migration charges, applicable penalties. - Category-wise subsidies and estimate of pending payments.
Tariff impact analysis	<ul style="list-style-type: none"> - Category-wise trends in tariff increase and break-up of tariff components - Month-wise impact of fuel surcharge, impact of electricity duty etc. - Financial implications of pending cases before APTEL, Courts.
Distribution costs	<ul style="list-style-type: none"> - Estimation of interest on long-term loans and source of long-term loans - Short-term liabilities, working capital requirement - Delays in scheduled payments to lenders and generators. - Historical growth of operation and maintenance expenses
Performance Accountability	<ul style="list-style-type: none"> - Disaggregated data on metering, reliability indicators, safety related data - Directives by SERC, compliance reports and action taken for non-compliance.

Most of the formats suggested in this report are being used by some DISCOMs or the other as part of their petitions or are reported by SERCs in the tariff order. In many states, crucial information is provided by utilities and SERCs on an ad hoc basis in compliance with SERC directives or is

provided during the scrutiny of the petition before the public hearing. However, the ad-hoc nature is problematic. For informed participation key information, which is repeatedly requested should be provided on a regular basis.

As per the Multi- Year Tariff Regulations in most states, variations in performance and therefore, costs based on approved trajectories for the stipulated time period can be due to factors within the control of the utility (controllable) and factors beyond the control of the utility (uncontrollable). The regulations specify norms for parameters which are influenced mostly by controllable factors. As per the tariff regulations in most states, majority of the cost impacts due to deviation in approved norms, i.e., controllable parameters are not passed on to consumers. This is to incentivise efforts to improve performance and efficiency. For uncontrollable parameters, major cost impacts are borne by the consumers. Some of the suggested formats also require specification of parameters as controllable and uncontrollable as per the ERC regulations to provide clarity on any gain or loss sharing that takes place between the utility and the consumers.

The parameters and variables specified in the formats are clearly explained sections below in the suggested formats. Some key points to note while reading the report and reviewing the formats are:

- All the formats are applicable to all the relevant utilities. The data for past years should be reported as per audited actuals where available, and estimates or projections otherwise. In each case, the table should clearly specify if the data is based on actuals, estimates, information approved by the SERC or projections.
- For the purpose of the report, the states and union territories in India are referred to as 'states' for ease of communication.
- The annual data to be reported in the formats is specified for every financial year beginning 1st April and ending on 31st March.
- For ease of understanding, the formats, which report data for multiple years, have the current year fixed as FY 2017-18.
- The growth rates are captured as Compound Annual Growth Rates (CAGR).
- The final year for the estimation of the growth rates is assumed to be 2017-18. Thus, a five year CAGR will capture the annual growth rates between 2012-13 and 2017-18.
- The tables specified for DISCOM specific information should be available for all DISCOMs in the state.
- Some of the formats also have formulas in order to provide clarity on the estimation method. These formulas are indicative and are subject to change based on SERC regulations and regulatory discretion.
- Wherever, disaggregated information is sought, it is meant for all the stations, divisions, feeders, consumer categories etc.
- Some formats have been highlighted with a *blue margin* along the page of the report. This means they are crucial and critical to informed processes and that most states do not provide the information.
- Formats which have significant information need only be provided in downloadable spread sheet/excel formats. These formats have been highlighted in the report.

- Some critical formats which should be part of the executive summary of the petition and orders have also been highlighted.

The forthcoming sections first provide a brief description of the data format and the importance of the desired data. This is followed by an account of the information available in different states.

3 Power Procurement

Power procurement costs account for more than 75% of the expenses incurred by the distribution companies and form a major part of consumer bills. Due to this, most tariff orders and petitions provide detailed information on the quantum and the cost of power procured. But in many states the information is not provided in a comprehensive manner, especially for disaggregated costs, the nature and extent of backing down of thermal power plants, and renewable energy procurement. Even in states where DISCOMs report this data in their petitions, a lot of information essential to consumers is not captured in the tariff orders.

3.1 Station-wise generation and costs for long-term contracts

Power procurement takes place from multiple sources based on various Power Purchase Agreements (PPAs). Information on the power generated and the costs incurred on a station-wise basis provide more clarity on the performance and costs of the DISCOMs.

Table 3 lists the key parameters essential to be captured in such a station-wise summary for long-term power procurement from firm sources. Most states provide information in a similar format. This table captures the extent of information available across states.

Table 3: Station-wise power procured and associated costs³

Station	Unit	Explanation	Status in states
Capacity Procured	MW	Capacity contracted by the DISCOM from a station	Bihar, Kerala, Manipur, UP, Puducherry, Karnataka, AN and Gujarat report this information.
Fuel Type/ Technology	Coal/ Gas/ Hydro	To understand costs and performance of plant	No state provides this information in the station-wise power procurement format. UP specifies this with a merit order stack.
Date of commercial operation (COD)	DD/MM/YY	Indicates age of plant	No state provides this information.
Duration of contract	DD/MM/YY	Along with COD, indicates duration of contract remaining	No state provides this information.
Nature of contract	Section 62/Section 63	Tariff determination for cost plus projects is under Section 62. Section 63 is for competitive bid projects	No state provides this information.

³ Abbreviations for the names of states are used in the table as specified here. UP is Uttar Pradesh, MP is Madhya Pradesh, AP is Andhra Pradesh, AR is Arunachal Pradesh, HP is Himachal Pradesh, J&K is Jammu and Kashmir, DNH is Dadra and Nagar Haveli, AN is Andaman and Nicobar Islands.

Station	Unit	Explanation	Status in states
Energy Available	MU	Generation estimated based on the availability of the plant. This long with energy dispatch provides details on surplus power.	AR, Gujarat, Punjab, and Puducherry provide information annually for each station. MP provides monthly data. Kerala provides average daily availability. In AP this information is aggregated by ownership. No other state provides this information.
Energy Dispatch	MU	Net Generation or the energy sent out based on Plant Load Factors (PLFs)	All states provide this information except MP.
Fixed cost and Variable Cost	₹ Cr or ₹/kWh	Fixed cost is the lump sum annual payments and variable cost accounts for fuel charged on a per unit basis.	AR, Assam, Chhattisgarh, HP, J&K, Kerala, Manipur, Nagaland, Odisha, Rajasthan, Sikkim, Uttarakhand, and Lakshadweep provide only total costs. All other stations provide fixed and variable costs.
Availability adjusted fixed cost	₹ Cr	Pro-rata adjustment if actual availability ≠ ERC norms	No state provides this information.
PLF incentives	₹ Cr	Variable cost adjusted if the PLF > ERC norm	No state provides this information clearly.
Costs due to impact of ATE judgments etc.	₹ Cr	Cost impacts due to various decisions of higher courts, review orders	No state provides this information clearly.
Total cost	₹ Cr	Includes fixed, variable costs	All states except Manipur
Per unit cost	Rs/kWh	Help compare costs of stations	All states except HP, Jharkhand, J&K, Manipur, Odisha, Rajasthan, Tripura, Telangana, and DNH
Transmission costs	₹ Cr	Station-wise intra-state, inter-state costs	Reported only in AR.

All state DISCOM tariff orders provide information on costs, energy procured etc., with the exception of Odisha. For the states of Chhattisgarh, Himachal Pradesh, Rajasthan, and Telangana, instead of reporting at the station-level, information is reported at the aggregated level based on the ownership. Thus, the information of NTPC stations is not available, but details of the aggregate purchase from NTPC are. Lakshadweep also does not provide station-wise details, possibly because almost all of its power is sourced from diesel generators and renewable energy sources. The tariff order for Jammu and Kashmir provides details of the procurement in sections of the order, but the same information would be easier to locate and analyse if it were provided in a table.

Seventeen states⁴ provide information on the net generation, fixed cost, and variable cost in one table. Information on the contracted capacity, fuel type, COD, and duration of contract would provide consumers with important information to analyse the data provided, even though these are specifications which are time invariant. With increased backing down, it is essential that the energy available and the energy dispatched are given, but this information is only provided by five states. Details of fixed and the variable costs are crucial to understand the cost build-up of particular stations, but this disaggregated information is not available in thirteen states. Additionally, no state clearly specifies incentives or rebates due to deviation in availability or PLFs from the ERC norms,

⁴ Surprisingly, Arunachal Pradesh, Assam, Chhattisgarh, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Manipur, Nagaland, Odisha, Rajasthan, Sikkim, West Bengal, and Uttarakhand do not provide this information in the same table. As Lakshadweep depends on solar and DG sets for its power, separation of fixed and variable cost is not possible.

no mentions cost impacts due to decisions in ATE or Court orders. Some states such as Maharashtra, Andhra Pradesh, Arunachal Pradesh, Puducherry and Bihar also report ‘other costs’. However, the constituents and the disaggregation of these costs in some cases are not specified. Only Arunachal Pradesh reports transmission costs on a station-wise basis. All other states report it on an aggregate level for the DISCOM, with possible segregation between inter-state and intra-state transmission costs.

Disaggregated information is not provided in most states for renewable energy procurement and short-term power procurement from market sources. This is discussed in greater detail in Section 3.4 and Section 3.8 respectively.

3.2 Generation short-fall

About the format

In the tariff determination order, the Commission projects or approves net generation for the upcoming year based on normative Plant Load Factors (PLFs) or past PLFs. The average plant load factor in India is about 60% to 65% (CEA, 2017 a, p. 13) which is much less than the normative plant load factor of 80% to 85% as prescribed by most SERCs. As per CEA (CEA, 2017 b, p. 2.08), some of the main reasons for this deviation include:

- Backing down or reserve shut down due to lower than anticipated demand
- Restricted operations or forced shut down due to receipt of inferior/wet coal or shortage or coal
- Restricted operations or forced shut down due to water shortages
- Backing down due to transmission constraints.

This deviation has impacts on the net generation, estimation of surplus power, and consequently on costs—especially fixed costs incurred by the DISCOM and costs passed on to consumers. Therefore, it is important for the consumer to know the extent of loss of generation or generation shortfall. This can be captured in Format 1.

Format 1: Shortfall in generation attributable to various reasons

Station	Approved PLF	Availability	Actual PLF	Generation Shortfall	Shortfall in generation due to:							
					Backing down/ Reserve Shut Down due to low demand	Planned Maintenance	Forced Outage	Fuel shortage	Issues with fuel quality	Transmission constraints	Water shortage	Other reasons
	%	%	%	MU	MU	MU	MU	MU	MU	MU	MU	MU
Station 1												
Station 2												
Total												

Format 1 captures station-wise deviation in PLFs and the consequent ‘shortfall in generation’. It specifies the shortfall in generation attributable to backing down due to lower than anticipated

demand, planned maintenance⁵, forced outages⁶, and issues with fuel quality or shortages. At times, generation cannot be evacuated due to transmission constraints, even though the plant is higher in the merit order stack. This should also be recorded. The *other reasons* stated in the format could include issues due to labour disputes, non-compliance with statutory provisions, etc. This information should be provided for the past three years as well as the current year.

Evidence from states

As of today, no state provides this information as part of the tariff order. CEA, in its annual review of the performance of thermal power stations, provides this information on an all-India basis (CEA, 2017 b). This shows that such information is collected regularly from thermal power plants.

3.3 Merit Order Stack

About the formats

At any particular time, demand is met by scheduling generation based on the merit order dispatch and any technical constraints⁷. The merit order ranks power procured by the DISCOM according to the ascending order of variable cost. Barring any technical constraints, plants with lower running costs will be used first to meet demand and the remaining relatively high cost plants are backed down. Some stations/sources, such as run-of-the-river hydro-power, nuclear, renewable energy, and short-term power procurement, are treated as must-run. Such stations are used first to meet demand, irrespective of the merit order.

In order to provide more clarity on the plants likely to be backed down, the DISCOMs should submit and SERCs should publish the projected and approved merit order stack for upcoming years, as well as the annual average merit order stack for the past years. This will provide more insights into the nature and extent of surplus and also point to surplus management strategies applicable to the DISCOM. As surplus can be seasonal and variable charges can vary with fuel surcharges, this information should be provided on a monthly basis.

A sample format for reporting merit order is show in Format 2. The Maharashtra and Telangana ERCs use a similar format to project the merit order on a monthly basis for the MYT period (MERC, 2016 a, p. 580; TSERC, 2017, p. 169). States can provide this information for past years and future projections as well.

⁵ Planned maintenance outages can be for annual checks or maintenance works. It also includes unscheduled or extended planned maintenance of thermal stations or unscheduled maintenance which could account for the deviation from the norm.

⁶ Forced outage refers to an outage of a generating unit due to a fault or other reasons which are not planned.

⁷ DISCOMs/SLDCs may not adhere to the merit order due to transmission constraints, system stability, generator ramp constraints, etc.

Format 2: Monthly merit order assumed for projections

Station	Variable Charge (Rs/kWh)	Net Generation on monthly basis (MU)											
		Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
<i>Must run stations</i>													
Station 1*													
Station 2													
<i>Merit order stations</i>													
Station 1													
Total													

*In case of renewable energy, this is source-wise

For past years, the variable charge can also vary on a monthly basis and thus the data can be reported in a modified format, as shown in Format 3.

Format 3: Monthly merit order reported based on historical data

April			May			June			July*		
Station	N.G (MU)	V.C (Rs/kWh)	Station	N.G (MU)	V.C (Rs/kWh)	Station	N.G (MU)	V.C (Rs/kWh)	Station	N.G (MU)	V.C (Rs/kWh)
<i>Must Run</i>											
Station 1#			Station 1			Station 1			Station 1		
Station 2			Station 2			Station 1			Station 2		
<i>Merit Order</i>											
Station 1			Station 1			Station 1			Station 1		
Total											

N.G = Net Generation and V.C = Variable cost including fuel surcharges.

*Table to extend for all months in financial year # In case of renewable energy, this is source-wise

This information should be provided for the current and past years and estimated for projections.

Evidence from states

Table 4: Information provided on merit order across state tariff orders

Information in tariff orders as per merit order	States ⁸
No relevant information	Chhattisgarh, J&K, Jharkhand, Karnataka, Meghalaya, Mizoram, Rajasthan, Sikkim, Tripura, and Uttarakhand
Average annual variable cost as per merit order	Madhya Pradesh
Net generation and average variable cost	Bihar, AR, HP, Andhra Pradesh, DNH and Goa
Annual net generation, availability and variable cost	Puducherry
Month-wise net generation projections, average annual variable cost.	Maharashtra and Telangana

⁸ Abbreviations for states the same as those used in Table 3

3.4 Renewable energy power procurement

3.4.1 Source-wise procurement

The format for station-wise power procurement discussed in Section 3.1 also accounts for information on renewable energy power procurement. With the renewable energy capacity contracted by the DISCOM increasing, it is important that source-wise information, especially net generation and costs incurred, is provided for renewables in the power procurement formats. Even so, most states provide the overall renewable energy procurement numbers without specifying the source, i.e., solar, wind, bagasse, etc. The only states which provide information on renewable energy purchase disaggregated for each source are Bihar, Telangana, Chhattisgarh, Gujarat, Tamil Nadu, Haryana, and Karnataka.

As purchase of Renewable Energy Certificates (RECs)⁹ has cost implications, it should also be included in Table 3 discussed in Section 3.1. As of March 2018, only tariff orders in the states of Assam Chhattisgarh, Mizoram, Nagaland, Sikkim, Tamil Nadu, Daman and Diu, Chandigarh and Puducherry capture this information. Assam orders also provide the disaggregation between solar and non-solar REC purchase.

3.4.2 Renewable energy contracts

About the formats

In addition to information on aggregate power procurement, details of renewable energy PPAs should also be provided. Renewable energy PPAs are based on a levelised tariff that is fixed over the period of the contract in nominal terms. Tariffs for subsequent PPAs have changed significantly over the years, hence it is important to report them as part of the tariff process. Tariff orders should contain a table providing information in the format specified in Format 4.

Format 4: Tariff-wise renewable energy procurement

Levelised tariff	Technology	Total Capacity (MW)	Average contract period remaining (Years)	Generation (MUs)

Further, disaggregated information on each contract would also provide clarity to consumers. A format for this information is provided in Format 5. The table specifies formats for generator-wise, PPA-wise, technology-wise, contracted capacity, levelised tariffs, and generation for the year. As the PPAs usually specify a target CUF, this value can also be mentioned in the format.

⁹ Renewable Energy Certificates (RECs) enable the meeting of Renewable Purchase Obligations (RPOs) of DISCOMs, especially in states which are not well endowed with renewable energy sources. One REC (Renewable Energy Certificate) represents 1 MWh of energy generated from renewable sources which can be bought by DISCOMs to meet shortfall in their RPOs. This purchase is only for the environmental attribute of the REC to meet RPOs. The generator receives the cost equivalent to that from any conventional source for the electricity.

Format 5: PPA-wise renewable energy procured

Name of Generator	Location of Plant	Technology	Year of PPA (DD/MM/YY)	Capacity (MW)*	Contract Duration (Years)	Target CUF as per PPA [#]	Applicable tariff (Rs/kWh)	Generation (MU)

*Including deration if applicable [#]CUF refers to capacity utilisation factor

As the information can be extensive, such formats need to be **provided only in downloadable spread sheet/excel format** on the websites of the DISCOMs and the SERCs along with the petition and order respectively.

Evidence from states

As of today, no state provides the information suggested in Format 4. Information specified in Format 5 is available on MSEDCL's website (MSEDCL, 2017, p. 7).

3.4.3 RPO Compliance

About the format

As per the mandate of the Electricity Act, 2003, SERCs have specified Renewable Purchase Obligations (RPO) which require the DISCOMs to purchase at least a certain quantum of renewable energy. The quantum is specified by the SERC each year as a percentage of the total energy sales grossed up for applicable losses. The target RPO percentage is specified separately for solar and for non-solar renewables. This is shown in Format 6.

In some cases, DISCOMs are unable to meet their RPOs via procurement of renewable energy. In such a circumstance, DISCOMs procure Renewable Energy Certificates (RECs), which are non-tangible energy commodities that confirm that electricity was generated from the renewable source. The purchase incurs costs for the DISCOMs but the consequent renewable energy generation does not accrue to the DISCOM. RECs are also available for solar and non-solar purchases. In some cases, SERCs have been allowing DISCOMs to carry-forward their RPO so that they are met in future years. Format 6 also specifies the RPO shortfall to be carried forward in a year and the shortfall from previous years to be met in that year. In case of non-compliance, SERCs can impose penalties on the DISCOM, which are not to be recovered from the consumers. Format 6 accounts for this.

Format 6: Renewable Purchase Obligation

Type	Parameter	Units	FY 16	FY 17	FY 18	FY 19	FY 20
Solar	Gross energy consumption	MU					
	Target RPO share	%					
	Target RPO quantum	MU					
	Shortfall to be met from previous periods	MU					

Type	Parameter	Units	FY 16	FY 17	FY 18	FY 19	FY 20
Solar	Total RPO requirement	MU					
	Energy Purchased	MU					
	REC Purchased	MU					
	Total Energy Purchased	MU					
	Total RPO achieved	%					
	Present shortfall	MU					
	Penalties, if any	₹ Cr					
Non-Solar	Target RPO share	%					
	Target RPO quantum	MU					
	Shortfall carried over from previous periods	MU					
	Total RPO requirement	MU					
	Energy Purchased	MU					
	REC Purchased	MU					
	Total Energy Purchased	MU					
	Total RPO achieved	%					
	Present shortfall	MU					
Penalties, if any	₹ Cr						

FY indicates financial year

Evidence from states

A few states such as Karnataka, Bihar, Maharashtra and Gujarat provide this information in the tariff order in similar formats. Karnataka, Maharashtra and Bihar do not provide information on shortfall carried over from previous periods. The detailed RPO calculation and the estimation of shortfall from previous periods should be available for the current year, for future projections, and for the past three years where audited accounts are available.

3.5 Month-wise renewable energy power procurement

About the format

Format 7 provides a template for month-wise details on renewable energy generation from various sources. This helps understand seasonal trends in generation, which can aid surplus/shortage management. States should provide this information for the past and current years, and should also provide projections for at least one year. Sources 1, 2, 3 etc., can be reported as solar, wind, biomass, bagasse, waste to energy etc.

Format 7: Month-wise renewable energy procurement

Year	2016-17 (actuals)			2017-18 (estimates)			2018-19 (projections)		
Generation (MU)	Source 1	Source 2	Source 3	Source 1	Source 2	Source 3	Source 1	Source 2	Source 3
April									
May*									
Total									

*Table to extend for all months in financial year

The formats specified should be used to report information for the current year, for future projections, and for the past three years where audited accounts are available.

Evidence from states

As of March 2018, Telangana and Andhra Pradesh provide this information in their orders and as part of their tariff petitions for all sources. Madhya Pradesh reports month-wise generation for solar and aggregated non-solar sources of renewable energy and Maharashtra reports month-wise generation for all renewable energy sources together.

3.6 Hourly generation/power procurement data

About the format

Energy generated from different stations and sources is subject to daily and seasonal changes, due to variations in load and the variable nature of renewable energy, backing down of power, maintenance schedules, forced outages, etc. Hourly information on energy sent out (net generation) for all stations from which the DISCOMs contract power can provide inputs on trends for future capacity addition planning and can make consumers aware of the constraints faced by the DISCOMs. This information should be provided at least for the past 3 years in the format specified in Format 8.

Format 8: Hourly generation

Date	Time	Station 1*	Station 2	Station 3	Station 4	DSM #	Total
DD/MM/YY	00:00	(MU)	(MU)	(MU)	(MU)	(MU)	(MU)

*RE generation to be provided source-wise # Refers to transactions using the deviation and settlement mechanism

Format 8 specifies generation for all stations on an hourly basis and also enables reporting of any energy adjustments due to the under-drawal or over-drawal via the deviation and settlement mechanism. The station-wise information on an hourly basis is extensive information and should be provided in a **downloadable spread sheet/excel format** on the SERC and DISCOM websites as part of the order and petition respectively.

Evidence from states

Information for the state-owned generating companies and privately owned generating companies is shared by MSEDCL¹⁰ during the tariff determination process in Maharashtra (MSEDCL, 2016 a). SLDCs of various states also record and report such information for varying durations. Maharashtra SLDC reports this information on an aggregated basis for State, Central and Private Generating stations based on fuel type for every hour. They also provide information on renewable energy

¹⁰ Maharashtra State Electricity Distribution Company Limited, the state-owned distribution company in Maharashtra shared this information while filing data gaps during the tariff determination process.

procurement (MSLDC, 2018). Madhya Pradesh SLDC reports this information for every 15 minute block for each station on a daily basis (MPSLDC, 2018).

3.7 Power procurement via competitive bidding

About the format

More than ten states have procured power via competitive bidding in the past couple of decades. The payments made are based on the bid parameters and the projections of charges are as per the PPA. Format 9 can capture the details of each PPA signed via competitive bidding which are important to assess cost impacts of these projects. The projects can be either Case 1 (where the procuring DISCOM does not specify the fuel or location or technology) or Case 2 (where the procuring DISCOM specifies the fuel, location or technology) and can be based on domestic fuel sources or imported fuel sources. The tariff itself can have several components namely, capacity charges, energy charges (with fuel charges, fuel handling charges, transportation charges as components) and transmission charges. The developer has the option to specify if the components are non-escalable or escalable. If non-escalable, the charge does not increase over time and if escalable, it is increased based on escalation rates issues by CERC on a periodic basis. Certain components (escalable and non-escalable) can also be specified in Rupees or Dollars for imported fuel. If it is quoted in dollars, the payments take place based on applicable exchange rates and escalation rates for that component. Therefore, while reporting this information in the suggested format, if the component is quoted in dollars, it should also be reported in rupee terms for that year to aid estimation.

Format 9: Details for power procured via competitive bidding

Particulars	Project 1	Project 2	Project 3
Name of Developer			
PPA Capacity (MW)			
Plant Location			
Date of PPA (DD/MM/YY)			
Duration of PPA (Years)			
Scheduled delivery date (DD/MM/YY)			
Actual COD (DD/MM/YY)			
Type of bid (Case 1/Case 2/UMPP)			
Type of fuel (Imported/ Domestic)			
Tariff adoption order (ERC, Case No., and Date)			
Net Generation (MU)			
Normative availability as per PPA (%)			
Actual availability (%)			
Levelised Tariff payable as per PPA (₹/kWh)			
Total Capacity charges (₹/kWh)			

Particulars	Project 1	Project 2	Project 3
<i>Escalable capacity charge component (in Rs/kWh)</i>			
<i>Non-Escalable capacity charge component (in ₹/ kWh)</i>			
Total Energy charges			
<i>Escalable fuel charge component (in ₹/ kWh)</i>			
<i>Escalable fuel charge component (in \$/ kWh)</i>			
<i>Non-escalable fuel charge component (in ₹/ kWh)</i>			
<i>Non-escalable fuel charge component (in \$/ kWh)</i>			
<i>Escalable fuel handling charge component (in ₹/ kWh)</i>			
<i>Escalable fuel handling charge component (in \$/ kWh)</i>			
<i>Non-escalable fuel handling charge component (in ₹/ kWh)</i>			
<i>Non-escalable fuel handling charge component (in \$/ kWh)</i>			
<i>Escalable transportation charge component (in ₹/ kWh)</i>			
<i>Escalable transportation charge component (in \$/ kWh)</i>			
<i>Non-escalable transportation charge component (in ₹/ kWh)</i>			
<i>Non-escalable transportation charge component (in \$/ kWh)</i>			
Total transmission charges (Rs/kWh)			
<i>Escalable component (in ₹/ kWh)</i>			
<i>Non-escalable component (in ₹/ kWh)</i>			
Total tariff as per PPA (Rs/kWh)			
Incentives or Disincentives as per PPA (₹ Cr)			
Compensatory tariff, if any (₹ Cr)			
Additional charge, if any (₹ Cr)			
Total payment made to generator (₹ Cr)			

Based on the components and the net generation, the total tariff is estimated. Additionally, any incentives or disincentives, compensatory tariffs due to SERC/ APTEL judgements or any additional charges will also impact payments. Thus the total payment should also be reported after accounting for these additional costs. This information should ideally be available for each project current year and for future projections as well as for the past three years where audited accounts are available.

Evidence from states

This information was provided by MSEDCL to some extent during the tariff determination process in Case 48 of 2016 (MSEDCL, 2016 b).

3.8 Procurement from the Market

About the format

To meet short-term power requirements, DISCOMs can procure power from trading licensees, power exchanges, generators, traders and other DISCOMs. However, the type of contract, the duration of the contract and the price of power procured can vary. Most DISCOMs procure 5% to 10% of the power from short-term sources. Except in the case of Delhi, privately owned distribution companies, meet 16% to 48% of their demand through short-term power procurement and this accounts for 13% to 35% of the total power procurement cost (PEG, 2017). Even DISCOMs with surplus power procure short-term power to meet seasonal shortages. With growing uncertainty in demand and increased renewable energy penetration, the role of short-term power is bound to increase. It is suggested that information be provided as specified in Format 10.

Format 10: Information on short-term power procurement

Seller	Date of Procurement	Type of contract	Duration of contract	Time- Block for procurement	Power Procured	Cost of power	Per unit cost of power
(Generator/ Trader/ DISCOM)	DD/MM/YY)	(RTC/Peak/Off-Peak)	(Hours/ Weeks/ Months)	(hh:mm-hh:mm)	MU	₹ Cr	₹/kWh
Generator 1							
Trading Licensee 1							
Power exchanges							
Captive generator 1							
DISCOM 1							
Total							

Short-term power can be obtained from traders, generators, power exchanges or another DISCOM and should be reported from each source. Transactions for short-term power procurement, even if they take place via the DEEP portal¹¹ will be with traders, DISCOMs, and generators which can be reported in the format. Procurement can be for round the clock (RTC) power or can be procured to address peak or off-peak shortages. The cost of power can be dependent on the time block of supply and therefore should be reported in the table. This information should be available for the current year. The formats should be used to also report data for the past three years as well as projections.. Information provided can be quite extensive for some states and thus need only be specified **in downloadable spread sheet/excel formats** in the SERC and DISCOM websites as part of the order and petition respectively.

¹¹ DEEP (Discovery of Efficient Electricity Price) is an e-Bidding and e-Reverse auction portal for procurement of short-term power by DISCOMs. It can be accessed here: <https://www.mstcecommerce.com/auctionhome/ppa/index.jsp>

Evidence from states

Currently most formats only report the total power purchased from the market. The formats used in Bihar, Arunachal Pradesh, Assam, Andhra Pradesh, Chhattisgarh, Nagaland, Tamil Nadu, Maharashtra, Uttar Pradesh, Daman and Diu, Chandigarh, Delhi, and Goa mention that total procurement and cost of procurement for power from bilateral sources, power exchanges, captive power plants etc., in the format described in Table 3. Karnataka, Madhya Pradesh, Rajasthan and Telangana provide the total quantum and rate for short-term power procurement without details for each source of power.

3.9 Energy Banking

About the format

DISCOMs also manage power surplus or shortages through energy banking with other DISCOMs, especially in the Northern Grid. Different DISCOMs have varied generation schedules and loads that they need to cater to. Thus, DISCOMs which have shortages for a particular period can meet their load by obtaining power from DISCOMs or Captive Generators which have surplus power at the time. This power can then be supplied at a later stage by the procuring DISCOM. Thus, energy banking is a bilateral exchange to cater to power requirements of involved parties at varied time periods.

As per the open access regulations in various states, renewable energy generators also have the option to bank and un-bank power with the DISCOM over a stipulated period of time to manage variable generation. In order to capture details of banking transactions, Format 11 can be used.

Format 11: Details of energy banking

Name of entity	Energy banked (MU)	Energy unbanked (MU)	Date Banked (DD/MM/YY)	Duration (hh:mm-hh:mm)	Date Unbanked (DD/MM/YY)	Duration (hh:mm-hh:mm)	Impact of transaction, if any (₹ Cr)

The format should specify the date and time slot for banking and unbanking as well as the quantum and cost impact. Even though the impact of such transactions is negligible in many states today, it could rise in the future with the proliferation of renewable energy generators and variation in DISCOM demand. Information should be reported for past years, the present year and for projections in tariff orders and petitions.

Evidence from states

Punjab, Haryana, Himachal Pradesh, Delhi, Uttarakhand and Rajasthan report total energy banked between DISCOMs on an annual basis in their tariff order. Details of power banked are also reported in the petitions of DISCOMs in Punjab, Haryana, Delhi, and Rajasthan. None of the states

report information on renewable energy banking.

4 Capacity Addition Plan

About the formats

Given the cost implications of capacity addition in the context of growing surplus across the country, there is a need to review capacity addition in the pipeline as part of the tariff determination process. DISCOMs should submit the detailed status of capacity in the pipeline. This should include the original and revised expected date of commissioning, delays and reasons for the delay. The DISCOMs should also note the status of the project based on important milestones especially relating to various clearances, fuel and water linkages, financial closure for the project and the status of construction. Format 12 can be used for this purpose. The format also includes the status of board approval which is necessary before investment takes place for state and central sector projects.

The format can be modified to report status of competitively bid projects and renewable energy projects in the pipeline as well. As this information is critical for future planning, this **should be reported in the executive summary or public notice for the petition and orders.**

Format 12: Status of capacity in the pipeline

Particulars	Plant 1	Plant 2
Name of Plant		
Location		
Fuel Source		
Ownership		
Original Expected date of commissioning (DD/MM/YY)		
Current expected date of commissioning (DD/MM/YY)		
Reasons for slippage, if any		
Status for Project Milestones		
<i>Board Approval</i>		
<i>Land Acquisition</i>		
<i>Forest Clearance</i>		
<i>Environment Clearance</i>		
<i>Fuel Arrangements</i>		
<i>Water Arrangements</i>		
<i>Financial tie-up</i>		
<i>Financial closure</i>		
<i>Status of Construction (BTG)</i>		

In addition to likely capacity addition, Maharashtra and Gujarat also provide details¹² for the decommissioning of currently contracted capacity. This information is also crucial information for

¹² Likely year for decommissioning in Maharashtra. Likely year for decommissioning as well as the reduction in fixed assets due to the same in Gujarat.

planning. Format 13 captures the likely date and reasons for decommissioning of capacity, especially if it is decommissioned earlier than its anticipated life term. Such details should be provided for 5-7 years in the future to aid capacity addition planning.

Format 13: Decommissioning plan for power procured

Name of Plant	Date of commissioning	Likely date of decommissioning	Reasons for decommissioning

Evidence from states

No state provides details on the various milestones of the upcoming capacity as shown in Format 12. Gujarat tariff order reports the allocated capacity of the station, likely year of commissioning, type of fuel, plant load factor, auxiliary consumption and likely fixed and variable cost for upcoming plants. Maharashtra’s tariff order mentions likely commissioning dates for the state generating company’s capacity and NTPC capacity. Punjab reports the likely commissioning date for upcoming plants and allocated share of power for the DISCOM. Uttarakhand reports only the likely energy availability from upcoming stations. Andhra Pradesh, Telangana, Bihar, Delhi, Haryana, Karnataka, Madhya Pradesh, Odisha, Tamil Nadu, Rajasthan, Uttar Pradesh and West Bengal do not even list the upcoming plants with the capacity allocated to the DISCOM. These states account for 80% of the total power procurement in India. In fact, Haryana, Madhya Pradesh, Uttar Pradesh, Bihar, Andhra Pradesh, and Telangana have seen an average increase of 10% per year in their installed capacities in the past four to five years.

Details of capacity addition for the future are mentioned in state plan documents and ‘Power for All’ documents for all states and are also mentioned in the business plans or specific petitions¹³ in some states. However, this data is provided at one time and is not revised on a periodic basis and in most cases, is not up for public consultation.

CEA in its broad status report provides status of various milestones on a monthly or quarterly basis for thermal power plants and hydro power projects (CEA, 2018 a; CEA, 2016; CEA, 2018 b) . Thus this information can be collected and provided for various projects during the tariff determination process.

5 Demand Estimation

Demand estimation is the cornerstone of the revenue model, power procurement options and the dispatch strategies used by the DISCOMs. With sales migration to open access, captive options, and rooftop solar systems, there is a growing uncertainty in demand, especially cross subsidising demand. Moreover, due to short-term open access, competitive peak and off-peak power availability in the market and day-time reduction in consumption due to roof-top solar, the peak demand is changing and shifting which also adds to the uncertainty. Understanding key trends in

¹³ For example, the additional surcharge petition by TANGEDCO, Tamil Nadu mentions the capacity in the pipeline (TANGEDCO, 2017, p. 10).

demand growth and load patterns is critical and the following sub-sections provide key data formats for information required to fulfil this need.

5.1 Historical and future demand growth

About the formats

Demand projections are made based on a set of assumptions by the SERC and deviation of actual sales from assumed sales can have costs impacts. In 2012-13, MSEDCL lost about ₹1750 crores as it did not account for the migration of about 2700 MUs of sales due to open access. This consequent loss of revenue was responsible for 26% of the tariff increase borne by consumers in 2013-14 (MERC, 2014 a). In many states, the growth rate assumed for future sales in a consumer category is much higher than past trends¹⁴. As the sales projections assumed are crucial, the decision to adopt a particular growth rate for a category needs to be clearly communicated to consumers as indicated in Format 14.

Format 14: Sales growth estimation

Consumer category	Sales reported in each category (MU)						CAGR in %					DISCOM Assumed growth for FY 19, future years	SERC Approved growth for FY19, future years	Reasons for deviation from historical rates
	FY 13	FY 14	FY 15	FY 16	FY 17	FY 18	5Yr	4Yr	3Yr	2Yr	YoY	(%)	(%)	
	Actuals					Estimates								
HT 1														
HT 2														
HT Total														
LT 1														
Slab 1														
Slab 2														
LT 2														
LT Total														
Total														

Yr indicates year. YoY indicates year on year. HT refers to High Tension and LT to low tension consumer categories.

According to Format 14, the category-wise sales for the past five years (based on audited actuals) are reported with estimates for the current year. The format can also capture the assumed growth rate for sales projections along with the justification for the growth rate adopted. **Information in this format should also be reported in the executive summary of the petition and order.**

¹⁴ There are many such instances especially for HT Industrial categories across states. The Rajasthan ERC assumed a growth of 6.48% for 2014-15 when the average annual growth rate was at 2.9% (RERC, 2015). The Maharashtra ERC assumed a growth rate of 7% for 2015-16, when the growth rate between 2010-11 and 2014-15 was negative at -1.6% (MERC, 2016 b; MSEDCL, 2012). The Madhya Pradesh DISCOMs projected a growth rate of 7.65% for 2016-17, even though sales grew only by 3.1% between 2014-15 and 2015-16 (MPPMCL, 2016). The Punjab ERC assumed a growth rate of 7.26% even though the growth rate between 2014-15 and 2015-16 was negative at - 2.44% (PSERC, 2016c).

The growth in number of consumers and connected load are also important to assess potential sales growth rate. This can be provided in formats similar to Format 14 and are specified in Format 15 and Format 16.

Format 15: Growth in number of consumers

Consumer category	Number of consumers reported in each category						CAGR in %					DISCOM assumed growth for FY 19, future years	SERC approved growth for FY19, future years	Reasons for deviation from historical rates
	FY 13	FY 14	FY 15	FY 16	FY 17	FY 18	5Yr	4Yr	3Yr	2Yr	YoY	(%)	(%)	
	Actuals					Estimates								
HT 1														
HT 2														
HT Total														
L T 1														
Slab 1														
Slab 2														
L T 2														
LT Total														
Total														

Yr indicates year. YoY indicates year on year. HT refers to High Tension and LT to low tension consumer categories.

Format 16: Growth in category-wise connected load

Consumer category	Total connected load reported in each category (kW)						CAGR in %					DISCOM assumed growth for FY 19, future years	ERC approved growth for FY19, future years	Reasons for deviation from historical rates
	FY 13	FY 14	FY 15	FY 16	FY 17	FY 18	5Yr	4Yr	3Yr	2Yr	YoY	(%)	(%)	
	Actuals					Estimates								
HT 1														
HT 2														
HT Total														
L T 1														
L T 2														
LT Total														
Total														

Yr indicates year. YoY indicates year on year. HT refers to High Tension and LT to low tension consumer categories.

Evidence from states

Bihar, Delhi, Uttarakhand and Gujarat tariff orders provide data for multiple years¹⁵. In each of these states, the growth rate assumed and the rationale is described in the order (GERC, 2017, pp. 113, 118-129; BERC, 2017, p. 276; UERC, 2017, p. 135; DERC, 2017, p. 188). The Maharashtra and Odisha tariff orders provide the sales growth rate assumed and the rationale for the same, for each category (MERC, 2016 a, p. 211; OERC, 2017, p. 78). The Punjab tariff order only provides 3 year and 4 year CAGR. Even though Haryana, Andhra Pradesh, Telangana, Karnataka, Uttar Pradesh, West Bengal, Madhya Pradesh, and Tamil Nadu have seen significant variations in sales growth in the recent past, the tariff orders do not have this information.

5.2 Sales migration trends

Migration of sales to open access and captive options has resulted in a significant reduction in HT revenue in the recent past. In Maharashtra and Punjab, the growth rates for industrial categories have also been negative in the past (Josey, Mandal, & Dixit, 2017 a). Such migration affects power procurement planning and revenue recovery of DISCOMs. Formats of each of these migration options are discussed in sub-sections below.

5.2.1 Open Access

About the format

Open access¹⁶ has been picking up in many states, despite the levy of significant sales migration charges¹⁷. As per SERC regulations, long-term open access is for a period between 12 to 25 years. The duration for medium term open access is between 3 months to 3 years and short-term open access is usually for less than a month. Short-term open access also makes scheduling and planning a challenge for DISCOMs as consumers opportunistically switch between the market and the DISCOM on a daily basis.

Open access from renewable energy generators has been picking up in Gujarat, Maharashtra, Andhra Pradesh and Tamil Nadu. With increasing cost of thermal generation, falling renewable energy prices and concessions on sales migration charges for renewable energy based open access, the consumers opting for this option will only increase.

Format 17 can document trends in open access.

¹⁵ Four years in the case of Bihar, eight years for Delhi and five years for Gujarat and Uttarakhand for sales data.

¹⁶ This is where a consumer of the DISCOM chooses to meet her demand wholly or partially from a generator of her choice for a defined period of time.

¹⁷ For wheeling, cross subsidy surcharge, transmission charges, and additional surcharge

Format 17: Extent of sales migration via open access

Consumer category	Open Access (MU)						Total
	Short-term		Medium-term		Long-term		
	RE	Non-RE	RE	Non-RE	RE	Non-RE	
Total							

RE stands for Renewable Energy based open access and Non-RE for non-renewable energy based open access

In Format 17, for each consumer category, information should be provided on energy wheeled for short-term, medium-term, and long-term open access. For all durations, the details can be provided for renewable energy based open access and open access based on conventional sources.

Evidence from states

Rajasthan DISCOMs, as part of their tariff petitions, report the open access sales via short-term open access and renewable energy open access (JVNL, 2017 a). MSEDCL in Maharashtra reported this information in its petition in 2016 (MSEDCL, 2016 b). Information on renewable energy open access is also collected by DISCOMs and SLDCs in Andhra Pradesh, Telangana, Madhya Pradesh and Karnataka (Sarode, Gambhir, Das, & Dixit, 2017). Maharashtra, Gujarat, Punjab, Andhra Pradesh, Karnataka, Haryana, and Madhya Pradesh report total open access sales during the estimation of additional surcharges¹⁸.

5.2.2 Captive Consumption

About the format

Loss of revenue and change in demand of the DISCOM can also take place due to migration of sales to captive consumers particularly in states such as Gujarat, Karnataka, Maharashtra, Odisha, and Tamil Nadu. Similarly, information for energy wheeled in the state for captive consumption should also be reported. The information can be reported by the DISCOM based on SLDC records for conventional captive power plants¹⁹ or group captive power plants²⁰. Both types of captive plants can be renewable energy based or based on conventional power and the reporting of energy wheeled should be separate. This information should be provided for past year, for the current year and for future projections. Format 18 can be used for reporting this information.

¹⁸ Maharashtra and Haryana estimates the additional surcharge in their tariff orders. All other states have separate regulatory orders for the estimation of additional surcharge. Maharashtra only provides an annual estimate. Gujarat and Punjab provide quarterly sales estimates and the rest of the states listed provide the sales information on a monthly basis.

¹⁹ Captive power plant refers to a power plant set up by any person, association or any company to generate electricity primarily for self-consumption.

²⁰ A group captive power plant is a plant for the collective use of many consumers. These consumers should consume at least 51% of the power generated and should own at least 26% of the equity.

Format 18: Extent of captive consumption

Type of Industry or Commercial activity*	Captive Power wheeled (MU)			
	Group Captive Power Plants		Conventional Captive Power Plants	
	RE	Non-RE	RE	Non-RE
Total				

*As per three digit level groups specified in the National Industrial Classification - 2008

Evidence from states

As of March 2018, CEA tracks and reports capacity, consumption and generation of captive power plants with capacity of over 1 MW (CEA, 2017 c). This information is provided on an industry-wise and state-wise basis. However, group captive or renewable energy captive projects are not reported separately.

5.2.3 Rooftop solar and net metering*About the format*

Another way that DISCOMs can face sales loss is due to rooftop solar systems. In most states about 60% to 70% of the non-agricultural sales have energy charges above ₹5/unit which is higher than the levelised tariff for rooftop solar projects. Thus, notwithstanding space constraints, many consumers can reduce their dependence on the DISCOM for supply by putting up grid connected solar systems. Where provisions are available, consumers can also opt for net metering which provides them with the option of injecting surplus energy back into the grid at a pre-specified rate to be paid by DISCOMs. Format 19 can be used to report consumer category-wise information on number of consumers who have installed such systems with the total connected load with the DISCOM and current drawal from the grid. The format also helps reporting of quantum of power injected back into the grid and financial impact of the settlement.

Format 19: Sales migration due to rooftop solar systems

Consumer category	Number of consumers with RTPV systems	Total connected load of such consumers (kW)	DISCOM sales to consumers with RTPV (MU)	Surplus energy generated injected into the grid (MU)	Payments/ Adjustments due to injection of power (₹ Cr)

Evidence from states

As the quantum of rooftop solar penetration is marginal today, this information is not captured in tariff orders. Going forward, the nature and extent of this migration can have significant impacts

and should be captured.

5.3 Hourly load data

About the format

Seasonal and diurnal variations in load due to multiple factors can impact DISCOM operations and costs. Format 20 captures crucial load-related data that should be provided on an hourly basis.

Format 20: Hourly load data

Date	Time	Estimated Unrestricted Demand	Demand Met	Load shedding	Load Management for Agricultural consumers	Agricultural Demand met	Open Access Demand	Captive Demand*
DD/MM/YY	00:00	MW	MW	MW	MW	MW	MW	MW

*For HT captive consumers using conventional and renewable energy. Does not include demand from rooftop solar installations. That will be part of DISCOM demand.

Format 20 can record the hourly unrestricted demand as well as the actual demand met by the DISCOM. Unmet demand can be due to load shedding or due to restriction of hours of supply for agricultural consumers, especially in states where investments have been made so that there are mostly separate feeders catering to agricultural consumers. The format captures load shedding, restriction in demand to agricultural consumers and the actual agricultural demand met on an hourly basis. In addition to this, the distribution and transmission wires also wheel energy to cater to open access demand and captive demand. Thus, the hourly load due to open access consumers and captive consumption can also be recorded. As the information can be detailed, such formats need to be **provided only in downloadable spread sheet/excel format** on the websites of the DISCOMs and the SERCs along with the petition and order respectively.

Evidence from states

MSEDCL in Maharashtra has provided this information as part of their petition (MSEDCL, 2016 a). Along with the hourly generation data, the Maharashtra SLDC has been providing information on hourly demand met, load shedding and load management for agriculture as well (MSLDC, 2018).

5.4 Estimation of unmetered demand

About the formats

Several DISCOMs have unmetered consumers whose demand is not measured but estimated on the basis of consumption norms and assumptions on use patterns. Most states have only unmetered agricultural consumers while some states such as Bihar, Madhya Pradesh, Tamil Nadu and Uttar Pradesh also have unmetered consumers in other categories. Distribution losses could be because

of theft and inefficiencies in the system and the excess power procurement costs incurred for this purpose need not be passed onto consumers. However, if such losses are deemed as unmetered sales, the DISCOMs can recover the additional power procurement cost through tariffs or subsidies.

Most SERCs and DISCOMs estimate unmetered demand based on normative assumptions which are not validated on a regular basis. The assumptions could be based on consumption by metered consumers of that category and region or it could be based on feeder /distribution transformer (DT) level data. In Uttar Pradesh, the norm used for estimating the consumption of 40% of Uttar Pradesh residential consumers who are rural and unmetered is 144 units/kW/month (Chunekar & Mulay, 2017). This is higher than the average consumption of urban domestic consumers in Delhi. In Maharashtra, Tamil Nadu, Madhya Pradesh, Uttar Pradesh, Andhra Pradesh, Telangana and Karnataka the ERCs have also reviewed the benchmark consumption norms for agriculture or changed the methodology for estimation to correct for overestimation. As the methodology and the assumptions used for unmetered demand estimation is critical, SERCs and DISCOM should report data for key parameters listed in Format 21 in their tariff orders and petitions respectively. This table should be replicated for each unmetered category in the state. If there are separate norms on a regional basis, then the table should be replicated for each region.

Format 21 can record annual information on the number of unmetered consumers, the connected load, the norm used and the estimated sales. The historical data provides some indication of the trends in the norms used and the estimated consumption patterns over time. In some DISCOMs, the norm is determined for the DT and not at the consumer level as is the case in Andhra Pradesh and Telangana. For such a case, Format 21 can be modified accordingly to report the norms. **This format should be part of the executive summary of the petition and order.**

Format 21: Estimation of demand for each unmetered category

Particulars	Number of un-metered consumers	Unmetered consumers as % of total consumers in category	Total Connected Load	Benchmark consumption norm used	Average consumption for metered consumers in category	Sales
Units	Number	%	kW or HP	kWh/(Kw or HP)/(month or year)	kWh/(kW or HP)/(month or year)	MU
FY13						
FY 14						
FY 15						
FY 16						
FY 17						
FY 18						
YoY Growth rate assumed for FY 19						
FY 19						

Some states do not use a consumption norm for a region or the state but rely on energy audit data from agricultural feeders to estimate consumption²¹. However, despite feeder separation, most states do not use this methodology for agricultural demand estimation. Further, in the states where feeder-level data is being used for agricultural demand estimation, the metered sales are accounted for but the unmetered consumption and the energy losses at the feeder-level remain unaccounted. In order to differentiate the unmetered consumption from the losses, assumptions are made regarding the line losses below the feeder-level. Format 22 is similar to the format specified in Format 23, in that it accounts for energy sold to each consumer category in a feeder. However it also captures the methodology used for estimation. Provision of such data will make it easier for SERCs and consumers to hold DISCOMs accountable for loss reporting and performance.

Format 22: Estimation of unmetered demand based on feeder energy input and sales data

Particulars	Units/ Specification	Feeder 1	Feeder 2
Circle			
Division			
11 kV Feeder Name			
Feeder Meter Reading (Manual/ Automatic)			
Input energy	MU		
Normative assumption for losses, if any	%		
Energy losses at the feeder-level	MU		
Sales	MU		
	<i>Metered</i>		
	<i>Unmetered</i>		
Number of consumers	MU		
	<i>Metered</i>		
	<i>Unmetered</i>		

In the format specified, estimates for the present year and audited actuals for the past three years should be reported. As the information is disaggregated and detailed, its needs to be **provided only in downloadable spread sheet/excel format** on the websites of the DISCOMs and the SERCs along with the petition and order respectively.

Evidence from states

Maharashtra provides historical data on agricultural sales, number of consumers, connected load and also tracks the change in norms. Even though Maharashtra uses consumption norms for estimation, MSEDCL has been providing information on circle-wise agricultural consumption on separated feeders and energy input on these feeders as part of their petition (MSEDCL, 2016 b, p. 235). Rajasthan and Karnataka provides details on the number of consumers, total and average connected load, the benchmark norms and sales but they do not provide the proportion of unmetered consumers (RERC, 2015, p. 72; KERC, 2017). The information is available only during

²¹ Notable exceptions include DISCOMs in Punjab and Haryana

true-ups and for projections without detailed historical data. Even though Gujarat has significant agricultural consumption, it does not specify the norm in the order.

Karnataka, in its recent order has specified a format for the DISCOMs to report sub-division-wise information on the number of agricultural feeders, sales to agricultural and non-agricultural consumers in these feeders and feeder-wise losses. The format also records number of pump sets connected to the agricultural feeders and the average consumption of the pump sets and the sales during the month. (KERC, 2017, p. 28). More states should adopt this practice

Both Madhya Pradesh and Tamil Nadu have agricultural and domestic unmetered connections. In the case of Madhya Pradesh, the norms for agricultural consumption and the number of unmetered consumers are mentioned. The norm for domestic unmetered consumption is not clear even though 7% of the sales is unmetered (MPERC, 2017). Tamil Nadu does not report the assumptions used and the estimates for the hut category or for agricultural consumers explicitly in its tariff order (TNERC, 2017 a, pp. 74-76).

Uttar Pradesh and Bihar have unmetered consumers in the domestic, commercial, agricultural and streetlight categories. Despite the large number of unmetered consumers, there is no information on the norms in the tariff order for Uttar Pradesh (UPERC, 2017). However, the SERC issued a suo-motu order while revising the norms recently which has more details (UPERC, 2016). Bihar provides the category-wise norms and the proportion of unmetered consumers (BERC, 2017, pp. 410,455).

DISCOMs in Punjab and Haryana use feeder-level data for estimation of agricultural demand. In the tariff order, Punjab provides historical data on the number of agricultural consumers and sales for the past six years along with 3 year, 4 year and 5 year CAGRs (PSERC, 2017, p. 148). In its petition, Punjab also provides data on the number of agricultural feeders, input energy to each feeder and connected load for agricultural consumers on a monthly basis (PSPCL, 2013). Haryana provides information only on an aggregate basis for the total input energy for agricultural feeders, the total consumption of non-agricultural consumers in agricultural feeders, the total agricultural consumption in mixed feeders and the assumed losses which are used to estimated agricultural consumption (HERC, 2017, p. 168).

5.5 Feeder-Level Energy Audits

About the formats

Feeder-wise energy audit data can provide a good indication of regional consumer mix and demand patterns which can inform policy making in the future. It can also provide a better estimate of distribution losses for the state. Such information can also help to set up feeder-wise/ division-wise loss reduction targets, and track progress. In the past, evidence was presented from various states to indicate that excessive T&D losses could also be due to issues with accounting of HT consumption (Dixit, Sant, Wagle, & Nhalur, 2002). Recognising this, one of the conditions under the UDAY bailout scheme was for signatory states to complete feeder-level metering.

The description of the feeder, the number of consumers, category-wise sales and energy losses should be reported at the feeder-level as shown in Format 23.

Format 23: Feeder-level energy audit data

Particulars	Units/ Specification	Feeder 1	Feeder 2
Type of feeder	Industrial/ Agricultural/Mixed Urban/Mixed Rural etc.		
Location of feeder			
Voltage level	kV		
Feeder Meter Reading	Automatic/ Manual		
Input energy	MU		
Sales (category-wise)	MU		
	<i>Category 1</i>		
	<i>Category 2</i>		
Number of consumers	MU		
	<i>Category 1</i>		
	<i>Category 2</i>		
Energy loss	MU		
Energy loss	%		

This information can be extensive and should be **provided in downloadable spread sheet/excel format** on the DISCOMs and the SERC websites along with the petition and order respectively.

A division-wise summary of this information can also be provided in the tariff orders and petitions to aid analysis of the information as shown in Format 24. Similar to Format 23, this information is extensive and needs to be provided only in a **downloadable spread sheet/excel format**. In addition to energy data this summary can also have information on billing and collection to enable the reporting of division-wise AT&C losses along with distribution losses. The reported AT&C losses can also be compared with target AT&C losses as committed by signatory states under UDAY. Detailed format for the estimation of AT&C losses is described in Section 8.

Format 24: Division-wise summary of feeder-level audits

Name of Division						
Particulars	Number of consumers	Connected Load	Metered sales	Unmetered sales	Revenue billed	Revenue collected
Unit	No.	kW	MU	MU	₹ Cr	₹ Cr
Consumer category 1						
Consumer category 2						
Consumer category 3						
Total						
<i>Distribution losses (%)</i>						
<i>Target AT&C losses (%)</i>						
<i>AT&C losses (%)</i>						

Evidence from states

As per the UDAY national dashboard, 100% of rural feeders have been metered in twenty-five states (MoP, n.d). Further, efforts have also been made by the Ministry of Power to record basic information from rural feeders in a central data acquisition system (RECTPCL, n.d). This data is also made available via the National Power Portal (MoP, 2018). Thus, disaggregated information for urban and rural areas by the DISCOM for each feeder is already being collected and collated. Therefore it can be reported as part of the regulatory process. MSEDCL has been providing this information summarised at the division-level as part of the tariff petition (MSEDCL, 2016 c). Odisha ERC has also been capturing division-wise AT&C losses in their tariff order (OERC, 2017, p. 108).

6 Energy Balance

About the format

The energy balance table in tariff orders provides a snapshot of the energy requirement and the energy available with the DISCOMs after accounting for applicable transmission and distribution losses. Thus, the energy balance table can give a sense of the power procurement within and outside the state boundary, impact of applicable losses on energy requirements and can also estimate the surplus or shortage faced by the DISCOMs. A typical energy balance table should provide these details as listed in Format 25.

Format 25: Energy Balance

Particulars	Formula	Unit	2016-17	2017-18	2018-19
Power procured from inter-state sources	A	MU			
Quantum of inter-state transmission losses	B	MU			
Rate of Inter-state transmission losses	$C = B/A$	%			
Power at state boundary	$D = A - B$	MU			
Power procured from intra-state sources	E	MU			
Quantum of intra-state transmission losses	F	MU			
Rate of intra-state transmission losses	$G = F/(E+D)$	%			
Power purchase payable	$H = A + E$	MU			
Energy availability at Transmission Periphery	$I = D + E - F$	MU			
Energy requirement at Transmission Periphery	$J = K + L$	MU			
Sales at EHV level (66kV and above)	K	MU			
Energy requirement at 33 kV	$L = M + O + P$	MU			
Quantum of Losses at 33 kV	M	MU			
Rate of Losses at 33 kV	$N = M/L$	%			
Sales at 33 kV level	O	MU			
Energy requirement at 11 kV	$P = S + Q + T$	MU			
Quantum of Losses at 11 kV	Q	MU			
Rate of Losses at 11 kV	$R = Q/P$	%			
Sales at 11 kV level	S	MU			

Particulars	Formula	Unit	2016-17	2017-18	2018-19
Energy requirement below 11 kV	$T = U + W$	MU			
Quantum of Distribution losses at DT level	U	MU			
Rate of distribution losses at DT level	$V = U/T$	%			
Sales at DT level	W	MU			
Surplus (+)/ Shortage (-), if any	$X = I - J$	MU			

Format 25 lists the power procurement from sources within the state and outside the state. The intra-state transmission losses as well as the inter-state transmission losses are accounted. This helps estimate power at the transmission periphery. Similarly, the sales at each voltage level are grossed up for applicable losses to estimate the energy requirement at the transmission periphery. In the case of projections, the difference between the energy requirement and the energy available at the state boundary indicates the need for short-term power procurement or for the need to manage surplus power through sale or backing down. This information should ideally be available for the current year, for the past three years where audited accounts are available, and for future projections. **This format should be reported in the executive summary of the petition and order.**

Evidence from states

Table 5: Evidence from states on reporting of energy balance

Particulars	States
No information with respect to energy balance	Kerala, Odisha and Karnataka
Report only energy requirement (total sales grossed up for losses)	Chhattisgarh, Gujarat, Himachal Pradesh, Jammu and Kashmir, Tamil Nadu, Uttar Pradesh, Uttarakhand, Telangana, Dadra and Nagar Haveli, Andaman & Nicobar Islands, Lakshadweep, Assam and Madhya Pradesh
Report only energy available (total power procurement after accounting for applicable losses)	Jharkhand and Haryana
Report total energy requirement but report power procurement without accounting for applicable losses	Andhra Pradesh, Rajasthan, Sikkim and Tripura
Provide both energy available and requirement.	Maharashtra, Meghalaya, Mizoram, Nagaland, Punjab, Chandigarh, Daman and Diu, Goa, Puducherry, Manipur
Along with energy availability and requirement, also report surplus or shortages	Bihar, Arunachal Pradesh, Delhi, Sikkim, West Bengal , Goa
Separately report intra-state and inter-state power procurement along with energy availability and requirement.	Bihar, Arunachal Pradesh, Delhi, Jharkhand, Maharashtra, Meghalaya, Mizoram, Nagaland, Punjab, Sikkim, Tripura, West Bengal, Haryana, Telangana and Goa

7 Revenue related data

Information on the revenue generated from various sources such as retail tariffs, sales migration charges, sale of surplus and subsidies provide an insight into the current business model of the DISCOM and could also provide increased clarity on the rising losses of DISCOMs.

7.1 Consumer data on revenue from tariffs

About the format

Revenue from category-wise retail tariffs and its different components (fixed charges, energy charges etc.) as well as revenue from rebates, penalties (due to time of day tariffs, power factor incentives, etc.) and meter rent can help understand the prevailing tariff design. This can be reported in Format 26. Moreover, the revenue from fuel surcharges and subsidies which also contribute to the revenue should also be made clear. Format 26 can also be used to clarify the revenue recovered by the state government via levy of electricity duties²² in each category. The format also reports data on number of consumers, and connected load which helps analyse and understand the data on revenue from various components of the retail tariff. The average billing rate as shown in Format 26 is the average revenue per unit of sales for the relevant category or slab.

Format 26: Information on category-wise sales and revenue

Consumer category	Number of consumers	Sales	Connected load	Revenue from:					Total revenue	Average billing rate	Electricity duty
				Fixed charge	Energy charge	Net Revenue from Penalties (+)/ Rebates (-)	Fuel surcharge	Subsidies			
	(Nos.)	(MU)	(kW)	₹ Cr	₹ Cr	₹ Cr	₹ Cr	₹ Cr	₹ Cr	Rs/kWh	₹ Cr
Category											
Slab											
ToD slot											
Total											

The information in the format should be available for the current year, for past three years where audited accounts are available and for future projections. **It should also be in the executive summary of the petition and order.**

²² Twenty state governments in India levy electricity duties.

Evidence from states

Table 6: Information on sales and revenue from retail tariffs across states

Relevant information in tariff orders	States
Category-wise revenue not reported	Tripura, Haryana, Assam and West Bengal
Category-wise sales not reported with category-wise revenue.	Chandigarh*, Chhattisgarh, Dadra and Nagar Haveli*, Delhi, Gujarat, Jammu and Kashmir, Jharkhand, Odisha, Puducherry*, Rajasthan, Tamil Nadu and Telangana
Only category-wise sales and revenue	Andaman & Nicobar, Andhra Pradesh, Arunachal Pradesh, Bihar, Daman and Diu*, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Meghalaya, Mizoram, Nagaland, Punjab, Sikkim, Uttar Pradesh and Uttarakhand
Revenue, sales, and revenue from fixed charges and energy charges.	Goa*, Lakshadweep*
Revenue from fixed and energy charges, sales and connected load for projections.	Manipur*, Maharashtra*

*These states provide slab-wise disaggregation for data.

7.2 Revenue from sales migration charges

About the format

With the proliferation of consumers opting for open access and captive consumption, DISCOMs are losing revenue from retail tariffs but at the same time, are also earning some revenue from sales migration charges. Open access and captive consumers pay wheeling charges for use of the distribution network. In case the captive or open access consumer obtains power from the DISCOM on a standby basis (say, if the generator fails to supply power, or power could not be obtained from the exchanges due to congestion), power is supplied on standby rates. Moreover, DISCOMs also charge penalties on fixed charges for exceeding the contracted demand. In addition, open access consumers in most states also pay cross subsidy surcharges to compensate the DISCOM for loss of cross-subsidy. Many 'surplus' states also levy an additional surcharge for under-utilisation of power procured on a long-term basis due to open access. Captive consumers in some states pay a parallel operation charge or a grid support charge to the DISCOM as well. be captured in Format 27.

Format 27 is useful to list the revenue recovered from each category of consumers due to sales migration charges.

In addition, many states also have concessions on wheeling, cross subsidy surcharge, additional surcharge etc., for consumers opting for migration using particular renewable energy (RE) sources. Details of this can also be captured in Format 27.

Format 27: Revenue from sales migration charges

Consumer Category	Unit	Consumer category 1	Consumer category 2	Total
Sales via open access	MU			
Standby power to open access consumers	MU			
Revenue from open access charges:				
<i>Wheeling</i>	₹ Cr.			
<i>Cross Subsidy Surcharge</i>	₹ Cr.			
<i>Additional Surcharge</i>	₹ Cr.			
<i>Penalties for exceeding contracted demand</i>	₹ Cr.			
<i>Standby charges</i>	₹ Cr.			
<i>Total</i>	₹ Cr.			
Concessions provided for RE open access:				
<i>Wheeling</i>	₹ Cr			
<i>Cross Subsidy Surcharge</i>	₹ Cr			
<i>Additional Surcharge</i>	₹ Cr			
<i>Any other</i>	₹ Cr			
<i>Total</i>	₹ Cr			
Consumption of captive consumers	MU			
Standby power to captive consumers	MU			
Revenue due to captive sales charges				
<i>Wheeling</i>	₹ Cr			
<i>Parallel Operation charges</i>	₹ Cr			
<i>Penalties for exceeding contracted demand</i>	₹ Cr			
<i>Standby charges</i>	₹ Cr			
<i>Total</i>	₹ Cr			

This information should be available for the current year, the past three years where audited accounts are available and for future projections.

Evidence from states

Most states provide information on revenue anticipated from wheeling, cross subsidy surcharge and additional surcharge for future years but seldom provide this information for true-ups or for past years. Rajasthan DISCOMs, as part of their petition provides this information in a comprehensive disaggregated manner (JVNL, 2017 a) . Maharashtra, Punjab and Tamil Nadu report only revenue from wheeling charges for past years.

7.3 Revenue from sale of surplus

About the format

If DISCOMs have more energy available than their requirement at a time, they can either back down contracted capacity or sell surplus power. Significant information on backing down can be made available using formats described in Sections 3.1 and 3.3. Format 28 can provide details on the surplus power sold and revenue from the same.

Format 28: Sale of surplus power

Particulars	Formula	2016-17	2017-18	2018-19
Total surplus power sold (MU)	$A = B+C+D+E$			
<i>Surplus sold via bilateral traders</i>	<i>B</i>			
<i>Surplus directly sold to other DISCOMs</i>	<i>C</i>			
<i>Surplus sold via power exchanges</i>	<i>D</i>			
<i>Surplus used via deviation and settlement mechanism</i>	<i>E</i>			
Total revenue from sale of surplus (₹ Cr)	$F = G+H+I+J$			
<i>Revenue from sale to bilateral traders</i>	<i>G</i>			
<i>Revenue from sale to other DISCOMs</i>	<i>H</i>			
<i>Revenue from sale via power exchanges</i>	<i>I</i>			
<i>Revenue from deviation and settlement mechanism (DSM)</i>	<i>J</i>			
Average rate of sale of surplus (₹/ kWh)	$K = F*10/A$			

Power sold through the DEEP portal will be to either a trader or a DISCOMs and thus, can be reported accordingly. Format 28 also captures transactions via the deviation and settlement mechanism (DSM).

Evidence from states

Maharashtra, Delhi, Haryana and Rajasthan report aggregate actual sale of surplus and revenue during true-ups. In Delhi, Maharashtra, Haryana, Rajasthan, Madhya Pradesh, Andhra Pradesh, and Telangana, the regulator or the DISCOM have projected surplus power for sale at higher than market rates for the upcoming year. The assumed revenue from such sale was used to offset the revenue gap projected and the tariff increase required for that year (Josey, Mandal, & Dixit, 2017 a). In most states, any additional financial impact due to this assumption is recovered from consumers during true-ups. The exceptions are Haryana and Delhi. The SERC in Haryana disallowed all the losses from sale of surplus power and the SERC in Delhi disallowed recovery of losses due to transactions of power via DSM during true-ups.

7.4 Category-wise subsidies

About the format

State Governments collectively disburse about ₹ 70,000 crores as revenue subsidies to support tariffs of certain consumer categories or to support certain expenses of the DISCOM (RBI, 2017). Despite the significant quantum, there is lack of clarity on the final subsidy payments to various consumer categories and the financial impact on DISCOMs if the subsidy payments are delayed.

Revenue subsidies can be for a specific consumer category to support payment of tariffs or can be to offset impact of fuel surcharges. In states like Bihar, subsidy payments are also provided to compensate the DISCOM for costs disallowed by the regulators (for example, subsidies are provided to recover power procurement costs incurred due to high distribution losses). Format 29 can report the total category-wise subsidy payments for tariff support and to support fuel surcharges. Additionally, it also suggests the reporting of subsidy payments made to the DISCOM to recover disallowed costs. The information in the format should be available for the current year, for the past three years where audited accounts are available and for future projections.

Format 29: Category-wise subsidy

Consumer Category	Subsidy approved/ received for tariff	Subsidy approved/ received for fuel surcharge	Total
Unit	₹ Cr	₹ Cr	₹ Cr
Consumer category 1			
Consumer category 1			
Subsidy to recover disallowed costs (e.g. power purchase due to high T&D losses)			
Total			

Evidence from states

Among the ten states with the largest number of subsidised consumers namely, Bihar, Uttar Pradesh, Madhya Pradesh, Gujarat, Rajasthan, Haryana, Punjab, Maharashtra, Tamil Nadu and Karnataka, it was seen that only Uttar Pradesh, Haryana, Bihar, Punjab (FAC) and Karnataka report disaggregated information on subsidies payable in the coming year in their tariff orders. Tamil Nadu ERC provides information on category-wise total subsidy quantum to be paid in the coming year in a separate order which is released shortly after the tariff order (TNERC, 2017 b). No state provides the subsidy payments made for fuel surcharges separately in the tariff order. Gujarat only reports less than 30% of the total revenue subsidies in their tariff orders and the details are not provided on a category-wise basis.

7.5 Scheduled payment of subsidies

About the format

Revenue subsidies account for 7% to 15% of the total revenue requirement of the DISCOM in many states. As per Section 65 of the Electricity Act, 2003, State Governments are to make subsidy payments in advance to the DISCOMs. In many cases, there are delays in subsidy payments and the sometimes the promised payments are not made during that year. Such delays can impact the working capital requirement of the DISCOM and may result in additional interest costs or carrying costs. There are also instances of the subsidy quantum for a particular category being revised during the year, post announcement, which should also be captured in the tariff order.

Format 30 captures year-wise information on subsidies to be paid by the state government (subsidy booked) and the actual subsidy received. It also specifies the adjustment of pending subsidies from prior periods and estimates the total pending subsidy payments at the end of the year. It can also capture the carrying cost incurred by the DISCOM due to the delay in payment of subsidies. This can be significant²³.

Format 30: Subsidy payments

Particulars	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Subsidy booked (₹ Cr)						
Subsidy received at the end of the year (₹ Cr)						
Adjustment in subsidies from previous years (₹ Cr)						
Pending subsidy payment (₹ Cr)						
Indicative carrying cost estimated due to pending payment (₹ Cr)						

Evidence from states

Tamil Nadu, Bihar, Rajasthan and Punjab also report historical data on actual subsidy payments in their tariff order but do not provide any other details. Tamil Nadu also provides the subsidy booked along with the actual subsidy received for the true-up year (TNERC, 2017 a, p. 186). Punjab provides information on all pending subsidy payments from past years while estimating the subsidy to be paid by the State Government in the coming year (PSERC, 2017, p. 282). In its petition, PSPCL also reports pending subsidy payments per category (PSPCL, 2017). The Power Finance Corporation publishes an annual report on the performance of state power utilities which reports the subsidies booked and subsidies received for a particular year (PFC, 2017).

²³ If one considers a DISCOM which is promised ₹ 4000 crores as subsidies every year but only receives 70% of the amount each year, the DISCOM will incur carrying costs to the tune of ₹ 1400 crores in 5 years itself.

8 Aggregate Technical and Commercial (AT&C) Losses

About the format

The persistent aggregate technical and commercial losses have been characterised as the major cause of financial distress of DISCOMs for decades. The major central government capital expenditure scheme, IPDS (and its predecessors) have the reduction of AT&C losses as its main goal. All bailout schemes, including UDAY have strong conditions and targets to reduce AT&C losses. Despite the political attention and stress on loss reduction targets, there seems to be no uniform methodology used for estimation of AT&C losses across states and programmes. This has been identified by CEA, CAG and others (PEG, 2017; CEA, 2017 d).

Under R-APDRP (Restructured Accelerated Power Development and Reforms Programme) the erstwhile program for AT&C reduction, the Power Finance Corporation (PFC) specified a methodology for estimation of AT&C losses (PFC, 2009). However, it is not clear if states have adopted this method for loss estimation.

In this context, the Central Electricity Authority issued guidelines for computation of AT&C losses in 2017 (CEA, 2017 d). The guidelines specify a format for estimation of AT&C losses which is replicated in Format 31. It is suggested that all DISCOMs report the information in this format.

Format 31: AT&C loss estimation

Parameters	Formula	Unit	Remarks	Value
Input Energy at state transmission periphery	A	MU	Net generation for intra-state power purchase and net generation+ inter-state transmission losses for inter-state power purchase	
Inter-state transmission losses	B	MU		
Net Input Energy at transmission periphery	C=A-B	MU		
Total energy sales	D	MU	Excludes traded/inter-states sales	
Revenue from sale of energy	E	₹ Cr	Revenue including subsidies booked, excluding energy traded/inter-state sales	
Subsidy booked	F	₹ Cr		
Subsidy received	G	₹ Cr		
Adjusted revenue from sale of energy on subsidy received basis	H= E-F+G	₹ Cr		
Opening debtors for sale of energy	I	₹ Cr		
Closing debtors for sale of energy along with adjustments for any amount written off during the year directly.	J	₹ Cr	As shown in the receivables schedule without provisions for doubtful debtors. Unbilled revenue not to be considered.	
Collection Efficiency	$K=(H+I-J)/E*100$	%		
Units realised	L=D*K	MU		
Units unrealised	M=C-L	MU		
AT&C losses	$N=M/C*100$	%		

Evidence from states

Delhi, Meghalaya, Arunachal Pradesh and Uttarakhand report the estimation of AT&C losses in the tariff order. Delhi reports the total sales, the revenue collected and billed, the collection efficiency and distribution loss to estimate the AT&C losses (DERC, 2017, p. 142). Meghalaya and Arunachal Pradesh provide more detailed formats with information on input energy, sales, metered and unmetered energy billed, revenue realised, collection efficiency, and distribution losses. Uttarakhand provides details on input energy, sales, energy billed, distribution loss and collection efficiency for 6 years in their tariff order (UERC, 2017, p. 239).

9 Tariff Impact on Consumers

Typically, the most contentious proposal during the tariff determination process is that of the final tariff impact on consumers. The final tariff is not just a function of the expenditure to be incurred by the DISCOM. In fact, it depends on the subsidy entitlements of various categories as well as the fuel surcharge and electricity duty levied on the category. Significant clarity on tariff trends, tariff break-up and additional applicable charges will be useful for consumers.

9.1 Trends in category-wise average tariffs

About the format

For the average consumer, a quick perusal of the tariff order is not enough for her to ascertain the increase in tariff in her category. There is a need to provide enough information for her to compare the increase in tariffs with tariff changes in other categories as well as with the historical increase in tariff.

Format 32: Category-wise increase in average tariffs

Consumer category	Actual Average Billing Rate (ABR) (including fuel surcharge, rebates, penalties etc.) (₹/kWh)						% Tariff Increase					%Tariff increase for year from FY 19		Approved ABR for FY 19	% Cross Subsidy (ABR/ACOS)	
	FY13	FY14	FY15	FY16	FY17	FY18	5Yr	4Yr	3Yr	2Yr	YoY	DISCOM Petition	SERC Approved			
	Audited actuals					Est.										
Category 1																
Total																
Average Cost of Supply																

*ABR refers to average billing rate or the average tariff for the consumer category and ACoS refers to average cost of supply for the DISCOM.

Format 32 provides information on the category-wise average tariff (or average billing rate which is the total revenue from all sources, including subsidies, fuel surcharges and penalties, per unit of

energy sold in that category) for the past five years. It also documents the growth in average tariffs with respect to the average proposed and approved tariff. The extent of cross subsidy for the category is also reported in the format as a ratio of the average tariff of the category and the average cost of supply (ACoS) for the DISCOM. **This information should be in the executive summary of the tariff petition and order.**

Evidence from states

Maharashtra, Arunachal Pradesh and Nagaland compare the past year’s average tariff with the current year’s tariff. The orders in Haryana, Maharashtra, Tamil Nadu, Karnataka, Arunachal Pradesh, Meghalaya, Mizoram, Nagaland, Uttarakhand, and Jammu and Kashmir compare the tariff increase proposed by the DISCOM for each category and the final approved tariff. Tamil Nadu, Bihar, Maharashtra, Odisha, Uttar Pradesh, and Rajasthan report cross subsidy based on the average cost of supply. Madhya Pradesh, Punjab and Karnataka report the extent of cross subsidy based on the voltage-wise cost of supply.

9.2 Break-up of final category-wise tariffs

About the format

Beyond the increase in average tariffs, the specification of each component of tariff on a per unit basis is important for the consumer to know. Format 32 can be used to report this information in consolidated manner.

Format 33: Break-up of final consumer category-wise tariffs

Consumer category	Fixed charge	Energy charge	%YoY increase in fixed charge	% YoY increase in variable charge	Per unit Subsidy	Additional charge, if any	Average Fuel surcharge	Electricity Duty	Final average tariff
	Rs/ month or kVA or kW or HP	₹/kWh	%	%	₹/kWh	₹/kWh	₹/kWh	₹/kWh	₹/kWh

Table 42 records the category-wise fixed charge and energy charge as well as the increase in these charges from the past year. As consumers also face tariff impacts due to subsidies and duties and other charges, the estimates for per unit subsidy, electricity duties, average annual fuel surcharges and any additional charge should also be reported. Where possible and applicable this information should also be provided on a slab-wise basis. Moreover, this format should be provided by the DISCOM for proposed tariffs and by the SERC for approved tariffs. **The information should be reported in the executive summary of the petition and order.**

Evidence from states

The fixed and the energy charge applicable is reported in the tariff schedule in each and every state. The increase in fixed and energy charge from the past year is reported only in Tamil Nadu, Daman

and Diu, Meghalaya, Mizoram and Uttarakhand. The subsidy per unit of sales, for each category along with the fixed and energy charge is reported in the tariff schedule in Karnataka and Tripura. Even though electricity duty can account for 15% to 20% of the bills payable in some states, no state provides the electricity duty applicable in such a format. Data on only the per unit base fuel surcharge determined along with tariffs, is provided in Daman and Diu, Chandigarh, Dadra and Nagar Haveli, Puducherry, and Gujarat. The actual fuel surcharge including month-wise adjustments could be higher.

9.3 Month-wise impact on fuel surcharges

About the format

Fuel surcharges are per unit charges typically levied on a monthly basis and revised on a quarterly basis which is being levied in many states in India. The surcharge is levied over and above tariffs to enable additional revenue recovery to compensate the DISCOM for deviation in uncontrollable costs, particularly power procurement costs. Fuel surcharges can be significant accounting for for 7% to 25% of revenue recovered from consumers (Josey, Mandal, & Dixit, 2017 b). Moreover, there are significant variations in the charges over the months which can add to uncertainties in final applicable tariffs. Maharashtra, Gujarat, Haryana, Rajasthan, Himachal Pradesh, Bihar, Uttar Pradesh, Chhattisgarh, and Assam specify a cap on the fuel surcharge that can be recovered from consumers in a month. Any fuel surcharge requirement over and above the cap can be recovered in the same period after regulatory approval or is carried forward for recovery in subsequent periods. Similarly, the per unit fuel surcharge for a period is estimated based on the cost deviation of the previous period and the estimated sales of the subsequent period. If there is a change in actual sales during the period, the recovery can also change. Format 34 can be used to report the month-wise sales to the category, fuel surcharge requirement during the period, the per unit average fuel surcharge rate for the month and the actual fuel surcharge recovered from consumers during the month. This recovery is subject to caps and changes in sales. In Gujarat, Daman and Diu, Dadra and Nagar Haveli, Chandigarh, and Puducherry, a base fuel surcharge rate is approved in the tariff order every year. This format should also capture the revenue and rate inclusive of this base rate. This information should be available for the current year and for the past three years where audited accounts are available.

Format 34: Month-wise impact of fuel surcharges

Consumer category	Fuel surcharge						
	Apr	May	June	...	Feb	Mar	Total
Category 1							
<i>Sales (MU)</i>							
<i>Per unit rate (₹/kWh)</i>							
<i>Fuel surcharge requirement (₹ Cr)</i>							
<i>Fuel surcharge recovered (₹ Cr)</i>							
Total							

Evidence from states

Information is not provided by any state in their tariff orders or petitions. Most states provide estimates of the applicable fuel surcharge on a monthly or quarterly basis via DISCOM circulars and SERC orders. However, the month-wise estimates for fuel surcharge rates and revenue recovered is not provided in a consolidated manner even in these circulars or orders.

9.4 Potential impact on consumer tariffs due to on-going litigation

About the format

Electric utilities are involved in several cases before ERCs, higher courts and tribunals over a variety of matters. The judgement or orders in these matters can have financial impacts. These impacts, in most cases are passed onto consumers in subsequent years. The current pending cases could potentially increase the revenue to be recovered from future retail tariffs and add to tariff uncertainty for consumers. Lack of timely recovery can also result in carrying cost which will have to be borne by consumers. In this context, detailing the potential tariff impact of on-going litigation will be useful. Format 35 captures potential impact for each pending case before various fora with details of the case to give consumers a better sense of possible impact in the coming years.

Format 35: Potential tariff impact due to ongoing litigation

Case No.	Name of involved parties	Forum (SERC, APTEL, High Court, Supreme Court)	Potential financial impact in coming years (₹ Cr)	Details of case

Evidence from states

As on March 2018, no SERC provides this information in their tariff orders. DISCOMs in Maharashtra and Andhra Pradesh, provides this information as part of its petitions (MSEDCL, 2016 b, p. 360; APSPDCL, 2017, p. 114) but Andhra Pradesh DISCOMs do not report likely cost impact.

10 Distribution Cost Related Information

Distribution costs consists of capital expenditure, operation and maintenance expenses and other expenses such as the regulated working capital requirement, income tax payments etc. Capital expenses refers to the annual interest payments for long-term loans and the return on equity to be recovered from consumers. It would also take into account the amount accruing to depreciation of assets. Operation and maintenance expense consists of administration and general expenses (rent, legal charges, travel etc.), repair and maintenance expenses and employee expenses. All states report key components of the distribution costs for true-ups and projections estimated as per specifications in SERC tariff regulations. Even so, detailed information is necessary to ascertain the efficacy of these costs. Some formats to capture this additional information are given in subsections below.

10.1 Capital investment related information

About the format

Capital expenditure takes place for investment projects of the DISCOMs and the commission approves the cost of the project and the timelines prior to the investment. However, the timelines can change along with the scope of the work and could lead to variations in the final capital cost. Moreover, if there are delays in the project, DISCOMs can also claim interest during. Capital expenditure need not necessarily translate to capitalisation or addition of the asset in the same year. It is also important to report the capital expenditure and the capitalisation for each year and the projections for the years to come.

Format 36 can be used to provide information for each capital expenditure project. Information on the ERC approval of the project, the expected benefit quantified in monetary terms as well as details on the planned and actual timelines and costs for the project are captured. The table also has space for the DISCOM to record reasons for deviation in costs and captures the interest during construction.

Format 36: Project-wise or scheme-wise status of capital works

Project Title	Unit	Project A	Project B
ERC Approval No.			
ERC Approval Date	DD/MM/YY		
Purpose of Project			
Expected benefit from scheme	₹ Cr		
Project Start date			
	<i>Original</i>	DD/MM/YY	
	<i>Revised</i>	DD/MM/YY	
	<i>Actual</i>	DD/MM/YY	
Project Completion date			
	<i>Original</i>	DD/MM/YY	
	<i>Revised</i>	DD/MM/YY	
	<i>Actual</i>	DD/MM/YY	
Capital cost of the project			
	<i>Approved</i>	₹ Cr	
	<i>Actual</i>	₹ Cr	
	<i>Deviation between approved and actual</i>	₹ Cr	
Reason for deviation			
Capital expenditure			
	<i>Year 1</i>	₹ Cr	
	<i>Year 2</i>	₹ Cr	
Capitalisation			
	<i>Year 1</i>	₹ Cr	
	<i>Year 2</i>	₹ Cr	
Total Interest during construction (IDC)			

Evidence from states

A very similar format is used by all Maharashtra DISCOMs to report its capital expenditure plan (MSEDCL, 2016 d). Rajasthan provides details of the project along with the expected benefits and the progress under the project in their capital investment plan petition usually provided along with the tariff petition (AVVNL, 2017). However, it does not provide details on capital expenditure incurred, capitalisation, delays and the associated interest during construction (IDC). Gujarat DISCOMs, in their petitions, provide information on capital expenditure and IDC for the whole distribution business rather than individual projects (MGVCL, 2018).

10.2 Source of funds for capital expenditure

About the format

Capital investments can be financed via loans, grants, consumer contributions, equity and internal accruals. However, only investments financed through loans and equity are part of the annual ARR (Aggregate Revenue Requirement). Thus, it is important to ascertain the sources of funds for each project every year to understand the recovery through capital expenses and the contribution of grants and internal accruals.

Format 37 can be used for reporting the funds obtained from each source for each project every year. The sources can be bank loans, loans from agencies such as Power Finance Corporation (PFC) or Rural Electrification Corporation (REC), state government loans or equity, DISCOM equity, state or central government grants, consumer contributions or internal accruals of the DISCOM. The information in the format should be available for past years the current year and for future projections.

Format 37: Sources of funds

Project Title	Project A	Project B	Total
PFC			
REC			
Banking sector loans			
State Government Loans			
State Government Equity			
DISCOM equity			
State Government Grant			
Central Government Grant			
Consumer contribution			
Internal Accruals			
Source 11			
Total funds arranged			

Evidence from states

Maharashtra and Uttar Pradesh DISCOMs provide this information in their tariff petitions (MSEDCL,

2016 d; PVVNL, 2017). Rajasthan DISCOMs provide this information as part of their petition for approval of the capital investment plan (AVVNL, 2017). The source of funds for capital investments for the DISCOM as a whole is reported in the tariff order for Rajasthan.

10.3 Interest on long-term loans

About the format

About 70% of the major capital investments are financed through loans. Therefore, it is important to report the details of these long-term loans including the duration, purpose, and amount of the loans and the applicable interest rates. This information, if reported annually, gives a better understanding of the long-term liabilities of the DISCOM. This is especially relevant in the current scenario where investments in flagship programmes such as ‘Power for All’ are most likely being financed through loans (Josey & Sreekumar, 2015). The information in the format should be available for past three years, for the current year and for future projections.

Format 38: Interest on long-term loans

Particulars	Unit	Loan 1	Loan 2	Total
Name of Lender				
Loan Specification				
Moratorium Period	DD/MM/YY to DD/MM/YY			
Repayment period	DD/MM/YY to DD/MM/YY			
Date loan was sanctioned	DD/MM/YY			
Loan Amount sanctioned	₹ Cr			
Loan amount outstanding at the beginning of the year	₹ Cr			
Loan amount repayable during the year	₹ Cr			
Balance amount at the end of the year	₹ Cr			
Interest rate applicable for the year	%			
Total interest payments	₹ Cr			

Format 38 specifies the loan amount, duration, purpose of loan, status of repayment and applicable interest rate for each long-term loan. Some loans also have a moratorium period during which the DISCOM does not have to make any repayment. This information can also be reported in the format.

Evidence from states

This data is specified in the above discussed format in the petitions provided by Uttar Pradesh DISCOMs (PVVNL, 2017). Maharashtra DISCOMs used to provide this data in their tariff petitions in

Form 4 (c) of the tariff formats (MSEDCL, 2015) but has discontinued the practice.

10.4 Operation and Maintenance expenses

About the format

The operation and Maintenance (O&M) expenses and its components are controllable and can increase at the rate of inflation or less. In fact, about nineteen states have linked their cost estimation to the growth of Consumer Price Index and Wholesale Price index. In spite of this, the expenses increase at a rate much higher than inflation at 10% to 14% per annum in many states. Historical data on these expenses based on audited accounts and the relevant CAGRs when presented with the weighted average inflation rates; provide a good sense of efficiency improvement possibilities. Format 39 specifies this.

Format 39: Trends in operation and maintenance expenses

Historical expenses (₹ Cr)							CAGR (%)					Estimates		
Particulars	FY 13	FY 14	FY 15	FY 16	FY 17	FY 18	5 yr	4 yr	3 yr	2 yr	YoY	Projected rate (%)	Weighted average rate of inflation (%)	FY19 estimates (₹ Cr)
Operations and Maintenance														
Administration and General														
Employee Expenses														
Repair and Maintenance														
Total														

Evidence from states

Chandigarh, Dadra and Nagar Haveli, Daman and Diu, and Puducherry provide historical data for the past four financial years, whereas Andaman and Nicobar, Goa, Lakshadweep, Sikkim, and Kerala provide data for the past two financial years. Karnataka and Jharkhand provide the same information only for the previous year. Uttar Pradesh, Bihar, Haryana, Karnataka, Uttarakhand, Assam, Jammu and Kashmir, Goa, and the Union Territories only provide data on the inflation rates for comparison in their tariff orders.

11 Tracking Financial Health

The financial health of state-owned distribution companies has always been a cause of concern. The precarious finances not only affect the functioning of the DISCOMs but also impact the financial health of other power sector institutions and that of lending agencies. Given the rising gap between costs incurred and revenue recovered, states incur short-term loans to finance working capital requirements. These loans, with higher interest rates contribute significantly to the growing debt. Moreover, DISCOMs also default on scheduled payments for the loans and on scheduled payments to generators, especially to the state-owned generating company. Reporting short-term liabilities might also provide a better understanding of the issues faced by the DISCOMs and can help monitor compliance to conditions of UDAY. Notably, the condition that DISCOMs in signatory states should not meet their short-term working capital requirement through bank loans (MoP, 2015). The formats prescribed below can help actors get a better sense of the liabilities of the typically cash-strapped DISCOMs.

11.1 Working capital requirement

About the format

The interest on working capital requirement which is recovered from consumers of the DISCOM is based on a working capital requirement estimated as per the tariff regulations. Typically, this is the equivalent to the operation and maintenance (O&M) requirement for one month, a fixed proportion of fixed assets to account for maintenance spares and revenue recovered for one to two months minus the total security deposits of retail consumers and one month equivalent of power purchase cost. The working capital requirement estimated based on this methodology is used to determine the interest on working capital requirement which is part of the ARR. This estimated requirement, is often much lesser than the actual working capital requirement²⁴. While it is prudent that the interest costs incurred by the DISCOM for the actual working capital is not being recovered for the coming year through tariffs, the current estimation structure also implies that the actual working capital requirement for past years is not reported during the tariff process. As it provides a good indication of the financial health of the DISCOM, it should be reported as in Format 40.

The information in the format should be part of the executive summary of the petition and order.

²⁴ In fact as per the UDAY scheme, banks and lending agencies are to provide only up to 25% of the revenue requirement as working capital for the distribution business (MoP, 2015). This limit itself is much higher than the regulated working capital requirement.

Format 40: Source of funds to meet working capital requirement

Year	Working capital requirement	Requirement met by short-term liabilities	Requirement met through other sources (internal accruals etc.)	Total interest payments to meet working capital requirement
2013-14				
2014-15				
2015-16				
2016-17				
2017-18				
2018-19				

Evidence from states

As of March 2018, no state reports this information in their orders or petitions. In fact, even the Ministry of Power does not report this information while tracking financial indicators as part of UDAY (MoP, n.d). The Punjab ERC provides additional interest to be recovered from consumers on certain working capital loans which it classifies as bridge loans. Therefore, historical information on bridge loans, which is only a part of the total working capital loans, is reported in the true-up petition for 2016-17 for the Punjab DISCOM, PSPCL (PSPCL, 2018).

11.2 Short-term liabilities*About the format*

Short-term liabilities to meet working capital requirements are a major contributor to banking sector liabilities, and a major reason for bailouts in the past. Thus, it is important to provide a list of short-term loans incurred by the DISCOM every year similar to Format 41 for long-term loans.

Format 41: Short-term loans and interest payments

Particulars	Unit	Loan 1	Loan 2	Total
Name of Lender				
Loan Specification				
Date loan was sanctioned	DD/MM/YY			
Loan Amount sanctioned	₹ Cr			
Loan amount outstanding at the beginning of the year	₹ Cr			
Loan amount repayable during the year	₹ Cr			
Balance amount at the end of the year	₹ Cr			
Interest rate applicable for the year	%			
Total interest payments	₹ Cr			

Evidence from states

This information not provided by most DISCOMs even though its provision can provide an indication of the scale of dependence on short-term loans and the sources for such loans. DISCOMs in Rajasthan, Karnataka, and Punjab provide this information as part of their true-up petitions (JVNL, 2017 b; BESCO, 2017; PSPCL, 2018).

11.3 Scheduled Payments and delays

About the format

A financially strained DISCOM finds it difficult to meet its commitments to lenders and power suppliers. Further, delays in payments to generators, especially to the state generating companies' affects the generators' working capital requirements and financial viability.

Format 42 can be used to capture the scheduled payment dates for each loan with the amount to be paid. The SERCs and DISCOMs should also report the actual date of payment, number of days of delay in payment and any pending amount.

Format 42: Delays in scheduled payments to lenders

Lender	Loan Specification	Amount Due	Scheduled date of payment	Amount paid	Date of payment	Delay in Payment	Pending Amount
		₹ Cr	DD/MM/YY	₹ Cr	DD/MM/YY	Days	₹ Cr

The data should be provided for short-term and long-term loans as part of the petitions for the past year and current year.

Format 43 captures the payments made to generators on a monthly basis. Thus, the amount due, the date for scheduled payment, the amount paid, the delay in payment and the pending amounts are all captured. The format specified in the table should be filled for all generators with whom the DISCOM has a power purchase agreement, including renewable energy generators. If the information is extensive, an aggregate source-wise summary of average delays and total pending amounts can be reported for renewable energy generators. The information should be provided for the past year and the current year.

Format 43: Delays in scheduled payments to generators

Month	Unit	April	May	June	July	August
Amount due	₹ Cr.					
Scheduled date of payment	DD/MM/YY					
Amount paid	₹ Cr.					
Actual date of payment	DD/MM/YY					
% amount paid	%					
Delay	Days					
Pending Amount	₹ Cr.					

Evidence from states

Maharashtra DISCOMs provide information on scheduled payments to lenders and generators and the delays in payments as part of their tariff petitions (MSEDCL, 2016 d).

12 Performance Accountability

DISCOMs need to be held accountable for the extent of metering, supply and service quality and compliance with standards of performance as per SERC regulations. In addition, DISCOMs are also implementers of various central and state government schemes. The progress under these schemes should also be monitored during the tariff process as well as it does have cost and performance impacts. SERCs also issue directions to the DISCOMs on various matters and compliance to these directions should also be tracked and recorded to hold DISCOMs accountable. Formats for reporting such information is recorded in sub-sections below.

12.1 Status of metering

About the format

Despite efforts over several decades, about 20% to 40% of sales for many DISCOMs remains unmetered. The metering of feeders and distribution transformers is not as challenging as consumer metering. Despite this, feeder metering and DT (Distribution Transformer) metering has not been completed in some states. Feeder and DT metering in a time-bound manner are also conditions in the UDAY scheme. Commissions also issue repeated directions to DISCOMs to complete metering and report the status of metering. Thus, states should report the status of metering in a clear and concise manner, not just for consumer meeting but also infrastructure metering. DISCOMs in Karnataka, Maharashtra, Gujarat and other states have AMR (Automatic Meter Reading) meters installed on their feeders. This helps make energy accounting easier and recording of information free of manual intervention. Therefore, the status of AMR metering should be tracked. This progress of metering can be tracked using Format 44.

Format 44: Status of metering

Particulars	Total number	Unmetered number	Metered number	Number with defective meters	% of with functional meters	Number with AMR meters
Consumer metering						
<i>Category 1</i>						
<i>Category 2</i>						
<i>Category 3</i>						
Distribution Transformers						
Feeders						
<i>33 kV</i>						
<i>11 kV non-agricultural feeders</i>						
<i>11 kV agricultural feeders</i>						

This information should be reported for past three years where latest audited actuals are available. Further, targets under the metering plan for upcoming years should also be translated to this format.

Evidence from states

In Punjab, Maharashtra, Uttar Pradesh, and Tamil Nadu the plan for metering is reported which details the number of meters to be installed in the coming years. In the same states, the status of metering is reported in compliance to the directives of the commission rather than as a separate section in the report. This is also true for Madhya Pradesh, Gujarat and Bihar. In addition to the metering plan, Punjab tariff order also reports the status of AMR metering for feeders. Karnataka and Gujarat report the status of metering of DTs. Bihar, Madhya Pradesh and Uttar Pradesh report the number of unmetered consumers and the proportion of the same for each category in its tariff orders. Bihar and Madhya Pradesh tariff orders also report number and proportion of unmetered feeders as well as the defective meters on existing feeders (BERC, 2017, p. 108; MPERC, 2017, p. 9). In addition, the status of metering for agricultural distribution transformers and feeders is also reported in Madhya Pradesh (MPERC, 2017, p. 123).

12.2 Supply and Service Quality

About the format

DISCOMs need to be accountable to consumers not only for the costs incurred but also for the quality of supply and service. As mandated in Section 59 of the Electricity Act, 2003, all SERCs have notified Standards of Performance (SoP) regulations which specify the minimum standards of service for the DISCOM to achieve and maintain. Further, the DISCOMs are also to submit quarterly compliance reports before the ERCs to record performance vis-à-vis the standards specified in the

Electricity Act, 2003. SERCs of Gujarat, Maharashtra, West Bengal, Odisha, Haryana, Karnataka and Madhya Pradesh upload these compliance reports on their website. DISCOMs in Delhi, Andhra Pradesh and Telangana make an annual summary of compliance and report this as part of their tariff petitions (BRPL, 2016; APSPDCL, 2017; TSSPDCL, 2016).

In addition, key statistics to monitor supply and service quality should be reported by the DISCOM for every division for the true-up year and the current year with every tariff petition and should be published in the tariff order. These are specified in Format 45.

Format 45: Division-wise key supply quality indicators

Name of Division	Consumer category 1	Consumer Category 2
% of unconnected households		
Number of pending connection applications		
Average time taken to restore supply in case of fuse-off call		
Average hours of supply based on feeder data		
Average evening hours of supply based on feeder data (Between 6 PM and 11 PM)		
% of metering related complaints to total complaints		
% of billing related complaints to total complaints		
Average % of meters which are read every billing cycle		
Number of faulty meters as a % of total meters		
Average % of meters with average reading every billing cycle		
Average % of meters with zero reading every billing cycle		
Average time taken to replace faulty meter		
DT Failure Rate (%)		
DT Replacement Rate (%)		
Average time taken to address DT failure		
Accidents reported		
<i>Fatal accidents due to the DISCOM (Human)</i>		
<i>Other fatal accidents (Human)</i>		
<i>Fatal accidents due to the DISCOM (Animal)</i>		
<i>Other fatal accidents (Animal)</i>		

On a division-wise basis, the proportion of unconnected households and the number of pending connection applications can be reported. Supply related information such as the average hours of supply of the division, average evening hours of supply as well as the average amount of time to restore supply after a fuse off call event²⁵ can also be reported. Non-availability of power supply can

²⁵ Fuse-off call refers to a complaint handling procedure with regard to an individual consumer and involving restoration of supply by replacement of a fuse at such consumer's premises, not simultaneous with any other failure (MERC, 2014 b)

also take place when the distribution transformer fails. Thus, the rate of failure and the rate of replacement of DTs along with the average time taken to address the DT failure should be reported. The DISCOM can also report the number of complaints related to metering and billing which were addressed. It would be beneficial to also report the average time taken to replace a faulty meter and the proportion of meters read.

Electrical accidents are also a major cause of concern with more than 9,000 lives being claimed every year in India due to electrical accidents and electrocution (NCRB, 2016). The DISCOMs should also report accidents reported and the number of fatal accidents among them. Of which it would also be useful to make a distinction between accidents which are due to the DISCOM and which were caused due to no fault of the DISCOM. This information can be extensive and can be provided in a **downloadable spread sheet/ excel based format** on the Commissions and DISCOMs websites as part of the tariff order and petition respectively. **A DISCOM-wide summary of this information can be reported in the executive summary of the petition and order.**

Evidence from states

Haryana, Bihar and Madhya Pradesh report the number of defective meters. Bihar ERC also reports the proportion of meters read (BERC, 2017, p. 456). The Andhra Pradesh and Telangana DISCOMs report this data, especially safety-related information as part of their tariff petitions (TSERC, 2016; APERC, 2017). Many of these indicators are reported by the DISCOM as compliance to SERC directives issued on an ad-hoc basis.

12.3 Compliance with Directives

About the format

As per the Electricity Act, 2003 SERCs can issue directions to DISCOMs and can also take penal action in case of repeated non-compliance. Format 46 can be filled by the DISCOM and the SERC to report compliance with directives. Most directives are issued with a time period for compliance (for example, feeder metering of all agricultural feeders by March 2019). The format records the directive, the time-period for compliance and the status of compliance. In case of non-compliance or delay in compliance, the reasons for the same should be stated. More often than not, SERCs issue the same directive to the DISCOM especially due to non-compliance. The frequency of such repeated directions should also be recorded for each directive. Along with this, any action taken by the SERC due to non-compliance should also be recorded. This information should be made available for a minimum of three years in the past.

Format 46: Compliance with directives

Directive	Time-period for compliance	Status of compliance	Reasons for non-compliance or delay in compliance	Number of times the directive has been re-issued due to non-compliance in the past five years	Action taken by SERC for non-compliance

Evidence from states

Table 7: Directives and compliance reports in tariff orders

Particulars	State
Directives in tariff orders reported in a separate section	All states except Rajasthan, Andhra Pradesh and, Odisha ²⁶ West Bengal and Telangana provide details of only the directives without the compliance status.
Directives reported with compliance to previous year directives, SERC comments and additional directions.	Uttarakhand, Tripura, Sikkim, Punjab, Puducherry, Nagaland, Mizoram, Uttar Pradesh, Meghalaya, Manipur, Maharashtra, Himachal Pradesh, Gujarat, Madhya Pradesh, Karnataka, and Arunachal Pradesh
In addition to compliance and additional directions, also report when the directive was issued.	Lakshadweep, Andaman and Nicobar, Goa, Chandigarh, Dadra and Nagar Haveli, Daman and Diu

The Uttar Pradesh tariff order includes a description of the directive, time period for compliance and the status of compliance (UPERC, 2017, pp. 376-422). The compliance status is reported for directives issues since 2013 in the tariff order for 2018-19. The format suggested in Format 46 is modelled based on the UPERC formats.

12.4 Progress under various central and state government schemes

About the format

There are several central government and state government schemes which need to be implemented by the DISCOMs. In many states, the central and state governments provide concessional loans and grants in order to address challenges before the DISCOM. Some of the schemes are listed below:

- Investments in the urban distribution network through the Integrated Power Development Scheme (IPDS).
- Providing connections to non-electrified BPL households, investment in rural backbone infrastructure, and separation of agricultural feeders under Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY) and various state government schemes.
- Connections for non-electrified non-BPL households via the Saubhagya scheme and several state government programmes.
- Restructuring of outstanding liabilities via the Ujjwal DISCOM Assurance Yojana or UDAY.

²⁶ The SERC website has a section for directions issued by the Commission to the utilities but the last directions are from the year 2012 (OERC, 2012).

- Ensuring planned and coordinated investments in the power sector (24x7 'Power for All' scheme)

Many of these programmes have their annual targets and conditions which need to be fulfilled by the DISCOMs. Considering the mandate that the SERCs have to protect the interest of small consumer, promote electrification and ensure optimal use of investments, SERCs should monitor progress under these schemes as part of the tariff determination process.

Format 47 can be utilised to monitor financial and physical progress under such schemes for each circle.

Format 47: Progress under central and state government investment schemes

Circle	Circle A	Circle B	Circle C
Physical target for the year			
<i>Goal 1</i>			
<i>Goal 2</i>			
Achievements during the year			
<i>Goal 1</i>			
<i>Goal 2</i>			
Planned expenditure			
<i>Grant</i>			
<i>Loan</i>			
<i>Others</i>			
Amounts disbursed			
<i>Grant</i>			
<i>Loan</i>			
<i>Others</i>			
Actual Expenditure			
<i>Grant</i>			
<i>Loan</i>			
<i>Others</i>			
Target vs. Achievement for programme duration			
<i>Goal 1</i>			
<i>Goal 2</i>			
Parameters to be monitored to mark progress in scheme			
Parameter 1			
<i>Parameter 2</i>			

The targets as identified in the scheme, such as electrification of a certain number of households for DDUGJY, are first recorded along with the achievements. This gives an indication of the performance of the DISCOM. Often, the bottleneck for completion of investment works under these

schemes is the disbursement and use of allocated funds. The format should also record the allocated funds, actual disbursements and the final expenditure for the year for both grants and loans. The comparison of targets and achievements should not be limited to the year alone but for the duration of the scheme as well. In addition, parameters can be monitored to assess the efficacy of the scheme. For example, to understand the progress under IPDS, AT&C losses reported in urban areas can be tracked and reported in the format specified above.

The bailout scheme UDAY was to enable state governments to gradually take over the outstanding liabilities of DISCOMs. UDAY aims not only to manage past liabilities but also to prevent the build of liabilities in the future. With this end in mind, DISCOM are to reduce dependence on short-term borrowing from banks, reduce the cost of supply, revise tariffs regularly and reign in distribution losses and AT&C losses.

Format 48 can help track progress of UDAY since its inception.

Format 48: Progress under UDAY scheme

Particulars	2015-16	2016-17	2017-18	2018-19
Total Outstanding Liabilities (₹ Cr)				
Amount taken over by state government as Bonds (₹ Cr)				
Amount retained by DISCOM (₹ Cr)				
Restructuring option for loan amount with DISCOM (₹ Cr)				
<i>Subsidies</i>				
<i>Loans</i>				
<i>Unfunded gap</i>				
Parameters to be monitored to mark progress in scheme				
<i>AT&C losses (%)</i>				
<i>Short-term loans taken in the year as a percentage of the ARR</i>				
<i>Short-term loans financed by banks</i>				
<i>Average cost of supply (₹/ kWh)</i>				
<i>Average billing rate (₹/ kWh)</i>				
<i>% of feeder with meters</i>				
<i>% of DTs with meters</i>				
<i>Parameter 7</i>				

On an annual basis, the DISCOM is to report, outstanding liabilities, the amount taken over by the state government and the amount with the DISCOM to be financed by loans or subsidies as well as the unfunded gap. Further, as it is imperative to ensure the financial predicament of the DISCOMs improves, the format also helps report progress under various parameters to reflect the health of the DISCOM.

Evidence from states

Very few SERCs provide any information on the implementation status in their tariff orders. If provided, it is either limited to capital expenditure details or is on an ad-hoc basis in response to

SERC directives. Uttar Pradesh, Assam, Odisha, Maharashtra, Himachal Pradesh and Karnataka report details of capital expenditure under DDUGJY and IPDS while estimating capital expenditure requirements. Some examples of information provided on progress under schemes as compliance to SERC directives include:

- Karnataka: Information on progress under DDUGJY and its predecessor RGGVY (Rajiv Gandhi Grameen Vidyutikaran Yojana) on a district-wise basis. (KEREC, 2017, pp. 222-224).
- Bihar: Information on installation of star-rated transformers under DDUGJY and BRGF (Backward Regions Grant Fund) (BERC, 2017, p. 480).
- Punjab: Progress of AMR metering of HT consumers under IPDS in its order (PSERC, 2017, p. 264).

Similarly, progress under UDAY is not reported systematically in all states. Punjab and Rajasthan tariff orders have some information on the loans taken over under UDAY and the interest payments to be made. Rajasthan tariff orders provide status of loans taken over and the unfunded gap (RERC, 2017, p. 57). Rajasthan DISCOM also report progress under various key performance indicators specified as part of UDAY (RERC, 2017, p. 115).

13 State-Owned Thermal and Hydro Power Plants

The data formats should be used during the tariff determination process of cost plus power plants, mostly, central sector and state sector generating plants and should also be part of their tariff orders. Evidence on data availability is presented from the petitions and orders of state owned generating company in eight states in India to highlight the need for such data. The states include Andhra Pradesh, Chhattisgarh, Gujarat, Haryana, Madhya Pradesh, Maharashtra, Telangana, and West Bengal.

13.1 Estimation of thermal generation

About the format

The net generation or the energy sent out from a generating station depends on the capacity of the plant, and its plant load factor (PLF) and auxiliary consumption. The availability of the station or unit is the percentage of time that the station or unit is available for generating power. Details of the parameters for the estimation of net generation are listed in Format 49 which should be filled for each station of the generating company.

Format 49: Estimation of net generation for each station

Particulars	Type (Controllable/ Uncontrollable)	Formula	Unit	2016-17	2017-18	2018-19
Capacity		A	MW			
Normative Availability		B	%			
Normative Auxiliary consumption		C	%			
Normative PLF		D	%			
Availability		E	%			
Auxiliary Consumption		F	%			
PLF		G	%			
Available Generation		$H=A*E*8.76$	MU			
Gross Generation		$I= A*G*8.76$	MU			
Auxiliary Consumption		$J= I*F$	MU			
Net Generation		$K= I-J$	MU			
Net Generation in excess of normative PLF		$L=K-\{A*D*8.76*(1-F)\}$	MU			
Rate for PLF incentive		M	Rs/kWh			
PLF incentive, if any		$N=M*L/10$, if $L>0$	₹ Cr			

For each station, the format should report the current capacity, the normative and actual values for availability, PLFs and auxiliary consumption. Based on the PLFs, reported capacity, and auxiliary consumption, the net generation is estimated. If PLFs are above the norms specified by the ERC, the generator also avails an incentive. This information should be available for past three years where audited accounts are available, for the current year and for future projections.

Evidence from states

All states have details on station-wise installed capacity in their orders and petitions. However, the estimation of net generation using actual and normative parameters is not summarised in Madhya Pradesh, Andhra Pradesh and Telangana tariff orders. In Gujarat, Haryana and Maharashtra, detailed information is available in the petitions as shown in Format 49. In Chhattisgarh, the operational parameters and norms are stated together for each station and the gross and net generation are reported separately.

13.2 Estimation of variable cost for thermal plants

About the format

Format 50 discusses the parameters required to estimate the variable cost of thermal power plants. The format is specified for coal based power plants but a similar format can also be utilised for gas based power plants. Based on the gross power generation, the quantity of fuel required can be determined. The quantity of fuel required depends mainly on the gross calorific value (GCV) of the fuel as well as the Station Heat Rate (SHR) of the thermal power plant. Most thermal power plants use fuel from multiple sources with different GCVs and prices (e.g. - coal from multiple mines, coal from domestic and imported sources etc.). The format in Format 50 lists the GCV for all the varied fuel sources. Coal-based plants also require secondary fuel for start-up requirements and flame stabilisation. The per unit consumption of secondary fuels and the station heat rates are controllable parameters. Based on the gross generation, the station heat rate, the calorific value of the fuels, and the proportion of fuel requirement, the quantity of each fuel required is estimated. The quantity of coal from each source is then grossed up to account for transit loss. Similar estimation is made for the secondary fuel based on the per unit secondary fuel consumption, net generation and the calorific value of the secondary fuel.

With the estimation of the quantum of fuel requirement from various sources, along with the fuel price as identified in Table 18, the total cost of fuel is determined. This needs to be added to any other variable cost (to be listed separately) and the PLF based incentive, if any to arrive at the total variable cost. Based on the process for gain and loss sharing due to controllable and uncontrollable factors as per the Commission's regulations, the variable cost can be adjusted. The details provided in Format 50 should be provided for past years as well as to estimate future variable charges.

Evidence from states

Maharashtra and Gujarat ERCs provide this information in separate tables in their orders in similar formats. In the case of Punjab, Haryana, Chhattisgarh and Madhya Pradesh, the average GCVs and the total fuel consumption is reported without source-wise disaggregation. West Bengal's utility provides most details except information on the fuel consumption and the GCVs of fuel sources. In their orders, West Bengal's state owned generating company also provides historical data (up to seven years) on actual station heat rates. (WBPDC, 2016, p. 19). Andhra Pradesh and Telangana do not provide any details in their tariff orders and petitions. Only the final per unit number variable charge is available for both states.

Format 50: Estimation of variable costs

Particulars	Type (Controllable/ Uncontrollable)	Formula	Unit	2017-18
Gross Generation		A (From Format 49)	MU	
Normative SHR		B	kCal/kWh	
Normative Secondary Fuel Consumption		C	ml/kWh	
Normative Transit Loss		D	%	
Actual SHR		E	kCal/kWh	
Actual Secondary Fuel Consumption		F	ml/kWh	
Actual Transit Loss				
<i>Transit Loss for Fuel Source 1</i>		G	%	
<i>Transit Loss for Fuel Source 2</i>		H	%	
<i>Transit Loss for Fuel Source 3</i>		I	%	
Average gross calorific value (GCV)				
<i>GCV of Fuel source 1</i>		J	kCal/kg	
<i>GCV of Fuel source 2</i>		K	kCal/kg	
<i>GCV of Fuel source 3</i>		L	kCal/kg	
<i>GCV of secondary fuel</i>		M	kCal/ml	
Heat Content		N= A*E	Million kCal	
<i>Heat content from Fuel 1</i>		O	%	
<i>Heat content from Fuel 2</i>		P	%	
<i>Heat content from Fuel 3</i>		Q	%	
Fuel consumption (Total)				
<i>Fuel Source 1</i>		$R = ((N*O*1000)/J)/(1-G)$	MT	
<i>Fuel Source 2</i>		$S = ((N*P*1000)/K)/(1-H)$	MT	
<i>Fuel Source 3</i>		$T = ((N*Q*1000)/L)/(1-I)$	MT	
<i>Secondary fuel</i>		U= A*F	KL	
Landed Fuel Price (Average)				
<i>Fuel Source 1</i>		V (From Format 51)	₹/MT	
<i>Fuel Source 2</i>		W (From Format 51)	₹/MT	
<i>Fuel Source 3</i>		X (From Format 51)	₹/MT	
<i>Secondary fuel</i>		Y (From Format 51)	₹/KL	
Total Fuel cost				
<i>Fuel Source 1</i>		$Z = (R*V)/10^7$	₹ Cr.	
<i>Fuel Source 2</i>		$AA = (S*W)/10^7$	₹ Cr.	
<i>Fuel Source 3</i>		$AB = (T*X)/10^7$	₹ Cr.	
<i>Secondary Fuel</i>		$AC = (U*Y)/10^7$	₹ Cr.	
Other Variable cost, if any		AD	₹ Cr.	
PLF Based incentive		AE (From Format 49)	₹ Cr.	
Total variable cost		AF=Z+AA+AB+AC+AD+AE	₹ Cr.	
Variable cost based on normative parameters		AG	₹ Cr.	
Gain/Loss sharing		AH	₹ Cr.	
Variable cost after gain/loss sharing		AI	₹ Cr.	
Per unit variable cost		AJ= AI*10/Net Generation	₹/kWh	

13.3 Estimation of fuel price for thermal plants

About the format

The landed price or the burner-tip price of fuel, especially coal has several components including the price of the fuel, transportation rates, taxes, cess, royalties etc. Transportation can be a major component of the total price, even accounting for 40% to 50% of the final price of the fuel. In the recent past, efforts have been made to reduce this cost via swapping arrangements²⁷ but railway freight rates have also been increasing significantly²⁸. Similarly, duties, cesses, and royalties are also key contributors to the price of the fuel. Therefore, break-up of the cost of the various fuels procured by the generator should be documented as indicated in Format 51.

Format 51: Break-up of fuel price for each thermal station

Particulars (₹/ MT)	Fuel 1	Fuel 2	Fuel 3	Secondary Fuel 1	Secondary Fuel 2
Base price of fuel					
Transportation cost					
Insurance					
Taxes					
Duties (Excise Duty, Customs duty, cesses if any)					
Coal cess/ GST Compensation Cess					
Royalties					
Total price of fuel					

This information should be available for past years, the current year and for future projections.

Evidence from states

MSPGCL, the Maharashtra State Generating Company, reports this information in every tariff petition. Other states such as Gujarat, Punjab, Haryana and Madhya Pradesh only provide the landed price of the coal and do not provide the transportation costs, royalties, cess etc. In the 2017-18 tariff order in Chhattisgarh the landed price is reported and used for the estimation but data on transportation cost is reported for three months only (CSERC, 2016). Andhra Pradesh, West Bengal and Telangana do not provide the landed price of coal itself.

²⁷Involves optimising the allocation of coal linkages to different power plants in India and swapping imported coal with linkage based domestic coal with the objective reducing transportation costs (MoC, 2015). The central government has been encouraging this approach via the launch of the Coal Mitra Portal and by introducing this as a measure under the Ujwal Discom Assurance Yojana (UDAY) bailout scheme as well (PIB, 2016; MoP, 2015).

²⁸ Between 2015 and 2017 railway freight charges for coal have increased by an average of 14% for train load and 19% for wagon load transportation (MoR, 2017; MoR, 2015).

13.4 Estimation of fixed costs for thermal plants

About the format

Fixed cost payments to generators account for 30% to 40% of the total costs and is paid as a lump-sum to generators irrespective of energy sold. A summary with the major components for fixed costs will be useful to consumers. The major components of fixed costs include capital expenditure, operation and maintenance expenses and other expenses which can include working capital requirement, income tax etc. The break-up for fixed costs for each station can be specified in Format 52.

Format 52: Break-up of station-wise fixed costs

Particulars	Formula	Unit	2017-18	2018-19
Operation and Maintenance Expenses	$A = B+C+D$	₹ Cr.		
<i>Administration and General</i>	B	₹ Cr.		
<i>Employee expenses</i>	C	₹ Cr.		
<i>Repair and Maintenance</i>	D	₹ Cr.		
Capital Expenditure	$E = F+G+H$	₹ Cr.		
<i>Interest on long-term loans</i>	F	₹ Cr.		
<i>Depreciation</i>	G	₹ Cr.		
<i>Return on Equity</i>	H	₹ Cr.		
Other expenses	$I = J+K+L+M$	₹ Cr.		
<i>Tax on income</i>	J	₹ Cr.		
<i>Prior Period expenses</i>	K	₹ Cr.		
<i>Interest on working capital loans</i>	L	₹ Cr.		
<i>Any other expense (please specify)</i>	M	₹ Cr.		
Non-tariff income	N	₹ Cr.		
Total fixed cost	$O = A+E+I-N$	₹ Cr.		
Normative Availability	P	%		
Actual Availability	Q	%		
Fixed cost adjusted for availability	$R = O*Q/P$	₹ Cr.		
Per unit fixed cost	$S = R*10/Net$ Generation	₹/kWh		

The format specified in Format 52 should be filled for each station, and should be used to report information for the current year, for future projections, and for the past three years where audited accounts are available.

Evidence from states

As of March 2018, very few states provide a summary of the major cost components considered while determining fixed charges for thermal power plants. In the orders and petitions of Gujarat, Maharashtra, Chhattisgarh, West Bengal, and Punjab, there are no fixed cost summary tables with the disaggregated costs for major components. However, the Aggregate Revenue Requirement

(ARR) is summarised with specification of fuel costs, capital expenses, operation and maintenance expenses etc. In these states, the petitions and orders have individual sheets to estimate the interest from long-term loans, working capital requirement, depreciation, employee expenses, repair and maintenance cost etc. Madhya Pradesh, Haryana, Andhra Pradesh and Telangana have fixed cost components in different tables and also have a station-wise summary for all the components in a format similar to Format 52 (MPERC, 2016, pp. 70-74; HERC, 2017, p. 83).

13.5 Estimation of costs for hydropower plants

About the format

The estimation for generation and costs for hydropower plants is very different from thermal power plants and should be specified in a different format as suggested in Format 53. Based on the capacity, availability and auxiliary consumption; the net generation for the hydro power plant can be reported. The annual fixed charge, similar to thermal generation stations can be reported by providing a breakup of capital expenses, operation and maintenance expenditure and other expenses such as income tax, working capital loans etc.

As per the tariff regulations of most ERCs, the recovery of the fixed charge takes place via a capacity charge levied on a monthly basis and an energy charge levied on a per unit basis. The former is estimated as a proportion (say, 50%) the total fixed cost after adjusting for the variation between normative and actual availability. The per unit energy charge is derived by dividing the remaining proportion (50%) of the fixed cost by the design energy²⁹ after accounting for auxiliary consumption. The tariff regulations of most ERCs also specify a cap on the energy charge applicable for the generation station which is also specified in the format.

The formats specified should be used to report information for the current year, for future projections, and for the past three years where audited accounts are available.

Evidence from states

In Gujarat, Punjab, Haryana, Madhya Pradesh, Andhra Pradesh and Telangana, the hydro power details are reported in the same formats as thermal. As the treatment is different in regulations, the formats should also be different. The MSPGCL tariff order issued by the Maharashtra ERC has a separate table reporting fixed cost, generation, auxiliary consumption, design energy, energy availability, capacity charge and energy charge in their tariff orders in a fashion similar to the format specified in Format 53.

²⁹ Design Energy is the quantum of energy which could be generated in a 90% dependable year with 95% availability of installed capacity of the station.

Format 53: Estimation of station-wise generation and cost for hydropower plants

Particulars	Formula	Unit	2016-17	2017-18	2018-19
Capacity	A	MW			
Design Energy	B	MU			
Normative availability	C	%			
Actual availability	D	%			
Auxiliary consumption	E	%			
Net Generation	F	MU			
Lease Rentals and Water royalties	G	₹ Cr			
Operation and Maintenance	H = I+J+K	₹ Cr			
<i>Administration and General</i>	I	₹ Cr			
<i>Employee expenses</i>	J	₹ Cr			
<i>Repair and Maintenance</i>	K	₹ Cr			
Capital Expenditure	L = M+N+O	₹ Cr			
<i>Interest on long-term loans</i>	M	₹ Cr			
<i>Depreciation</i>	N	₹ Cr			
<i>Return on Equity</i>	O	₹ Cr			
Other expenses	P=Q+R+S+T	₹ Cr			
<i>Tax on income</i>	Q	₹ Cr			
<i>Prior Period expenses</i>	R	₹ Cr			
<i>Interest on working capital loans</i>	S	₹ Cr			
<i>Any other expense (please specify)</i>	T	₹ Cr			
Non-tariff income	U	₹ Cr			
Total fixed cost	V=(G+H+L+P)-U	₹ Cr			
Average annual capacity charge	W= V*0.5*D/C	₹ Cr			
Energy charge rate	X= V*0.5/{B*(1-E)}	Rs/kWh			
Cap on energy charge	Y	Rs/kWh			
Final energy charge	Z=MIN(X,Y)	Rs/kWh			

13.6 Summary for State Generating Company Stations

About the format

Given the multiple stations of the state generating companies, numerous cost heads and performance parameters for each generator, a summary with the key parameters, fuel related costs and fixed costs is useful to compare between stations and capture key trends. Such a summary can be as per Format 54.

The formats specified should be used to report information for the current year, for future projections, and for the past three years where audited accounts are available. CERC can also provide this information for all the cost-plus plants that it fixed tariff for, on their website. Additionally, **projections should also be reported in the executive summary for the petition**

and order of the generating companies.

Format 54: Summary for all state-owned generating stations

Particulars	Unit	Station 1	Station 2
Capacity	MW		
Date of Commissioning	DD/MM/YY		
Fuel Type	Coal/ Gas/ Hydro		
Normative Availability	%		
Normative PLF	%		
Normative Station Heat Rate	kCal/kWh		
Normative Auxiliary Consumption	%		
Availability	%		
Plant Load Factor	%		
Auxiliary consumption	%		
Net Generation	MU		
Station Heat Rate	kCal/kWh		
Variable Cost	₹/kWh		
Total Variable Cost	₹ Cr		
Landed Price of Fuel	Rs/MT		
<i>Base price of fuel</i>	Rs/MT		
<i>Transportation cost of fuel</i>	Rs/MT		
<i>Duties, Taxes, Cess</i>	Rs/MT		
<i>Royalties</i>	Rs/MT		
<i>Other costs for fuel</i>	Rs/MT		
Fixed cost	₹ Cr		
<i>Lease rentals, if applicable</i>	₹ Cr		
<i>Capital Expenditure</i>	₹ Cr		
<i>Operation and Maintenance</i>	₹ Cr		
<i>Other costs</i>	₹ Cr		
<i>Non-tariff income</i>	₹ Cr		
<i>Fixed cost adjusted for availability</i>	₹ Cr		

Evidence from states

As mentioned in Section 4.4, Gujarat, Chhattisgarh, Maharashtra, Punjab and West Bengal provide a summary of major cost heads which contribute to the ARR. Additionally, Chhattisgarh provides a comprehensive table for station-wise summary of variable costs and net generation (CSERC, 2016, p. 142). However, the disaggregation is not at a level of detail as shown in Format 54. Andhra Pradesh and Telangana have no summary table. Madhya Pradesh and Haryana provide comprehensive summary for the fixed cost and the variable cost for each station in two separate tables for every component (MPERC, 2016, p. 85; MPERC, 2016, pp. 70-74; HERC, 2017, pp. 82-83) which could be provided by all states.

14 Way Forward

The report provides a compendium of formats for various cost and performance heads of the DISCOMs and State Generating companies which can be used not only to engage in the tariff determination process but also to get a better understanding of crucial trends in the state electricity sector. Some of the formats which are being used by SERCs today have been developed more than a decade ago and have not been systematically reviewed or revised to account for current and emerging trends. A lot of information is reported in an ad-hoc fashion and historical trends are seldom captured. The focus of this study has been on capturing recent trends in the sector such as the emergence of surplus power, migration of consumers to open access and captive options, and the increasing cost of thermal generation. It also suggests formats for key trends which are typically not captured in the tariff determination process such as the increased dependence of short-term loans to finance working capital requirements, progress under electrification schemes, and the impact of fuel surcharges and electricity duty on consumer tariffs. It is essential that such information is provided as part of the tariff determination process as there is significant public engagement during the process.

Based on the information reported in tariff orders in all states and union territories, as well as the information in available tariff petitions, it is clear that there are several data gaps which make it difficult for consumer groups, researchers, investors, and policy makers to get a complete understanding of the issues before the sector, particularly the distribution companies. However, almost all of the information required in the suggested formats is currently being made available in some tariff orders, petitions or central government monitoring and tracking reports. Thus, it would not be onerous or cumbersome for utilities and SERCs to provide this information as part of the tariff petition and orders respectively.

In many formats, information disaggregated on an hourly basis, at a feeder or a division level etc., have been suggested for reporting. Reporting disaggregated information helps consumer groups in specific analysis for a geographical area of interest and can help researchers have a more comprehensive assessment of the issue. This can also lead to increased accountability and can spur innovative ideas for tariff design, loss reduction, management of surplus power and estimation of agricultural demand etc. As most consumer groups engaging in tariff processes have access to the internet, such information can be provided in a downloadable spread sheet/excel-based format on the Commissions' and DISCOMs' websites as part of the tariff order and petition respectively. Such formats are highlighted in the report. As only soft-copies need to be made available, this information will not be cumbersome to publish and disseminate. The report also highlights important formats which can be part of the executive summary or public notice which is published with the tariff order and petition.

The formats provided in the report are only an indicative template which will change with state realities, regulations, and orders. The compilation also needs to be added to by various stakeholders in the sector in the spirit of informed public participation.

In order to increase the legitimacy of tariff processes and to ensure informed participation,

DISCOMs and SERCs can:

- **Use the suggested formats in upcoming tariff processes:** The formats are based on information which is already collated by the DISCOM and other utilities. In fact, the suggested formats can be used for the tariff determination process for the upcoming year and all the information can be provided as part of the order and the petition.
- **Ensure clarity about information provided:** In many states, certain terms are used in the petitions and reports without a clear explanation of what it signifies. For example, Rajasthan DISCOMs report 'box-up' of plants along with information on backing down (RERC, 2016). It is not clear if this refers to the prolonged 'shutting down' of plants as reporting by other states. Therefore, DISCOMs and SERCs should provide a list of definitions for the terms used in every formats.
- **Ensure adoption of formats:** Many SERCs have prescribed important formats which are seldom filled by utilities. In case the utility fails to adopt or fill a particular tariff format, ERCs can issue directions or impose penalties for non-compliance. Only concerted efforts will ensure information is provided by the DISCOMs and other utilities. Such a step can go a long way towards strengthening accountability processes.
- **Ensure that historical data is provided in consistent formats:** For many crucial variables, historical data based on audited data is not provided in a consistent manner. This information is important for trend analysis.
- **Ensure third party verification of crucial performance parameters:** This can include parameters concerning AT&C, distribution losses, supply and service quality indicators, performance of thermal generating stations and studies related to the quality and availability of coal.

Intra-state comparison of crucial information is also important to inform policy processes and nip emerging issues in the bud. To enable this, SERCs can also use uniform tariff formats and terminology in their tariff determination process. As state-level realities need to be captured, tariff orders and petitions may not be uniform but efforts can be made to ensure a certain degree of standardisation in reporting. Having standard information formats would also imply a comprehensive and collaborative exercise to define the type and frequency of information required, processes for collating the information, formats for reporting the information and procedures to ensure veracity of information submitted. The Regulatory Information Management System or RIMS was proposed over a decade ago to address this pressing need. As of March 2018, only Gujarat ERC reports information on a quarterly basis under RIMs (GERC, 2018). This information is not used for further analysis. Given several changes in the sector and the lack of readily available information on the emerging trends, the idea of standard reporting formats should be revisited and various actors can play a role in the process as listed below:

1. **Forum of Regulators** can take the lead in suggesting formats as well the processes, frequency and conventions for reporting. Many of the suggested formats can be adapted for this exercise as well.
2. **State Electricity Regulatory Commissions** can adopt the standardised formats and formalise

reporting in the formats by notifying regulations similar to the Uniform Recording, Maintenance and Reporting of Information Regulations in Maharashtra (MERC, 2008). This will help ensure that information is provided in these formats.

3. **Ministry of Power** can collate information provided in these formats and publish annual analysis reports tracking key trends in the sector. Such reports will include financial and performance indicators and will also analyse trends and provide policy suggestions.

The formats themselves can be reviewed every five years to account for trends in the sector through a consultative process. Such an exercise can go a long way in ensuring informed participation in policy and regulatory processes and aid decision making.

List of Abbreviations

AMR	Automatic Meter Reading	MT	Metric Tonne
APTEL	Appellate Tribunal for Electricity	MU	Million Units
ARR	Aggregate Revenue Requirement	MW	Mega Watt
AT&C	Aggregate Technical and Commercial	MYT	Multi Year Tariff
BERC	Bihar Electricity Regulatory Commission	NTPC	National Thermal Power Corporation
CAGR	Compound Annual Growth Rate	O&M	Operation and Maintenance
CEA	Central Electricity Authority	OERC	Odisha Electricity Regulatory Commission
COD	Commercial Operation Date	PFC	Power Finance Corporation
DDUGJY	Deen Dayal Upadhyaya Gram Jyoti Yojana	PLF	Plant Load Factor
DEEP	Discovery of Efficient Electricity Price	PPA	Power Purchase Agreement
DISCOM	Distribution Company	PSERC	Punjab Electricity Regulatory Commission
DSM	Deviation and Settlement Mechanism	R-APDRP	Restructured Accelerated Power Development and Reforms Programme
DT	Distribution Transformer	RE	Renewable Energy
ERC	Electricity Regulatory Commission	REC	Rural Electrification Corporation/ Renewable Energy Certificate
FOR	Forum of Regulators	RERC	Rajasthan Electricity Regulatory Commission
FRP	Financial Restructuring Plan	RIMS	Regulatory Information Management System
GCV	Gross Calorific Value	RPO	Renewable Purchase Obligation
GERC	Gujarat Electricity Regulatory Commission	RTC	Round The Clock
GUVNL	Gujarat Urja Vikas Nigam Limited	RTI	Right To Information
GW	Giga Watt	SEB	State Electricity Board
HERC	Haryana Electricity Regulatory Commission	SERC	State Electricity Regulatory Commission
HT	High Tension	SHR	Station Heat Rate
IDC	Interest During Construction	SLDC	State Load Dispatch Centre
IPDS	Integrated Power Development Scheme	SoP	Standard of Performance
JERC	Joint Electricity Regulatory Commission	T&D	Transmission and Distribution
kCal	Kilo Calorie	TANGEDCO	Tamil Nadu Generation and Distribution Corporation
KERC	Karnataka Electricity Regulatory Commission	TNERC	Tamil Nadu Electricity Regulatory Commission
KL	Kilo Litre	TSERC	Telangana State Electricity Regulatory Commission
kWh	Kilo-watt hour	UDAY	Ujjwal Discom Assurance Yojana
MERC	Maharashtra Electricity Regulatory Commission	UERC	Uttarakhand Electricity Regulatory Commission
MoP	Ministry of Power	UPERC	Uttar Pradesh Electricity Regulatory Commission
MSEDCL	Maharashtra State Electricity Distribution Company Limited	UPPCL	Uttar Pradesh Power Corporation Limited
MSLDC	Maharashtra State Load Dispatch Centre	YoY	Year on year

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- 2 The lesser known tariff: Fuel Surcharge levy in Indian states (2017)
<http://www.prayaspune.org/peg/publications/item/365.html>
- 3 Choosing Green: The status and challenges of renewable energy based open access (2017)
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- 4 Understanding the impacts of India's LED bulb programme, "UJALA" (2017)
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- 5 India's Journey towards 175 GW Renewables by 2022 - A July 2017 Update (2017)
<http://www.prayaspune.org/peg/publications/item/356.html>
- 6 The Price of Plenty: Insights from 'surplus' power in Indian States (2017)
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- 7 In the Name of Competition: The annals of 'cost-plus competition' in the electricity sector in Mumbai (2017)
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- 8 Residential Electricity Consumption in India: What do we know? (2016)
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- 9 Coal Block Allocations: Opportunity Lost, Chaos Gained? (2015)
<http://www.prayaspune.org/peg/publications/item/312.html>
- 10 Demanding Electricity Service: A Guide for the Community Activist (2015)
<http://www.prayaspune.org/peg/publications/item/300.html>

Bricks without Clay

Crucial data formats required for effective tariff processes

A lot of information is provided by utilities during the tariff determination process which aids decision making. In fact, tariff orders and petitions are among the few comprehensive, regularly updated sources of information on the state power sector, especially for distribution companies (DISCOMs). Information provided here helps various consumer groups, researchers, civil society organisations, central and state governments, banks, and investors gain crucial insights on issues that affect the sector.

However, a substantial amount of crucial information is not captured in tariff orders and petitions. This is particularly true for emerging trends such as the recent increase in surplus power, sales migration of cross-subsiding consumers, rapid progress under various electrification schemes and increased procurement of renewable energy. Additionally, data on the extent of the short-term liabilities of DISCOMs and information on coal quality, availability and transportation costs is also not available in many states.

This report documents information formats available across states for crucial cost and performance parameters and suggests formats for providing vital information necessary for decision making. These formats can be easily adapted by SERCs for the upcoming tariff process. Further, they can be used to ensure uniform processes for collection and regular reporting of information across states. This can aid inter-state comparisons and also enable agile and appropriate policy responses.