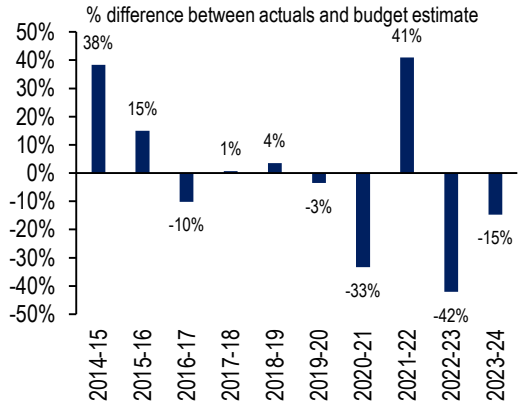
Allocation towards grid-connected solar power project is estimated to increase by 79% over the previous year. In 2024-25, 0.1% of the total allocation towards MNRE has been allocated for capital expenditure.

Trends in fund utilisation over the years

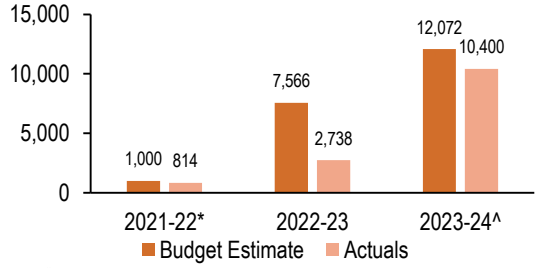
Ministry of Power: Over the last decade, fund utilisation by the Ministry of Power has seen wide fluctuations (see Figure 1 on next page). In 2021-22, the actual expenditure was 41% higher than the budget estimate. This was owing to higher than budgeted expenditure on multiple schemes such as Integrated Power Development Scheme (IPDS), Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGY), and Strengthening of Power Systems. Upon the launch of RDSS scheme in 2021, the ongoing projects under IPDS and DDUGY have been subsumed under RDSS.[10] In 2022-23, actual expenditure by the Ministry was 42% lower than budgeted. Fund utilisation under RDSS was 64% lower than budgeted. In 2023-24, as per revised estimates, the overall expenditure by the Ministry of Power is estimated to be 15% lower than budgeted. Expenditure under RDSS in 2023-24 is estimated to be 14% lower.

Figure 1: Fund utilisation by the Ministry of Power



Note: For 2023-24, revised estimate taken as actuals.
Sources: Demands for Grants of Ministry of Power for various years; PRS.

Figure 2: Funds allocated to RDSS have been undertutilised (in Rs crore)



Note: #Since scheme was approved after budget presentation for 2021-22, revised estimate taken as budget estimate. ^For 2023-24, revised estimate taken as actuals.
Sources: Demands for Grants of Ministry of Power for various years; PRS.

Smart metering

Smart metering is a key focus area under the RDSS scheme for more efficient billing and collection by distribution utilities.[12] It provides for the installation of meters at consumer level as well as system level.[12] The scheme is to be implemented between 2021-22 and 2025-26.[10] Table 2 provides data on status of metering as of July 2024. The scheme targets to install 10 crore smart consumer meters by December 2023 in its first phase.[10] As of July 24, 2024, 22.2 crore consumer meters have been sanctioned under RDSS and certain schemes subsumed under it.[13] Contracts have been awarded for 11.8 crore consumer meters and 1.28 crore consumer meters have been installed.[13] In 19 states where consumer meters have been sanctioned, deployment is yet to begin.[13] In many other states, deployment has started 2023 onward.[13]

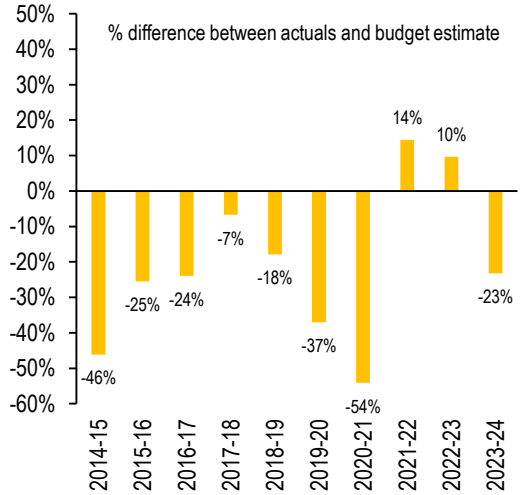
Table 2: Status of smart metering as of July 24, 2024

Type	Sanctioned	Achievement	
		In number	In %
Consumer Meters	22.2 crore	1.28 crore	6%
Distribution Transformer Meters	52.7 lakh	0.83 lakh	2%
Feeder Meters	1.83 lakh	0.19 lakh	10%

Source: All India Smart Metering Status, Website of National Smart Grid Mission of Ministry of Power, as accessed on July 29, 2024; PRS.

MNRE: Over the last decade, actual expenditure by MNRE has generally been lower than the budget estimate, except in 2021-22 and 2022-23. In 2023-24, as per revised estimates, the overall expenditure by MNRE is estimated to be 23% lower than budgeted. A key scheme with lower utilisation is PM-KUSUM (45% lower in 2023-24). The scheme provides for solarisation of agricultural pumps.[7] Expenditure towards grid-connected wind power projects in 2023-24 is estimated to be 25% lower than budgeted.

Figure 3: Low fund utilisation by MNRE



Note: For 2023-24, revised estimate taken as actuals.
Source: Demands for Grants of MNRE for various years; PRS.

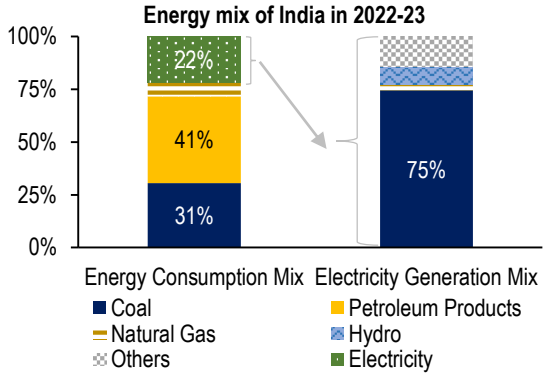
Issues for Consideration

Transition to cleaner energy sources

In 2022-23, 95% of India's energy supply was sourced from fossil fuels– coal, crude oil, and natural gas (Figure 4).[14] Fossil fuels are the largest

contributor of greenhouse gas emissions (about 75% globally), leading to global warming.[15,16] Hence, transition to cleaner energy sources is the centrepiece of climate change mitigation.[17] This transition is envisaged in two key ways: (i) shifting to non-fossil sources for electricity generation, and (ii) shifting to electricity for final consumption.[18] In 2022-23, about 22% of the energy consumed in India was in the form of electricity; 75% of this electricity was generated from coal.[14] The rest came from sources such as hydro, solar, and wind.

Figure 4: 75% of electricity generation in 2022-23 was from coal



Source: India Energy Statistics 2024, MoSPI; PRS.

As part of its climate-related commitments, by 2030, India aims to achieve: (i) 500 GW of non-fossil generation capacity, (ii) meeting at least 50% of its electricity requirement from renewable sources.[19] The Central Electricity Authority (2023) projected that much of the renewable energy capacity will come from solar and wind.[20] Solar and wind are projected to have 42% and 14% share in the total installed capacity by 2031-32 (Table 3).[20] 35% of the total generation is expected to be met from these two sources.[20] Nuclear energy capacity is projected to increase from 8 GW as of June 2024 to 20 GW by 2031-32.[20]

For the same amount of power generation, a higher installed capacity is needed in case of solar and wind as compared to other sources. For instance, coal capacity can be utilised up to 90% of the time, whereas the highest possible capacity utilisation in case of solar is estimated to be 20%-22% and that of wind power in the range of 30%-40%.[21]

Capacity addition targets missed

India had set a target of achieving installed capacity of 100 GW of solar and 60 GW of wind power by 2022.[23] As of June 2024, the installed capacity of solar stood at 85 GW and that of wind at 47 GW.[22] Key reasons for underachievement on targets include: (i) issues with land acquisition, (ii) delay in clearances, (iii) contractual disputes, (iv) disruption in global supply chain due to COVID-19, and (v) policy uncertainty due to changes in tariff regimes and re-negotiation of power purchase agreements.[20,,23,24]

Table 3: All-India installed capacity (in GW)

Source	June 2024		March 2032 Projected	
	Capacity	In %	Capacity	In %
Solar	85	19%	365	42%
Coal	218	49%	260	30%
Wind	47	10%	122	14%
Large Hydro (>25 MW)	47	11%	62	7%
Gas	25	6%	25	3%
Nuclear	8	2%	20	2%
Biomass	11	2%	16	2%
Small Hydro (<=25 MW)	5	1%	5	1%
Diesel	1	0%	-	-
Total	**446**	-	**874**	-
Pumped Hydro Storage	-	-	27	-
Battery Storage	-	-	47	-

Sources: Installed Capacity Report for June 2024, Central Electricity Authority; National Electricity Plan Generation Vol. I, May 2023, Central Electricity Authority; PRS.

Table 4: Capacity added during 2017-2022 lower than target (in GW)

Source	Target/Scheduled	Actual	Gap	Actual as % of Target
Solar	88	42	46	48%
Coal	48	31	17	65%
Wind	28	8	20	29%
Hydro	7	3	4	43%
Nuclear	3	0	3	0%
Biomass and Gas	2	2	0	100%
Total	**176**	**85**	**91**	**48%**

Source: Draft National Electricity Plan, Vol I, March 2023, Central Electricity Authority; PRS.

Challenges with financing

The Standing Committee on Energy (2022) noted that there is a huge gap between the required and actual investment for renewable capacity addition.[25] Against the required annual investment of Rs 1.5-2 lakh crore, the actual annual investment in the last few years was around Rs 75,000 crore.[25] It observed that the banking sector has been reluctant towards financing renewable energy projects.[25] The Committee recommended the Ministry of New and Renewable Energy to: (i) find alternative financing mechanisms such as green bonds and infrastructure investment trusts, and (ii) explore the possibility of prescribing banks and financial institutions to lend a minimum percentage to renewable energy projects through a Renewable Finance Obligation.[25] It recommended the Ministry of New and Renewable Energy to encourage financing projects by public sector lenders such as Power Finance Corporation (PFC) and Indian

Renewable Energy Development Agency (IREDA).[25] It also recommended that the government should reduce or exempt guarantee fee charged to lenders such as PFC and IREDA.[25] The fee is charged at the rate up to 1.2% per annum on funds raised from the international market.[25]

Availability of solar panels

In the recent years, India has imported more than 75% of its installed solar panels.[26,27] To arrest import, the central government has taken several measures.[27,28] In 2022, import tariffs on solar panels as well as raw material for such panels was increased.[27] These policies have led to an increase in price in the short-term.[27] At the same time, in 2020, the central government had introduced the production-linked incentive to promote domestic manufacturing.[29] Annual solar panel manufacturing capacity of 48 GW is expected to be added under this scheme by 2026.[30]

Driven by these incentives, domestic manufacturing capacity for solar panels is expected to rapidly increase over the next five years and be sufficient to meet the domestic demand thereafter.[27] However, India may need to continue to import polysilicon and wafer, which are needed to make solar panels.[27,31]

Rooftop solar capacity below target

Through the Rooftop Solar Programme, India had aimed to achieve 40 GW of solar capacity by the end of 2022.[32] As of December 2023, only 10.4 GW of rooftop solar capacity was added.[33] The Standing Committee on Energy (2022) observed that roof-top systems are not attractive for consumers due to: (i) non-availability of information at grass root level, (ii) time consuming and complicated procedures for setting up, and (iii) delays in subsidies.[34]

PM-Surya Ghar Muft Bijli Yojana was approved in February 2024 with the aim of increasing the share of rooftop solar capacity.[11] Under this scheme, financial assistance will be provided to one crore households to install rooftop solar.[11] This is expected to help them obtain free electricity up to 300 units every month.[11]

Solarisation of agricultural pumps below target

The PM-KUSUM scheme aims to achieve a solar capacity of 35 GW through solarisation of agricultural pumps and small solar power plants on barren agricultural land.[35,36] It aims to add 10 GW of small solar power plants.[35,37] Originally, this capacity was to be added by 2022.[37,38] The target has subsequently been revised to 2025-26.[39] The Ministry of New and Renewable Energy (2023) observed that onset of COVID-19 pandemic affected capacity addition under the scheme during 2020-21 and 2021-22.[35] It also observed that access to affordable finance and lack of subsidy from state governments are among key reasons for poor uptake of the scheme.[35,40]

Table 5: Targets vs Achievement under the PM-KUSUM Scheme (as of November 2023)

Parameter	Target	Achievement	In %
Grid-connected Decentralised Solar Plants	10,000 MW	141 MW	1.4%
Stand-alone Solar Pumps	14 lakh	2.8 lakh	20%
Grid-connected Solar Pumps	35 lakh	4,594	0.1%

Source: 'Progress and Implementation of PM Kusum Scheme', Press Information Bureau, Ministry of New and Renewable Energy, December 23, 2023; PRS.

Need for storage capacity

Power generation from solar and wind are intermittent in nature.[41] The variability is due to external factors which are beyond human control.[41] There may also be mismatch between demand and supply. For instance, there may be a higher demand for electricity during the evening hours but solar power cannot be generated at that time. For their effective integration at large scale, availability of affordable storage systems is crucial.[42] Battery and pump storage are expected to be two primary options for storage in India.[20] In pump storage, water is pumped and stored upstream with surplus energy, which can later be used to run turbines. CEA has projected that India will aim to add 27 GW of pump storage capacity and 47 GW of battery energy storage system for this purpose.[20]

In case of solar power in India, IEA (2021) observed that as of 2020, new solar power with battery storage systems were more expensive than new coal power.[43] Although, this is expected to change by 2030 (30% lower per unit).[43] By 2030, solar energy with battery storage is also expected to be competitive with existing coal capacity.[43] This is expected to be driven by a consistent decline in prices of batteries as well as solar panels.[21,43,44 45]

In 2021, the Union Cabinet approved production-linked incentive scheme for domestic manufacturing of advanced batteries.[46] Under this scheme, annual battery manufacturing capacity of 40 GWh will be added.[46] The scheme is administered by the Ministry of Heavy Industries.[46] In September 2023, the Cabinet also approved viability gap funding scheme for battery energy storage systems.[47] It envisages development of 4,000 GWh of storage projects by 2030-31.[48]

Declining capacity utilisation of coal plants

In 2009-10, plant load factor (PLF) for coal and lignite plants was 84%, which has come down to 57% in 2022-23.[48] PLF is a measure of the output of a power plant compared to the maximum output it could produce. This may be due to: (i) availability of surplus capacity in certain regions, (ii) low demand for power, (iii) demand being met from other sources such as renewables, and (iv) unavailability of fuel. Poorer capacity utilisation may increase the unit cost of electricity generation from these plants and may also present challenge of financial viability before some of them. CEA has projected that PLF of coal-based power plants will continue to hover around 58-59% till 2031-32.[20]

Addition of transmission lines

Transmission systems need to be augmented in view of new generation capacity and increase in demand for carrying capacity.[49] Between 2017-18 and 2021-22, India had targeted to add 1,10,281 circuit kilometre (ckm) of transmission lines.[49] However, the achievement was 81% (88,865 ckm).[49] CEA observed that reasons for delay include: (i) right-of-way issues, (ii) delay in getting forest clearances, (iii) contractual issues, (iv) delay in land acquisition, and (v) onset of COVID-19 pandemic.[49] CEA projects that India will need to add 1,23,577 ckm of transmission lines between 2022-23 and 2026-27.[49] Under the Green Energy Corridor, the central government has been funding laying of transmission lines for evacuating power from renewable energy projects.[50] Phase-II of the project is estimated to provide for evacuation of 33 GW of renewable energy.[50]

Availability of power

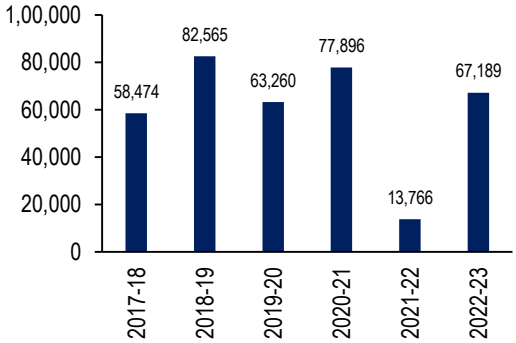
Over the years, availability of power has considerably improved.[51] Energy deficit at the national level in 2023-24 was 0.3%.[52] Energy deficit refers to the percentage of power demanded which was not supplied. Peak deficit at the national level in 2023-24 was 1.4%.[52] Peak deficit refers to the shortfall in supply during the highest consumption period in a day. However, some states saw relatively higher peak deficits in 2023-24 (see Table 6 in annexure). These include: (i) Maharashtra (10.2%), (ii) Jharkhand (7.9%), and (ii) Bihar (7.8%).[52] Further, availability of 24X7 power supply is yet to be achieved. In July 2024, the Ministry of Power observed that average power supply in rural areas is 21.9 hours in 2024 and 23.4 hours in urban areas.[51] High variance exists across states on these parameters (Table 7 in annexure).[53] For instance, in 2021-22, average number of hours of power supply in rural areas was 13.3 hours in Himachal Pradesh and 16.3 hours in Haryana.[53]

Financial health of distribution companies

In almost all parts of the country, electricity distribution is a local monopoly business, i.e., a single company, typically a state government-owned entity, serves all consumers in a given area. These companies have long-term bilateral contracts with generators which are government as well as private companies, to meet a majority of its expected demand. Tariffs for power procured from generators are determined by Regulatory Commissions, except where the tie-up is through competitive bidding. Although private participation is permitted, their presence among discoms is limited. In 2022-23, the state government-owned enterprises and power departments taken together had a 93% share in the electricity distribution sector by both revenue earned and volume of energy sold.[54]

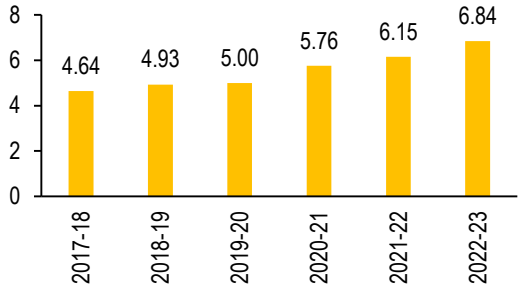
The distribution segment is the interface between consumers and the entire value chain of the power sector, and thus, is key to revenue realisation for the entire sector. Discoms have continued to register financial losses and have required government support from time to time to be bailed out from these situations. For instance, in 2015, under UDAY scheme, state governments had to take over 75% of the debt of their discoms worth Rs 2.3 lakh crore.[55] They were also required to provide grants for any future losses. Persistent financial problems result in delays in payments and non-payment of outstanding dues to generators, which in turn also impacts their fuel suppliers, i.e., coal companies. In six years between 2017-18 and 2022-23, cumulative losses were Rs. 3.6 lakh crore.[56] In 2022-23, on average, distribution utilities spent Rs 7.1 per unit to earn Rs 6.7, resulting in revenue gap of 39 paise per unit. [56] Persistent losses have also led to a rise in indebtedness for these companies.[54] Key reasons for persistent losses by distribution utilities are discussed on next page.

Figure 5: Discoms continue to make losses (Rs crore)



Note: Losses above are based on actual subsidy received excluding revenue grant under UDAY, and regulatory income (receivables in future).
Source: Reports on Performance of Power Utilities, Power Finance Corporation; PRS.

Figure 6: Outstanding debt of discoms has been rising (Rs lakh crore)



Source: Reports on Performance of Power Utilities, Power Finance Corporation; PRS.

Technical and commercial losses

In 2022-23, on aggregate, distribution utilities could bill only 87% of the electricity they injected into the grid. Of which, they collected 97% of the amount they billed.[54] This amounted to aggregate technical and commercial losses of 15.4%.[54] AT&C losses range between as low as 7% in Kerala, and as high as 25% in Bihar, 30% in Jharkhand, and 52% in Arunachal Pradesh, respectively.[54] These losses can be attributed to: (i) technical losses which include some unavoidable loss in energy transfer, (ii) inefficiencies in energy transfer due to the sub-optimal condition of the network, and (iii) commercial losses such as theft by tapping in and bypassing metering, inadequate metering, and payment default by consumers. The Revamped Distribution Sector Scheme, launched in 2021, seeks to bring down AT&C losses to 12%-15% by 2024-25.[57]

Underpricing of tariff

Tariffs charged to consumers are regulated by State Electricity Regulatory Commissions. Often, tariffs are designed on a multi-year basis. At times, they are designed such that the tariff is lower than the cost in initial years, and cost recovery is offloaded to upcoming years. These costs, recoverable in future, are termed regulatory income. For instance, in 2022-23, Maharashtra discoms booked a regulatory income of Rs 16,614 crore.[54] However, non-recovery of costs would add up as annual losses for discoms. This would also require discoms to incur costs on working capital loans.

Tamil Nadu's discom TANGEDCO, which observes lower AT&C losses (10%) than the national average, was the among the highest loss-making discoms in the country for a few consecutive years. This situation has been due to under-pricing of tariffs. A white paper released by the Tamil Nadu government (2021) had observed that electricity tariffs were not revised in Tamil Nadu for seven years.[58] The Electricity (Amendment) Bill, 2022, which lapsed with the dissolution of 17th Lok Sabha, sought to provide that tariff should recover all prudent costs.[59]

Power procurement cost

Power procurement costs constitute about 70%-80% of the total costs of discoms.[56] Power procurement cost varies significantly across states, from as low as about Rs 2.9-3.1 per kWh in Kerala and Himachal Pradesh, to as high as Rs 5.5-6 per kWh in states such as Delhi and Karnataka.[56] For source-wise power purchase cost at the national level, see Table 8 in annexure. A study report for NITI Aayog (2021) observed that discoms have entered into expensive and long-term thermal PPAs based on incorrect estimates of power demand.[60] Fixed costs of the excess capacity must be paid, even if power is not generated by the generation company. In many states, a high percentage of power demand is tied up in long-term contracts.[60] Gujarat, Karnataka and Rajasthan have almost 100% of their maximum demand tied up.[60] While these arrangements give security in planning supply, they limit the discoms' ability to take advantage of lower power costs in short-term markets. Fixed costs, which are roughly 47% of the cost will still have to be paid under these long-term contracts if the discom looks for alternative cheaper sources for procuring power.[60]

As discussed earlier, about 75% of the electricity is generated from coal. There is some dependence on import for meeting coal requirement. In 2022-23, about 5% of the coal requirement for the electricity sector was met from import.[61,62] Rise in coal prices in international markets may also raise prices for power. In 2021-22, India imported coal at an average price of Rs 8,300 per tonne. This rose to Rs 12,500 per tonne in 2022-23, an increase of 51%.[61] Coal was primarily imported from Indonesia, and prices shot up due to the Russia-Ukraine war, and demand surge by countries such as India and China.[61] In October 2023, the Ministry of Power directed all generation companies to continue using at least 6% imported coal until March 2024.[63] The Ministry had observed that due to variability in rainfall, hydro power generation was lower, this had increased the dependence on coal for meeting demand.[63] To reduce coal import, the Standing Committee on Coal (2023) recommended: (i) increasing the minimum assured supply of coal from 75% to 80%, (ii) exploring new mining sites and expediting operationalisation of mines, and (iii) augmenting coal washing capacity.[64]

Cross-subsidy in pricing of power

Cross-subsidy is a tariff mechanism where some consumer categories pay a higher price to subsidise the consumption of other consumer categories. Typically, industrial and commercial consumers cross-subsidise the consumption of residential and agricultural consumers. NITI Aayog (2019) observed that in many states, cross-subsidies have

been higher than the long-term policy goal of limiting it within ± 20% of the average cost of supply.[65] Higher electricity prices may make industries uncompetitive. This may create an incentive for them to look for direct procurement from generators or set up their own power plants. In turn, this may make discoms lose out on consumers with higher consumption levels and higher paying capacity. This would adversely affect their revenue prospects.

Cross-subsidy along with explicit government subsidy pay for the provisioning of unmetered free power in many parts of the country. Not metering consumption may encourage injudicious use of electricity, and also leads to accounting issues for discoms. NITI Aayog (2019) observed that unmetered free power to farms has had an adverse impact on groundwater levels due to the injudicious use of tube wells.[66]

Compliance with RPO

To spur demand for renewable energy, distribution utilities (discoms) are obligated to procure a minimum percentage of their electricity supply from renewable sources, referred to as renewable purchase obligation (RPO). In 2022-23, 15 states met their RPO obligation (Table 10 in annexure).[67] The Union Ministry of Power (2022) had observed that discoms perceive renewable energy to be expensive and having additional costs towards integration.[23] As per an October 2023 notification, RPO is set at 29.9% for 2024-25 and will progressively rise to 43.3% in 2029-30.[68]

Open Access

As per the Electricity Act, consumers with a demand of 1 MW and above are permitted to procure electricity from sources other than the local discom.[69] Discoms and transmission companies are mandated to provide such consumers with non-subsidy surcharge are payable for such access. This mechanism is commonly referred to as open discriminatory access to their network access. Open access aims to: (i) induce efficiency improvement in electricity distribution companies through healthy competition in the power market, (ii) provide choice to consumers for procuring power from their preferred supplier.[70] Consumers would opt for open access to benefit from lower prices elsewhere. In June 2022, the Ministry of Power notified the Electricity (Promoting Renewable Energy through Green Energy Open Access) Rules, 2022.[71] The Rules propose a framework for open access to renewable energy (from sources including solar, wind, hydro, and waste-to-energy). This framework allows consumers with a demand or sanctioned load of 100 kilowatts and above to access renewable energy through open access.

The Standing Committee on Energy (2022) observed that adoption of open access has been below potential.[72] One of the key reasons has been high surcharges levied by regulatory commissions to protect the prevailing cross-subsidy level.[72] If large consumers move away from the local discom, the cross-subsidy level for other consumers of that discom gets adversely impacted. Hence, a cross-subsidy surcharge was envisaged under the Electricity Act to protect the subsidy level. However, these high charges lead to open access becoming financially unattractive.[70] A 2019 study for NITI Aayog also highlighted some operational barriers observed with open access: (i) distribution and transmission licensees denying access citing capacity constraints, (ii) onerous conditions regarding the minimum level of drawl and advance scheduling of power despatch (citing grid discipline), and (iii) delay in executing maintenance requests.[65]

Annexure

Table 6: Energy and peak deficit in 2023-24 (in %)

State	Energy Deficit	Peak Deficit
Andhra Pradesh	0.1%	0.0%
Arunachal Pradesh	0.0%	0.2%
Assam	0.8%	0.0%
Bihar	1.4%	7.8%
Chhattisgarh	0.1%	0.0%
Delhi	0.0%	0.0%
Goa	0.0%	0.0%
Gujarat	0.0%	1.1%
Haryana	0.5%	1.9%
Himachal Pradesh	0.3%	0.0%
Jammu and Kashmir	1.4%	1.5%
Jharkhand	3.8%	7.9%
Karnataka	0.2%	0.0%
Kerala	0.0%	0.0%
Madhya Pradesh	0.2%	2.4%
Maharashtra	0.1%	10.2%
Manipur	1.5%	3.8%
Meghalaya	7.6%	0.0%
Mizoram	0.0%	0.0%
Nagaland	0.0%	0.1%
Odisha	0.1%	0.0%
Puducherry	0.0%	0.0%
Punjab	0.0%	0.0%
Rajasthan	0.6%	0.0%
Sikkim	0.0%	0.3%
Tamil Nadu	0.0%	0.0%
Telangana	0.0%	0.0%
Tripura	0.0%	0.0%
Uttar Pradesh	0.3%	1.5%
Uttarakhand	0.7%	8.7%
West Bengal	0.1%	0.0%
All-India	**0.3%**	**1.4%**

Source: Executive Summary Report for April 2024, Central Electricity Authority; PRS.

Table 7: Average number of hours of power supply in 2021-22

State Name	Urban	Rural
Andhra Pradesh	23.9	23.6
Arunachal Pradesh	22.7	-
Assam	23.7	-
Bihar	23.6	20.4
Chhattisgarh	23.8	21.3
Delhi	24.0	-
Goa	23.7	-
Gujarat	24.0	23.5
Haryana	23.6	16.3
Himachal Pradesh	23.9	13.3
Jammu and Kashmir	22.3	-
Jharkhand	23.3	-
Karnataka	23.6	17.6
Kerala	23.9	19.6
Ladakh	23.8	-
Madhya Pradesh	23.9	19.4
Maharashtra	24.0	23.2
Manipur	23.7	-
Meghalaya	23.9	-
Mizoram	23.9	-
Nagaland	23.5	-
Odisha	23.7	23.0
Punjab	23.7	22.1
Rajasthan	23.9	21.3
Tamil Nadu	24.0	22.2
Telangana	23.9	21.9
Tripura	23.9	19.9
Uttar Pradesh	23.5	15.9
Uttarakhand	23.6	21.6
West Bengal	23.8	23.5
All-India	**23.8**	**20.6**

Note: Data not available for states indicated with dash (-).
Source: Unstarred Question No. 1964, Lok Sabha, Ministry of Power, answered on July 28, 2022; PRS.

Table 8: Weighted Average Power Purchase Cost (Rs per unit)

Source	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Bio Power	4.45	4.71	5.4	5.53	5.11	4.96	4.96	5.65
Coal	3.50	3.67	3.7	3.82	4.14	4.16	4.29	4.34
Diesel	11.44	12.73	15.9	20.52	16.54	18.32	19.91	30.21
Hydro	2.07	2.28	2.22	2.25	2.28	2.33	2.3	2.45
Nuclear	2.82	2.85	3.27	3.31	3.53	3.49	3.49	3.6
Oil and Gas	4.72	4.46	4.29	4.79	5.04	4.92	5.15	5.35
Small Hydro	3.11	3.19	2.76	2.8	2.85	2.28	2.75	2.84
Solar	6.94	7.13	5.87	5.26	4.7	4.48	4.15	3.97
Wind	4.05	4.27	4.43	4.39	4.2	4.13	3.66	4.04

Source: India Climate and Energy Dashboard, NITI Aayog; PRS.

Table 9: Performance of distribution utilities in 2022-23

State/UT	AT&C Losses	ACS (Rs per unit)	ARR (Rs per unit)	ACS-ARR Gap (Rs per unit)
State Sector	**15.8%**	**7.2**	**6.7**	**0.47**
Andaman & Nicobar Islands	19.8%	34.2	32.0	2.20
Andhra Pradesh	8.0%	7.4	7.6	-0.22
Arunachal Pradesh	51.7%	6.7	6.7	0.00
Assam	16.2%	8.1	7.4	0.62
Bihar	25.0%	6.7	6.8	-0.03
Chhattisgarh	16.1%	5.5	5.2	0.29
Delhi	10.7%	11.2	10.2	0.94
Goa	11.9%	5.9	6.0	-0.14
Gujarat	10.7%	6.2	6.2	-0.02
Haryana	12.0%	6.8	6.9	-0.15
Himachal Pradesh	10.6%	6.6	5.6	0.93
Jharkhand	30.3%	7.4	4.9	2.50
Karnataka	13.9%	8.1	7.7	0.43
Kerala	7.1%	6.6	6.2	0.33
Ladakh	30.3%	7.5	5.3	2.18
Madhya Pradesh	20.6%	6.0	5.7	0.30
Maharashtra	18.6%	7.7	7.3	0.40
Manipur	13.8%	8.3	7.1	1.15
Meghalaya	24.0%	5.6	4.9	0.67
Mizoram	26.3%	9.7	8.0	1.70
Nagaland	45.8%	8.2	8.5	-0.32
Puducherry	17.5%	6.2	5.8	0.39
Punjab	11.3%	6.4	5.7	0.69
Rajasthan	15.9%	6.6	6.4	0.24
Sikkim	36.7%	4.3	4.9	-0.69
Tamil Nadu	10.3%	8.9	8.0	0.89
Telangana	18.7%	7.8	6.4	1.40
Tripura	28.2%	6.3	5.4	0.89
Uttar Pradesh	22.3%	8.1	6.9	1.19
Uttarakhand	15.3%	6.1	5.3	0.72
West Bengal	17.3%	6.1	6.1	-0.01
Private Sector	**10.9%**	**6.7**	**7.2**	**-0.49**
Dadra & Nagar Haveli and Daman & Diu	3.6%	6.0	6.2	-0.15
Delhi	7.1%	7.6	8.2	-0.62
Gujarat	3.9%	7.7	8.2	-0.50
Maharashtra	6.5%	8.0	9.1	-1.09
Odisha	21.9%	4.9	5.0	-0.10
Uttar Pradesh	8.4%	6.3	6.9	-0.64
West Bengal	8.2%	7.1	8.0	-0.89
All-India	**15.4%**	**7.1**	**6.7**	**0.39**

Note: AT&C losses: Aggregate Technical and Commercial (AT&C) loss is the ratio of power for which the discom did not receive any payment to the total electricity procured by the utility. *ACS: Average Cost of Supply; ARR: Average Revenue Realised. ARR indicated above is on subsidy billed basis.

Source: Report on Performance of Power Utilities 2022-23, Power Finance Corporation; PRS.

Table 10: Compliance with Renewable Purchase Obligation in 2022-23

State	Target				Achievement			
	Wind	Hydro	Other	Total	Wind	Hydro	Other	Total
Andhra Pradesh	0.81%	0.35%	23.44%	24.61%	3.30%	0.00%	25.10%	28.50%
Arunachal Pradesh	0.81%	0.35%	23.44%	24.61%	0.00%	3.50%	15.30%	18.80%
Assam	0.81%	0.35%	23.44%	24.61%	0.00%	2.70%	20.40%	23.20%
Bihar	0.81%	0.35%	23.44%	24.61%	0.10%	0.10%	15.90%	16.00%
Chhattisgarh	0.81%	0.35%	23.44%	24.61%	0.10%	1.20%	11.90%	13.30%
Delhi	0.81%	0.35%	23.44%	24.61%	0.00%	0.60%	23.80%	24.40%
Goa	0.81%	0.35%	23.44%	24.61%	0.80%	0.40%	16.10%	17.30%
Gujarat	0.81%	0.35%	23.44%	24.61%	3.50%	0.20%	16.50%	20.30%
Haryana	0.81%	0.35%	23.44%	24.61%	0.00%	0.90%	20.80%	21.70%
Himachal Pradesh	0.81%	0.35%	23.44%	24.61%	0.00%	2.70%	76.00%	78.70%
Jammu & Kashmir & Ladakh UT	0.81%	0.35%	23.44%	24.61%	0.00%	0.00%	56.90%	56.90%
Jharkhand	0.81%	0.35%	23.44%	24.61%	0.00%	0.00%	30.00%	30.00%
Karnataka	0.81%	0.35%	23.44%	24.61%	6.40%	0.00%	40.30%	46.70%
Kerala	0.81%	0.35%	23.44%	24.61%	0.00%	0.00%	36.30%	36.30%
Madhya Pradesh	0.81%	0.35%	23.44%	24.61%	0.10%	0.00%	22.30%	22.40%
Maharashtra	0.81%	0.35%	23.44%	24.61%	0.00%	0.00%	17.10%	17.10%
Manipur	0.81%	0.35%	23.44%	24.61%	0.00%	0.20%	33.80%	34.00%
Meghalaya	0.81%	0.35%	23.44%	24.61%	0.00%	3.20%	56.70%	59.90%
Mizoram	0.81%	0.35%	23.44%	24.61%	0.30%	0.40%	42.10%	42.70%
Nagaland	0.81%	0.35%	23.44%	24.61%	0.00%	5.20%	31.30%	36.50%
Odisha	0.81%	0.35%	23.44%	24.61%	0.10%	0.10%	25.30%	25.40%
Puducherry	0.81%	0.35%	23.44%	24.61%	0.00%	0.00%	6.60%	6.60%
Punjab	0.81%	0.35%	23.44%	24.61%	0.20%	0.00%	27.30%	27.60%
Rajasthan	0.81%	0.35%	23.44%	24.61%	0.00%	0.00%	18.30%	18.30%
Sikkim	0.81%	0.35%	23.44%	24.61%	0.00%	3.70%	84.70%	88.40%
Tamil Nadu	0.81%	0.35%	23.44%	24.61%	5.80%	0.00%	19.70%	25.50%
Telangana	0.81%	0.35%	23.44%	24.61%	0.00%	0.00%	20.20%	20.20%
Tripura	0.81%	0.35%	23.44%	24.61%	0.00%	0.10%	13.50%	13.60%
Uttar Pradesh	0.81%	0.35%	23.44%	24.61%	0.00%	0.40%	14.80%	15.20%
Uttarakhand	0.81%	0.35%	23.44%	24.61%	0.00%	3.00%	57.40%	60.40%
West Bengal	0.81%	0.35%	23.44%	24.61%	0.10%	0.00%	15.90%	15.90%

Source: Starred Question No. 122, Rajya Sabha, Ministry of Power, August 1, 2023; PRS.

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