POWER PERSPECTIVES

State overview: Maharashtra

Part of Power Perspectives

An Initiative by Prayas (Energy Group), Pune

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Prayas (Energy Group)

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About Power Perspectives

Power Perspectives is an initiative by Prayas (Energy Group) to provide brief commentaries and analyses on important developments in the Indian power sector in various states and at the national level. The portal hosts articles on a wide-ranging set of issues to inform policy makers, regulators, researchers, journalists and civil society organisations about sector developments from a public interest perspective. The initiative focuses on critical developments that are not adequately reported.
As part of the initiative, developments in focus states are tracked. In addition to articles, each focus state has a "State Overview" document which provides a brief background of the state and infographics with key statistics. The portal can be accessed here: https://prayaspune.org/peg/resources/power-perspective-portal . Comments and suggestions are welcome at powerperspectives@prayaspune.org.

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State Overview: Maharashtra

1 Introduction and approach

Often regarded as one of the pioneering states in the Indian power sector, Maharashtra invested early in village electrification, renewable energy development, capacity addition and development of the regulatory institution. The state has also been an early adopter of competitive bidding for power procurement, appointment of franchisees for managing distribution networks and separation of agricultural feeders to manage demand. Power sector decision makers in the state have been at the forefront of innovation with schemes such as the Chief Minister's Solar Agriculture Feeder Policy, load shedding protocol and novel approaches to unmetered agricultural demand estimation. This note discusses many of these efforts and documents lessons. An overview of the state sector players is detailed in Box 1.

Box 1: Major institutions in Maharashtra power sector

Except in Mumbai city, electricity is Maharashtra is primarily supplied by state owned entities which were created with the unbundling and corporatisation of the Maharashtra State Electricity Board in 2005. The details of the companies are given in Table 1.

Table 1: Companies formed after unbundling

Type of Company	Name
Generation	Maharashtra State Power Generation Company Limited (MSPGCL)
Transmission	Maharashtra State Electricity Transmission Company Limited (MSETCL)
Distribution	Maharashtra State Electricity Distribution Company Limited (MSEDCL)
Holding Company	MSEB Holding Company Limited (MSEBHCL)

Mumbai has had a structure of electricity sector different than most places in the country. It is served by private and municipal electricity companies, with its own transmission grid, and currently it is the only city in India which allows consumers to choose between distribution companies. There are four distribution licensees serving the electricity consumers of Mumbai:

- Brihanmumbai Electricity Supply and Transport Undertaking (or BEST), a municipal undertaking, serves the island city
- Adani Electricity Mumbai Limited (or AEML, which was till recently Reliance Infrastructure Limited (RInfra) and before that Bombay Suburban Electricity Supply Limited or BSES), a private company, serves suburban Mumbai
- Tata Power Company Limited (or TPC), another private company, was declared a parallel distribution licensee for consumers in the island city and suburban Mumbai by the Supreme Court in 2008[1], and serves as a distribution company in both these areas
- MSEDCL, serves consumers in the eastern suburbs of Bhandup and Mulund.

In addition to these utilities there are eight trading licensees, nine private transmission licensees (including three owned by private licensees supplying to Mumbai) and nine deemed distribution licensees in Maharashtra.

All of these entities are regulated by the Maharashtra Electricity Regulatory Commission (MERC) which was set up in August, 1999. As per the Electricity Act, 2003, the key functions of the commission include determining tariffs, ensuring regulatory oversight for all licensees in Maharashtra, facilitating open access, protecting consumer interest, adjudicating disputes, and specifying relevant standards and regulations in the sector. Appeals against decisions of the MERC are heard by the national Appellate Tribunal for Electricity which serves as the appellate authority for all 29 ERCs in India and the Petroleum and Natural Gas Regulatory Board.

The Maharashtra Energy Development Agency (MEDA) is the state nodal agency to promote and develop renewable energy and implement energy conservation measures.

Table 2 provides a brief overview of the performance and status of the distribution licensees in the state.

[1] Civil Appeal no. 2898 of 2006 with Civil Appeal nos. 3466 and 3467 of 2006. Supreme Court of India.

Table 2: Overview of distribution business (FY19)

Particulars	MSEDCL	BEST	TPC	AEML
ACOS (Rs/kWh)	7.9	6.38	7.90	8.42
Sales (BU)	104	4.57	4.53	8.36
% Agriculture	25%	0%		
% Domestic	19%	44%	41%	50%
% Commercial and Industrial	43%	44%	51%	45%
% Others	13%	12%	8%	5%
Outstanding working capital loans as a % of ARR	30%	Not available for distribution business alone.		
Cumulative revenue gap (+)/surplus (-) (% of ARR)	21%	-25%	-1%	0%
Peak Demand (MW)	5,746	969	612	557
Power procured (BU)	136	4.92	4.56	9.37
of which % RE	9.90%	2%	7.50%	3%
of which % short-term	4.4%	21%	11.80%	40.5%

Source: PEG compilation from tariff petitions and statutory filings by the companies

Even with pioneering efforts, the Maharashtra state utilities, especially the state-owned distribution utility, MSEDCL which caters to about 95% of the consumers in the state, are facing financial and operational challenges. As per the annual report of FY19, MSEDCL's short-term borrowings by the end of the year were to the tune of Rs. 23,000 crores which is roughly equal to 30% of the utility's aggregate revenue requirement (ARR) of FY19. This is also higher than the prescribed limit of 25% of ARR for short-term loans under the Ujjwal DISCOM Assurance Yojana (UDAY), the central government bailout scheme which Maharashtra became party to in 2016.

The major contributor to this challenge is that revenue recovery, be it from tariffs, subsidies or charges, is not keeping up with the cost increase. Given the nature and scale of its operations, this note will focus on the challenges before MSEDCL as well as the prospects for the distribution utility going forward. Maharashtra also has three private utilities operating in the city of Mumbai. As Mumbai is the first area in the country where parallel licencing was rolled out, Section 2 details Mumbai's experience with retail competition as well as the ongoing power purchase and transmission changes in the city.

While MSEDCL has managed to overcome sustained shortages with capacity addition, a significant amount of the capacity added is under-utilised due to its relatively high costs, increasing the burden on consumers. The story of capacity addition as well as renewable energy power procurement in Maharashtra is detailed in Section 3 of this note. This is important as power procurement costs account for about 70% of MSEDCL's expenses.

Despite operating in one of the most industrialised states in the country, MSEDCL is unable to retain commercial and industrial (C&I) consumers in an effective manner due to non-competitive tariffs. This is primarily due to a rapid increase in its cost of supply which was about Rs.7.9/ kWh in FY19 and growing at a steady 4% per annum. With C&I consumers migrating to open access and captive options, MSEDCL is unable to rely on cross-subsidy from such consumers to meet the demand of small residential and agricultural consumers. Agricultural consumers are in receipt of significant state government subsidies. While agricultural demand has been growing, there are significant issues with the veracity of agricultural data and its use in the estimation of demand and distribution losses in the state. With low-cost renewable energy (RE) options, the rate of sales migration could steadily increase. However, RE also provides opportunities to reduce the cost of supply for agricultural consumers. These trends and associated policy developments are explored in detail in Section 4 of this state overview.

With its financial challenges, investment in distribution networks, efficient management of existing operations and ensuring quality supply and service is crucial for MSEDCL. Trends in distribution costs and accountability for supply and service quality are described in Section 5 and 6.

Maharashtra has also been known for creating and expanding participatory spaces in regulatory processes which has helped in informed decision making, enhancing public accountability and deliberation towards innovative solutions for challenges before the sector. However, in recent years these spaces have been shrinking with decision making becoming more litigious. Between 2015 and 2020 around 15% of the cases before APTEL were appeals against orders of MERC. The note ends with a commentary on regulatory oversight and governance in the sector.

2 Electricity Distribution and Supply in the city of Mumbai

2.1 Parallel licensees

Mumbai is the only city in the country where consumers can choose to move from one distribution utility to another. This was done with the objective of promoting competition and consumer choice[2]. However, when TPC was declared a parallel licensee, it did not have its own network to cater to consumers in Mumbai. It approached the commission with a network rollout plan, which would have taken time to implement. In order to allow consumers to exercise choice without waiting for a new network to be built, MERC asked TPC to explore the possibility of using RInfra's wires in the interim. The commission then put in place a protocol called "changeover" in suburban Mumbai[3] in 2009, which allowed consumers to avail of TPC's supply while remaining connected to RInfra's wires through open access. This was unique because under the Electricity Act, 2003, wires and supply are considered as one and part of the electricity distribution business; in the absence of carriage-content separation, the Act requires parallel licensees to have their own separate networks. This requirement was temporarily relaxed in the case of Mumbai. However, changeover could not be operationalised in the island city, since BEST is a 'local authority' under the provisions of the Electricity Act and, is exempt from providing open access to its wires network. Interestingly, while consumers have been given a choice of moving from one licensee to the other, the tariffs are not competitively determined, but are set by the MERC. In addition, the companies operate in cost-plus system, so all their prudent costs are passed onto consumers.

Following the operationalization of changeover many consumers moved to TPC, as at that point of time tariffs of TPC were much lower than that of the other two licensees. However, two important questions with regards to the introduction of competition remained unresolved. The first was the question of cross-subsidy and revenue gaps. At the time of the changeover protocol, RInfra was servicing all suburban Mumbai consumers. Given the cross-subsidy structure of Indian electricity tariffs, RInfra needed large consumers to cross-subsidize its subsidized consumers (mostly residential). In addition, past revenue gaps that RInfra had accumulated needed to be recovered from its consumers. With many (mostly large) consumers changing over to TPC, it was unclear who would pay for the loss in cross-subsidy or the revenue gaps. The second was the question of TPC's network. While changeover allowed TPC to use RInfra's wires to supply electricity to consumers, this was an interim arrangement. There was no clarity on whether and for how long this arrangement should continue and the need and extent of TPC's parallel network in the long term, nor on the manner of expansion of this parallel network.

[2] Faced with the prospect of introducing competition in Mumbai, the commission found Mumbai to be "technically and financially well-equipped to enter the phase of a competitive electricity market" (Case no. 14 of 2002. Maharashtra Electricity Regulatory Commission).

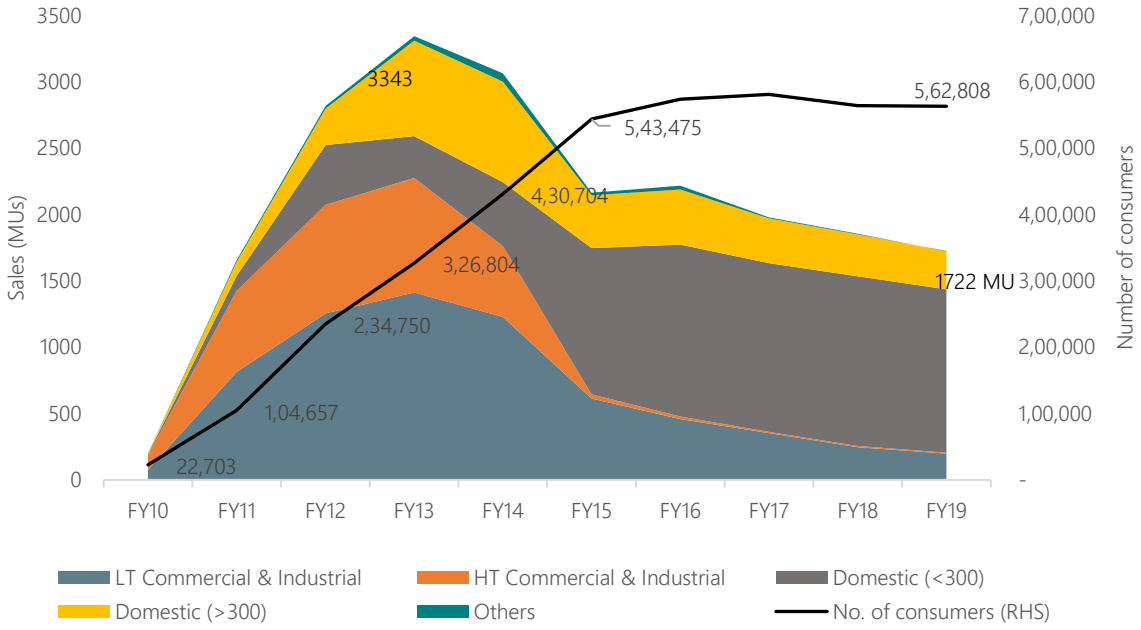
[3] Case no. 50 of 2009 – Interim Order. Maharashtra Electricity Regulatory Commission.

2.2 Losses and payments

In the meantime, the increase in costs of both RInfra and TPC led the commission to create regulatory assets, such that the pending revenue recovery was spread over multiple years. These regulatory assets would be paid for by consumers through the levy of the regulatory asset charge (RAC). In July 2011, nearly two years after the operationalization of changeover and with 1.54 lakh consumers having chosen changeover, MERC, on the directions of the APTEL, decided that changeover consumers too would have to pay RAC for RInfra[4]. The MERC in the same order also allowed RInfra to charge cross-subsidy surcharge (CSS) to changeover consumers. Finally, since many HT commercial and industrial consumers (subsidizing) had opted for changeover, to correct the skewed consumer mix, the commission managed the tariff so as to have a balance between large and small consumers for both competing distribution companies[5]. These charges also resulted in different categories of consumers moving in and out of the changeover consumer category, as can be seen from Figure 1.

Currently, changeover remains lucrative for certain categories of consumers, those able to take advantage of lower TPC energy charges and lower AEML wheeling charges, such as domestic consumers with less than 300 units of consumption. This has resulted in an increase in the number of changeover consumers even as changeover sales have fallen, as can be seen in Figure 1.

Figure 1: Changeover consumers of TPC-D



Source: PEG compilation from various regulatory orders and petitions.

For these consumers, changeover succeeded in providing choice, even if it did result in a complex tariff structure. From FY21 onward, no more RAC has been approved by the MERC[6]. From FY09 to FY19, Mumbai's electricity sales increased from 14,840 MU to 18,356 MU[7], inclusive of open access sales, a CAGR of 2% over this period. Open access sales increased significantly from FY16 onwards, and in FY9 accounted for 21% of all HT sales in Mumbai.

[4] Case no. 72 of 2010. Maharashtra Electricity Regulatory Commission.
[5] For analysis of Mumbai's power sector and power purchases, read: In the Name of Competition: The annals of 'cost-plus competition' in the electricity sector in Mumbai: https://www.prayaspune.org/peg/publications/item/333
[6] Case no. 325 of 2019 and Case no. 326 of 2019. Maharashtra Electricity Regulatory Commission.
[7] This total includes the sales (MU) of BEST, TPC, AEML and the OA sales as reported by TPC and AEML.

2.3 Network rollout

While the parallel network question remained un-resolved, the MERC had allowed TPC to spend on network expansion and both TPC's changeover and direct consumers were increasing. In response to RInfra's allegations that TPC was selectively laying down its network and cherry-picking RInfra's high-end subsidizing consumers, the commission in August 2012 ordered TPC to complete network expansion in 11 identified clusters[8], and then in October 2013 declared all consumers in those clusters with less than 300 units of monthly consumption (~ 8 lakh consumers) as direct consumers of TPC[9]. In response to appeals against this order, APTEL rebuked the commission for exceeding its jurisdiction by transferring consumers. It stated that consumer choice should be protected and wherever possible network duplication should be avoided.

In November 2015, MERC appointed a committee to come up with a criterion for extension of network to supply electricity to consumers such that network duplication is minimized. The committee submitted its report in March 2016 and the MERC gave its order in the case in June 2017. In its order, the commission divided the area of Mumbai based on four scenarios (a to d) grouped based on network(s) present in the area. The committee split consumers into five levels (1 to 5) based on the ease with which the premises can be connected as well as their voltage. For the scenario where the area is covered by one or both licensees, but where projected growth could increase the number of consumers (Scenario d), for consumers in Level 3 to 5, the distribution licensees must make a proposal to a new committee established for this purpose, called M-DNAC (or the Mumbai Distribution Network Assessment Committee). This committee assesses the comparative costs and decides which utility is better placed to provide the connection[10].

The lack of clarity on the arrangement for network rollout and phased transition to an optimal arrangement, finally resulted in a complicated system of distribution planning in suburban Mumbai. In the Island City, since open access was never an option, TPC is building a duplicate network. As per TPC, it would require 7 years to complete its network rollout in both suburban Mumbai and the Island City. Recently, MERC expressed its concern at discrimination by TPC in laying down its LT network near areas where its HT infrastructure is operational[11].

Apart from the cost of inefficiency inherent in any network duplication exercise, the rollout may in fact hamper the possibility of competitive tariffs and would require proper oversight from the commission.

2.4 Power purchase and costs

Power purchase accounts for 70% of the costs of Mumbai utilities and hence, efficient power purchase planning is essential to lowering costs. Historically, the distribution utilities have not signed competitively bid contracts, preferring cost-plus contracts with (mostly) their sister companies (see Box 2, Table 3).

[8] Case no. 151 of 2011. Maharashtra Electricity Regulatory Commission.
[9] Case no. 85 of 2013. Maharashtra Electricity Regulatory Commission.
[10] Case nos. 182 of 2014 and 40 of 2015. (MERC). M-DNAC's composition includes: one/more MERC technical officers not below Dy. Director rank.; one/ more technical external members, and may include Consumer Representative (CR). M-DNAC, constituted in, 2017, consisted of two MERC technical officers, one Ombudsman, two external members from MSEDCL, one CR). As re-constituted in 2019, M-DNAC consists of two technical officers, one Ombudsman, one MSEDCL member. There are no CRs in M-DNAC.
[11] Case no. 326 of 2019. Maharashtra Electricity Regulatory Commission.

Box 2: Overview of power procurement by Mumbai utilities

Table 3: Current contracted capacity of Mumbai utilities

Station	Ownership	Fuel	Contracted Capacity (MW)	Signed	Term (years)	Tariff FY19 (Rs/unit)
BEST						
Walwahan Solar Energy	Tata Power	Solar	20	2013	25	8.32
Tata Power Unit 5	Tata Power	Coal/Oil/Gas	256	Signed: 2006, Extended:2019	5	5.44
Tata Power Unit 7	Tata Power	Gas	92			3.3
Tata Power Unit 8	Tata Power	Coal	100			5.42
Tata Power-Hydro	Tata Power	Hydro	228			2.1
AEML						
ADTPS (Dahanu)	Adani Industries	Coal	500	Signed: 2008, Extended:2018	5	4.44
VIPL	Reliance Power	Coal	600	2012	25 years, PPA terminated in 2019	
Dhursar Solar Power	Reliance Power	Solar	40	2011	25	10.46
Reliance Innoventures	Reliance Power	Wind	45	Na	M/L	4.85
Reliance Clean Power	Reliance Power	Wind	45	Na	M/L	5.81
TPC						
Tata Power U5	Tata Power	Coal/Oil/Gas	244	Signed:2006, Extended:2019	5	5.44
Tata Power U7	Tata Power	Gas	88			3.3
Tata Power U8	Tata Power	Coal	150			5.42
Tata Power-Hydro	Tata Power	Hydro	218			2.1
Palsawade Solar	Tata Power	Solar	25	2014	25	8.98
Khandke	Tata Power	Wind	50.39	2007-2008	13	5.45
Visapur (GSW)	Tata Power	Wind	24	2013-2014	13	5.81
Visapur (GSW)	Tata Power	Wind	8	2013-2014	13	5.67
Agaswadi	Tata Power	Wind	49	2011-2012	13	4.56

Note: Table shows PPAs for contracted capacity more than 20 MW.
Source: PEG compilation from tariff orders and recent orders related to power purchases.

While historically reluctant to sign competitively bid contracts, recently there has been a spate of bidding-based RE procurement in Mumbai, which is expected to begin supply in the next few years.

- AEML discovered Rosepetal Solar Energy Private Limited, a sister concern, in the bidding for 350 + 350 MW (green horn) wind-solar hybrid, at a cost of Rs. 3.35/kWh; as a result of the MERC's order, it renegotiated the tariff to Rs. 3.24/kWh[12]. A 25-year long-term agreement has been signed between the parties, with supply expected from FY 2021-22.
- Similarly, TPC signed a 25-year long-term contract with Tata Power Renewable Energy Limited, its sister concern, that emerged as the least-cost bidder in the bidding for 150 MW of solar power, at a cost of Rs. 2.83/kWh[13]. Supply from this project is expected to begin from June 2022.
- TPC also approached the commission to conduct bidding for the long-term procurement of 225 MW Wind-Solar hybrid[14]. The bid was won by Tata Power Green Energy Limited, another sister concern, at Rs. 2.59/kWh and the long-term (25 years) PPA was approved in August 2020[15].
- Finally, BEST had undertaken medium-term competitive bidding for 750 MW. However, the transmission scenario in Mumbai made it necessary to have certain units of Tata Power running for system stability. Hence, BEST's PPA with TPC for 667 MW was extended for 5 years (FY24)[14]. However, it also signed a PPA with Manikaran Power Ltd. and its developer Sai Wardha for 100 MW till FY24 at Rs. 4.55/kWh. However, there were delays in signing the PPA that resulted in no power being supplied from Manikaran in FY20. The supply is now expected to commence from April 1, 2020[16]. MERC has also directed BEST to undertake bidding for solar and non-solar purchase, with supply beginning from FY23 onward.

Currently, TPC sells its generation from Trombay and its hydropower plants to its own distribution arm and BEST. AEML purchases power from its own generation station at Dahanu and till very recently, from Vidarbha Industries Power Limited (VIPL), a sister concern of RInfra[17].Long-term (non-RE) cost-plus capacity of Mumbai utilities (mainly Trombay and Dahanu) costs around Rs. 4.5/kWh. Rates for RE cost-plus capacity vary widely, as can be seen from Table 3. The newly contracted RE capacity of TPC and AEML are expected to bring down their costs in the next five years.

In the case of Mumbai, expensive power and a reluctance to sign competitively bid contracts has resulted in an increase in costs to consumers as well as the creation of regulatory assets for all the three utilities. The trend of procuring long-term PPA-based power only from sister companies continues to date, with both AEML and TPC signing long-term renewable energy PPAs with sister concerns (detailed in Box 2).

In 2009, when Tata Power decided to stop sale of power to RInfra, RInfra had a firm PPA only with its own generation station at Dahanu, which catered to 500 MW of its 1500 MW demand. The utility had not signed a PPA despite the MERC's orders. RInfra pursued all legal channels to get back Tata Power's supply but did not sign a long-term PPA till FY14. In the meantime, it met its shortfall through purchase of expensive short-term power. For example, by FY11, it was purchasing 38% of its power from the short-term market at Rs. 5.57/kWh. The combination of high-cost power and a commission-imposed tariff freeze during this time, resulted in huge revenue gaps, which the commission allowed to be passed onto the consumers[18]. However, to avoid a tariff shock, the commission created regulatory assets. A regulatory asset of Rs. 3,377 crore (64% of the ARR for RInfra in FY13) till FY12 was approved by the commission for recovery from consumers[19]. MERC decided to turn TPC's revenue gaps into regulatory assets as well, amounting to Rs. 760 crore at the beginning of FY16[20]. Similarly, MERC created a regulatory asset of Rs. 300 crore for BEST in FY12.[21]

In recent years, since the price of the short-term purchases was lower than the rate of their contracted capacity, the utilities were able to lower their cost of supply. While taking advantage of lucrative short-term prices is beneficial in lowering costs, in the case of Mumbai, such purchases occur because of contracting expensive, non-competitive power or not contracting power at all. Short-term purchases should be used as a strategy after ensuring that consumers are not being put at unnecessary risk. In FY19, the percentage of short-term purchase by BEST, AEML and TPC was 22%, 41% and 12% respectively.

2.5 Transmission Planning

Mumbai has its own electricity grid, connected to the Maharashtra state grid through transmission lines, whose capacity determines the amount of power that can be brought into and sent out from the city.

[12] Case no. 281 of 2019. Maharashtra Electricity Regulatory Commission.
[13] Case no. 292 of 2019. Maharashtra Electricity Regulatory Commission.
[14] Case no. 88 of 2020. Maharashtra Electricity Regulatory Commission.
[15] Case no. 152 of 2020. Maharashtra Electricity Regulatory Commission.
[16] Case no. 324 of 2019. Maharashtra Electricity Regulatory Commission.
[17] The PPA with VIPL stands terminated from December 16, 2019.Details available here: https://prayaspune.org/peg/resources/power-perspective-portal/268-vipl-termination-lapses.html
[18] After issuing the tariff order on June 15, 2009, MERC stayed tariff increase for some consumer categories of AEML (then RInfra) on July 15, 2009. This stay was vacated on September 9, 2010.
[19] Case no. 9 of 2013. Maharashtra Electricity Regulatory Commission.
[20] Case no. 18 of 2015. Maharashtra Electricity Regulatory Commission.
[21] Case no. 171 of 2011. Maharashtra Electricity Regulatory Commission.

This does not apply to the generation from TPC and AEML since these have their own dedicated transmission lines. TPC's Trombay generation stations and AEML's Dahanu are "embedded generation" and taken together are 1,877 MW. In FY17, Mumbai's peak demand was 3,531 MW. The transmission capacity available at 1,767 MW, was just enough to import power to meet the peak demand[22].

In the past, the lack of timely augmentation of the transmission capacity has resulted in a constraint on the import of power, and Mumbai utilities have had to sign contracts with expensive embedded generation. While the commission has repeatedly remarked on the fragility of the Mumbai system, little action has been taken to augment the transmission capacity.

More recently, the transmission system constraints resulted in complications during BEST's competitive bidding. While it received bids from many generators, BEST was unable to sign contracts due to transmission constraints. As per the State Transmission Utility (STU), the Mumbai transmission system requires the running of the embedded generation (500 MW Trombay Unit 5 of TPC in particular) for ensuring reliability and security of the Mumbai power system[23]. This required BEST to extend its contract with TPC and continue purchases from Unit 5. As per the STU, system stability required these plants to remain on bar till the commissioning of the 400 kV receiving station at Vikhroli, which is expected in the next few years. Thus, BEST's contract was extended in 2019 with TPC till FY24. The Vikhroli substation is seen as key to easing the constraint on transmission. Interestingly, this project was till recently with TPC's transmission arm. The project was approved in June 2011, with the works expected to be completed by March 2015. The commission took this project away from TPC due to inordinate delay in September 2018[24]. Subsequently, tariff based competitive bidding was carried out by the STU in which Adani Transmission Limited was selected as the least cost bidder to develop the project on a build-own-operate and maintain basis[25]. To ease the transmission constraint, a 1000 MW HVDC (VSC based) Link between 400 kV MSETCL Kudus & 220 kV AEML Aarey EHV station, estimated to cost Rs. 6,700 crore was approved to be built by a subsidiary of Adani Electricity Mumbai Limited as a cost plus project[26] by MERC. Such a massive strategic project was awarded on a cost-plus basis despite experience with inordinate delays and cost escalation with this route not just across the country but even in Mumbai.

[22] Case no. 5 of 2017. Maharashtra Electricity Regulatory Commission.
[23] Case no. 249 of 2018. Maharashtra Electricity Regulatory Commission.
[24] Case no. 204 of 2017. Maharashtra Electricity Regulatory Commission.
[25] Case no. 141 of 2020. Maharashtra Electricity Regulatory Commission.
[26] Case no. 190 of 2020. Maharashtra Electricity Regulatory Commission.

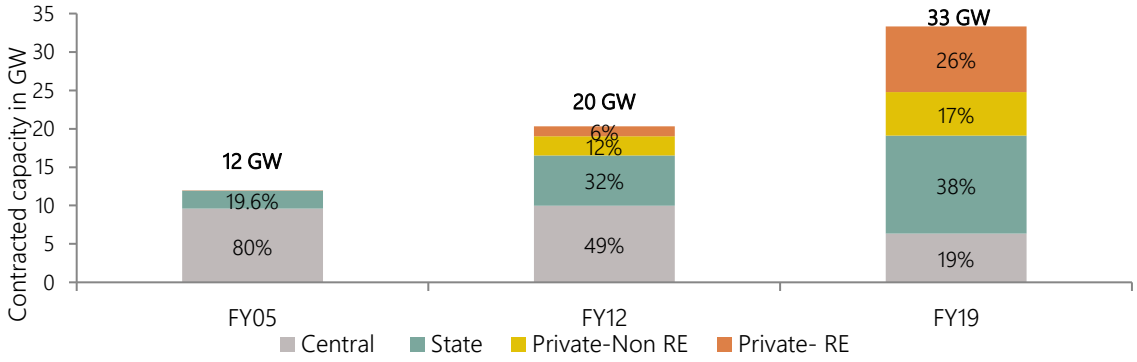
3 Power purchase planning for MSEDCL

3.1 Capacity addition and Power Procurement

Between 2001 and 2005, the MSEB faced massive shortages. On an average about 1/5th of the demand remained unmet. MSEDCL's power procurement was not keeping pace with its demand growth. In fact, between FY01 and FY05 while demand increased by 22%, generation grew by merely 12%.
Part of the sluggish progress was the financial situation of MSEB as well as reluctance to add capacity due to the failed experience with procurement from Enron's Dhabol Power Company (DPC).[27]

By 2005, with the state reeling under sustained power shortages, MSEDCL initiated competitive bidding to procure power and also invested in substantial capacity addition of MSPGCL. Due to the efforts since FY05, capacity sourced from conventional sources increased by almost 12.8 GW between FY05 and FY19. Renewable energy capacity increased by 8 GW in the same period. Figure 2 details the capacity addition in the state since 2005 by ownership. About 80% of MSEDCLs power procurement has continued to be from coal-based sources since 2005. As can be seen, significant increase in procurement was due to the capacity addition by MSPGCL and private power plants mostly via competitive bidding. The share of RE procurement increased from 0.5% in FY05 to a 10% share in power procurement (MU) by FY19.

Figure 2: Contracted capacity by MSEDCL since FY05



Note: Power from central, state and private non-RE sources was mostly coal based.
Source: PEG compilation based on MSEDCL true-up petitions before MERC.

With this capacity addition, MSEDCL transitioned from a utility having chronic shortages to sustained off-peak surplus capacity. While reduced load shedding was welcome, the surplus capacity also came with its set of challenges. The power procured, in excess of demand was typically high cost and thus remained under-utilised or backed down as efforts to sell this capacity did not yield much success. Figure 3 (R.H.S) provides further details on the costs incurred for power procurement in this period.

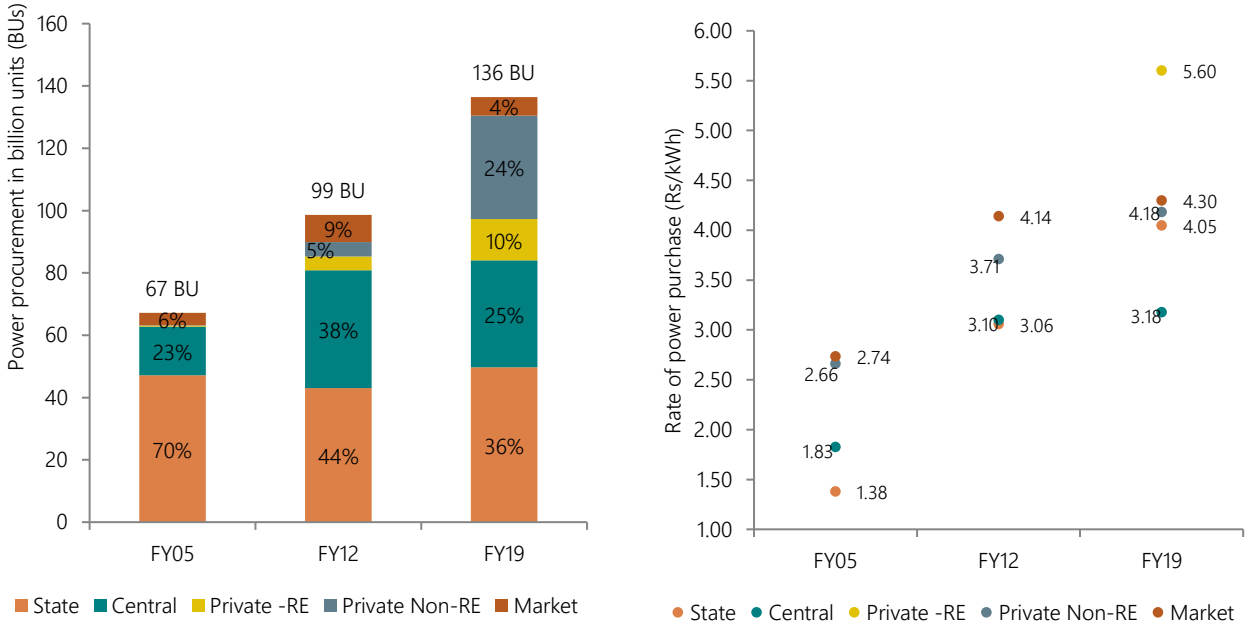
From Figure 3 (L.H.S), the relative dependence on power procured (MUs) from central and state sector sources has come down but the share from private sources both conventional and renewable has

[27] DPC was a gas based project contracted by MSEB in 1992, fraught with issues related to lopsided terms of contract, technology, fuel and capacity. Due to failure to meet technical commitments, the project was rescinded in 2001. It was revived in 2005 as Ratnagiri Gas and Power Pvt. Ltd. (RGPPL), a joint venture of NTPC, GAIL (India), MSEDCL and some financial institutions. Since commissioning in 2007 and 2009, RGPPL units have faced technical and operational issues as well as lack of fuel availability. Currently, it is supplying power to Railways at a tariff of Rs. 5.50/kWh made viable by transmission concessions by Maharashtra Government, tax exemptions and waiver of fuel marketing margin by GAIL. Please see: https://www.prayaspune.org/peg/publications/item/87, https://www.prayaspune.org/peg/publications/item/301, and http://www.rgppl.com/pdf/RGPPL%20AR%202018-19%20Final.pdf

increased. This trend in power procurement is even though 25% of the capacity (MW) added in the past 14 years is from MSPGCL plants (as shown in Figure 2). This could be because MSPGCL capacity was relatively high cost and consequently is often backed down (on economic principles). In fact, as seen in Figure 3, MSPGCL had the lowest average cost in FY05 but became much more expensive than central sector capacity by FY19. The coal-based capacity from private sources is also comparable in cost to new MSPGCL plants. Thus, most of the capacity added since 2005, has seen substantial cost increase. The details of MSPGCL capacity and private capacity contracted are in Sections 3.3 and 3.4.

Since most of the capacity addition thus far has been coal-based, the share of coal based power in MSEDCL procurement has stayed more or less at 80%. Figure 3, reports RE prices only for FY19 as RE procurement reporting, especially in FY05 and FY12 also included purchase from co-generation and captive sources skewing the prices. FY19 rate is the weighted average price of several projects. Recently, MSEDCL has been contracting capacity, especially solar at about Rs. 3/kWh. Given the fall in RE prices, it is expected that the weighted average price itself will fall to Rs. 3.85/kWh by FY25.

Figure 3: Power procurement mix (L.H.S) and cost (R.H.S) by ownership

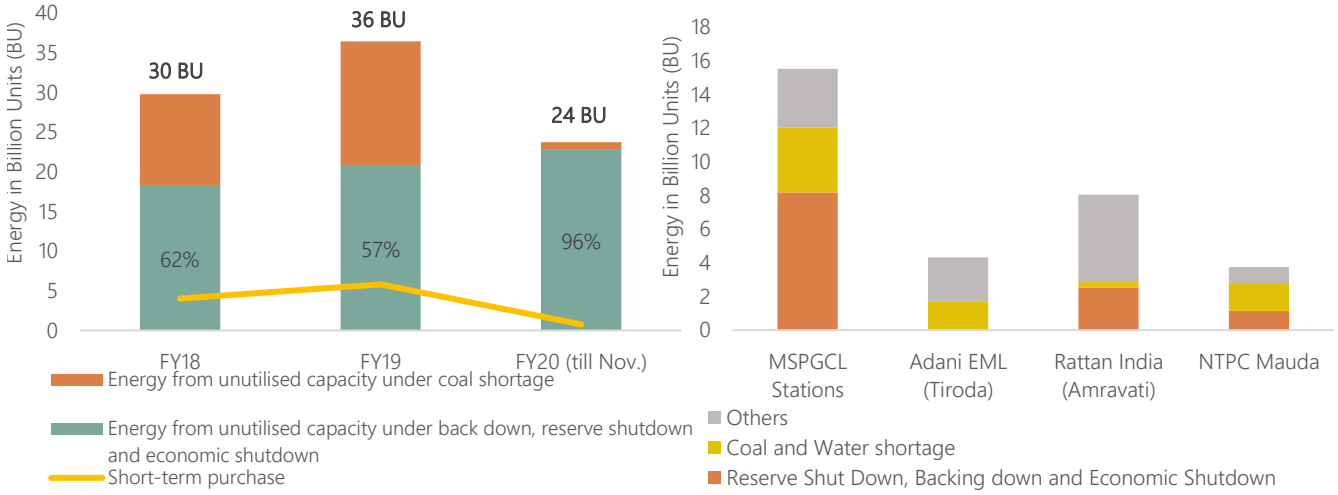


Source: PEG compilation from tariff orders and Petitions related to MSEDCL for various years.

3.2 Extent of surplus, shortages and its management

Since FY17 about 3-4 GW of thermal capacity contracted by MSEDCL has been under-utilised for various reasons. In many cases, the capacity itself was unavailable due to coal shortages. In fact, in FY18 and FY19, about 40% of the under-utilisation was due to coal shortages. With the easing of coal availability issues especially for MSPGCL, the potential generation from capacity unavailable due to coal shortages reduced dramatically to 4% of the generation from un-utilised capacity in FY20. This is shown in Figure 4 (L.H.S). Figure 4 (R.H.S) shows an indicative break-up of 'surplus' generation from unutilised capacity from each major generation company in FY18.

Figure 4: Details of surplus across years (L.H.S) and break-up for 1 year (R.H.S) (FY18)

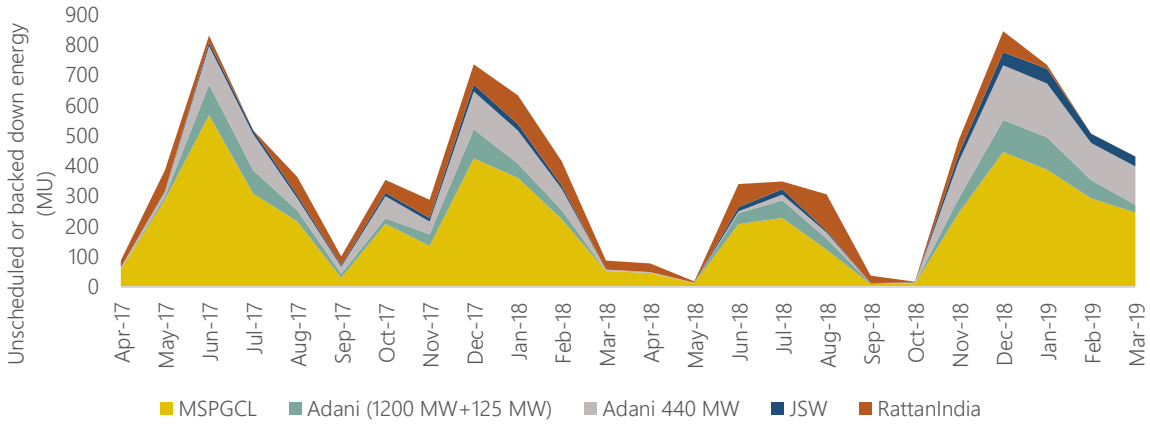


Source: PEG Compilation from data provided by MSEDCL in tariff petitions and from CEA thermal generation review.

In FY18 and FY19, much of the energy deemed surplus was due to coal shortage issues, especially for MSPGCL plants. Thus, it was because the contracted capacity was unavailable for dispatch. To compensate for the coal shortage or shutdown due to equipment failure, repair and maintenance requirements, MSEDCL had to resort to some amount of short-term procurement.

However, a sizable proportion of the surplus capacity was also due to underutilisation of available capacity due to lack of adequate demand at the time. As power is scheduled on economic principles such that thermal capacity with least variable (or marginal) cost gets scheduled first, high cost capacity can be unscheduled even if available especially when demand for is subdued. This is called backing down. As opposed to Figure 4, Figure 5 focusses only on the month-wise backing down of capacity (not coal/water shortage, reserve shutdown, economic shutdown) from MSPGCL and contracted private sector capacity for FY18 and FY19. Backing down is seasonal and reduces significantly in the summer and post monsoon months. The contribution of MSPGCL and contracted capacity from Adani Power Maharashtra Limited to the total backing down is substantial.

Figure 5: Break-up of month-wise backing down

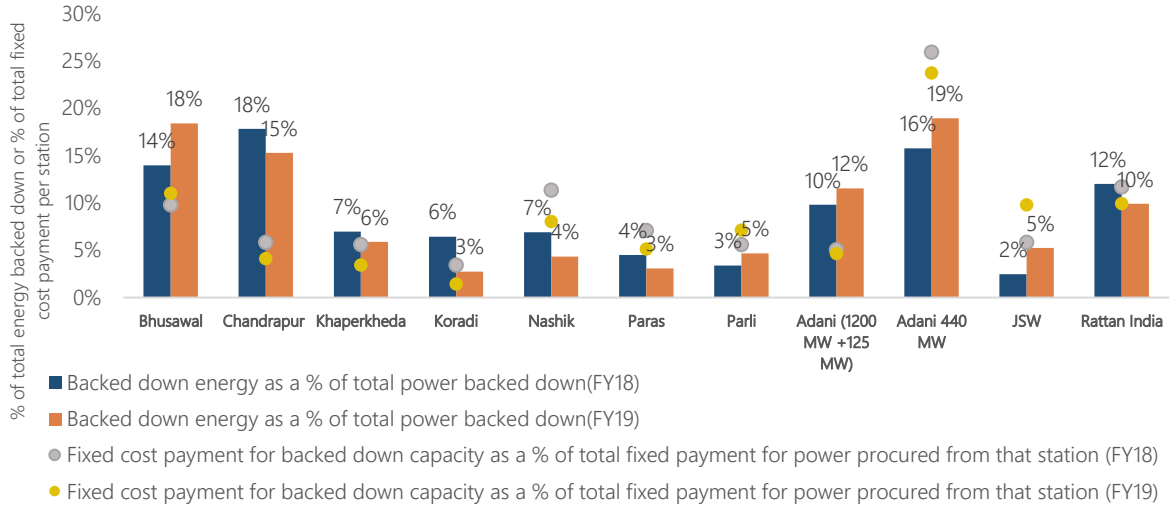


Source: PEG analysis of data provided by MSEDCL in tariff petitions.

This is clearer in Figure 6 which shows the extent of backing down of MSPGCL stations and private generators for FY18 and FY19. Thermal power contracts specify two-part payments such that a lumpsum amount or fixed cost is paid if the plant is backed down. Fixed cost payments paid towards unutilised

capacity can be significant and ranges from 1% to 26% of the total fixed cost payments made to the station in these years.

Figure 6: Extent of backing down and impact on fixed costs for FY18 and FY19

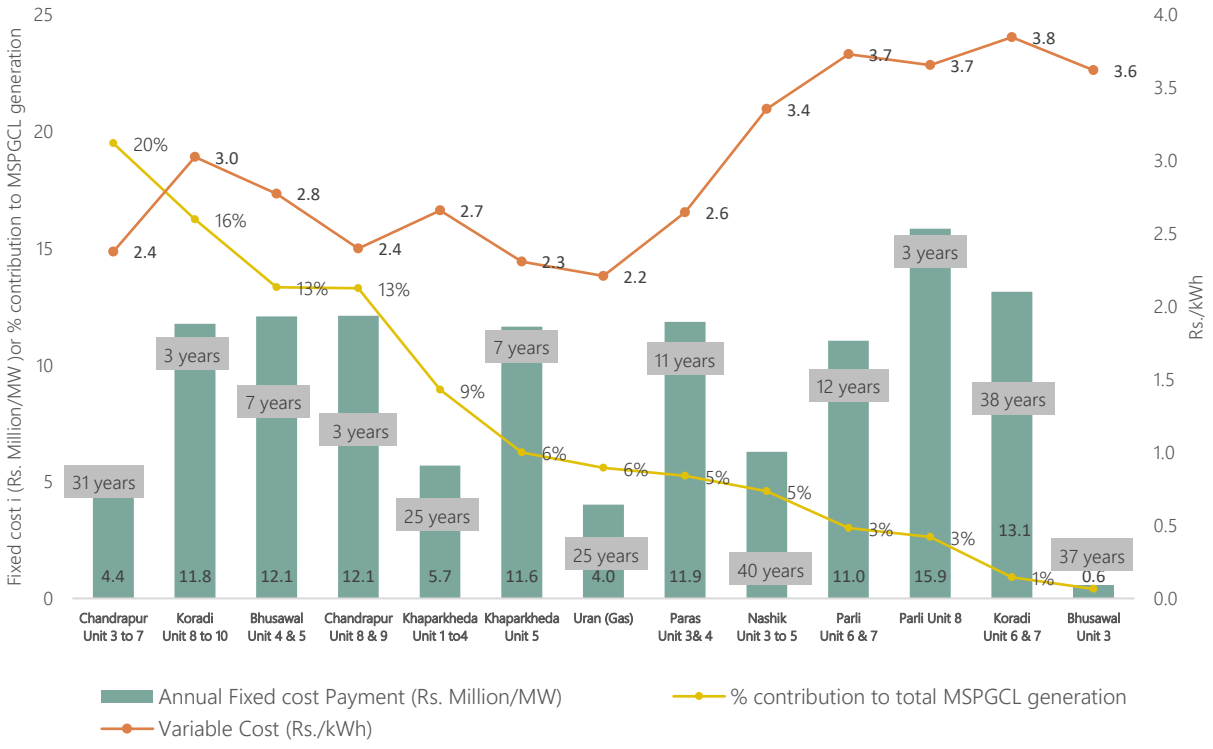


Source: PEG analysis based on data provided by MSEDCL in tariff petitions.

3.3 State sector capacity addition and its efficiency

MSPGCL's current capacity is 13 GW of which 76% is coal based, 5% is gas based and 19% is from hydropower. The average power procurement cost from MSPGCL stations in FY19 is Rs. 3.90/kWh which has risen at a rate of 4% on average since FY12. As thermal capacity contributes most of the power procured and the costs, this section will focus on the performance and cost of thermal plants. Figure 7 provides details on the average vintage (as on 31.03.2020) and costs (FY19) of MSPGCL stations.

Figure 7: Vintage, fixed costs (L.H.S) and variable cost (R.H.S) of MSPGCL capacity

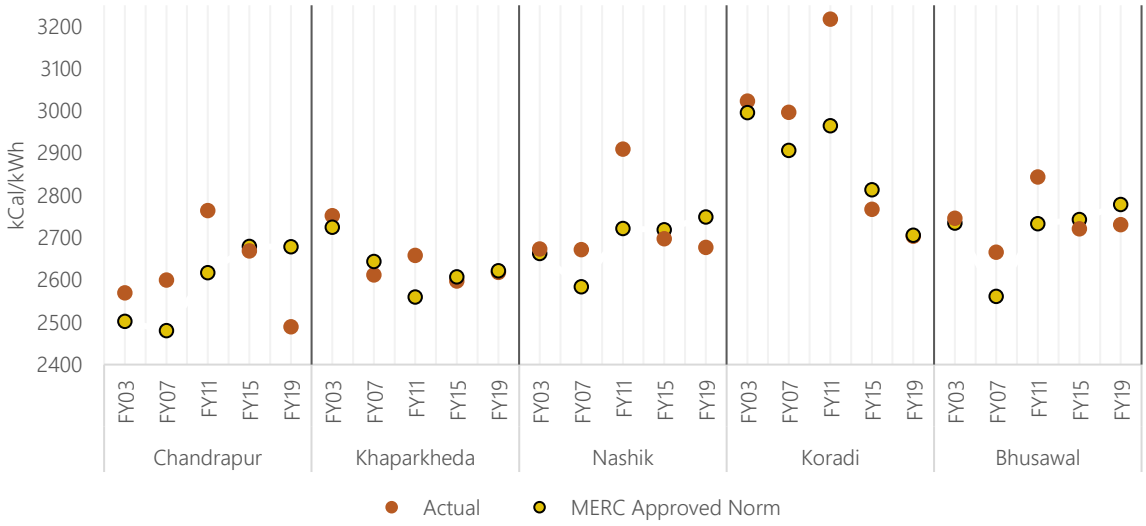


Source: PEG analysis of data from MSPGCL tariff petition and MERC orders.

The variable costs for these stations vary from Rs. 2.2/kWh to Rs. 3.6/kWh. The significant fixed cost requirement (without adjusting for availability) varies from Rs.40 lakhs per MW/year to Rs. 1.6 crores per MW/year. The fixed and variable costs depend more on performance characteristics of the stations, it's capital costs. delays in commissioning, plant location and the distance from coal source than on the age of the plant.

A crucial performance metric for cost-plus thermal capacity is the station heat rate (SHR). Station Heat Rate or the energy (kCal) required by the thermal plant to generate one kWh of electricity has significant impact on costs. In fact, the performance of the stations is evaluated by the Commission based on SHR improvement as compared to a pre-specified norm. Figure 8 compares actual heat rates and norms for older MSPGCL stations across years[28]. On average, there has been marginal improvements in actual SHRs especially in recent years. Reasons provided by MSPGCL for deterioration/ marginal improvement in SHR include station vintage, issues with coal quality and availability, unscheduled outages and part load operation due to backing down. It must be noted that except in the case of Koradi, the norm itself has been revised upwards over the years. Due to the norm revision, the stations appear to be performing well even though the improvements over the years have been marginal. This reduces accountability for this crucial performance metric. This can be observed for recently added capacity as shown in Figure 9.

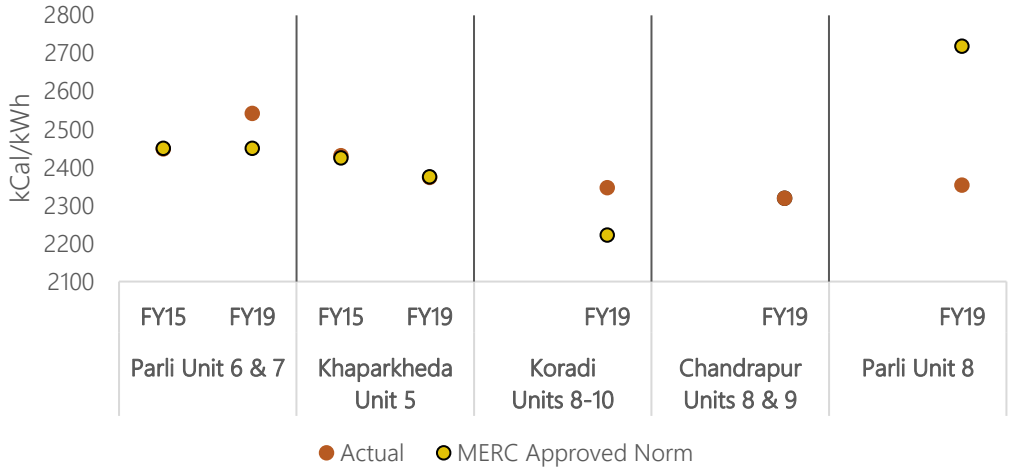
Figure 8: Station heat rates of older MSPGCL stations across years



Source: PEG compilation from MSPGCL tariff petition and MERC tariff orders across years.

[28] The changes between FY11 and FY15 could be attributed to restatement of station heat rates based on a study conducted by CPRI and commissioned by MERC across stations.

Figure 9: Actual and normative station heat rates for recently added MSPGCL capacity



Source: PEG compilation from MSPGCL tariff petition and MERC tariff orders across years.

A major reason for the significant fixed cost payments for new plants is not just the capital cost but also costs due to delays. Table 4 captures the delay in recently commissioned plants and the share of interest during construction (IDC) incurred due to delays.

Table 4: Delay and contribution of IDC to capital cost for recently commissioned capacity

Station	Delay (months)	IDC as a % of Capital Cost
Bhusawal Units 4&5	31	17%
Khaperkheda Unit 5	22	19%
Chandrapur Units 8 & 9	34	27%
Koradi Units 8 to 10	26	24%
Parli Unit 8	38	27%

Source: PEG compilation from MERC orders for capital cost approval for these stations

It is also curious that MSPGCL, while reporting challenges due to coal shortage in FY18 and FY19, has undertaken Case IV bidding (coal tolling)[29] to supply coal to private generators who in turn sell power to MSEDCL at a rate discovered via competitive bidding. Since MSPGCL has the flexibility to use allocated coal in of its stations, the necessity of this arrangement is not clear. In FY19, Ideal Energy Private Limited (IEPL)[30] and Dhariwal Infrastructure were allocated coal from Nashik Unit 1 and Bhusawal Unit 3 and supplied power at a rate of Rs. 2.7/kWh to MSEDCL. This rate is higher than the variable cost of Chandrapur Unit 8 & 9 as well as Khaperkheda stations which were facing coal shortages at the time and have variable costs 10% to 15% lower than the discovered rate of supply[31].

3.4 Private capacity addition

Figure 3 shows that thermal power procured from private sources is relatively high cost (as compared to central sources) which is evidenced by the increase in average power procurement rate from private sources over time, with capacity addition. The details of private thermal capacity added are in Table 6.

[29] Coal tolling allows state owned generating companies to allocate linkage coal allotted to them to private power companies through a process of bidding on the condition that the private player will supply power back at the same rate as the station from which the coal was allotted.

[30] Subsequently, the contract with IEPL was terminated due to non-payment of dues.

[31] It must be noted that the distance from these plants to Nashik and Bhusawal and from the private plants (IEPL and Dhariwal) to Nashik and Bhusawal is comparable.

The table captures the capacity contracted by MSEDCL through various rounds of competitive bidding. Some capacity, like LVTPL, JIPL, CGPL and Lanco Teesta has not materialised and is currently in the process of contract termination. Other competitively bid capacity, has seen significant escalation in fixed and variable costs. This is primarily on account of risks associated with coal availability which the developer sought to pass onto consumers[32]. The relief was provided under the 'change in law' provisions in the contract largely on account of change in the National Coal Distribution Policy and the SHAKTI Policy of the Union Government. Thus, any additional cost incurred in procurement of coal from alternative sources to the extent of shortfall in supply of linkage coal along with consequent carrying cost is to be compensated by MSEDCL.

In addition to the tariff paid in FY19, MSEDCL must pay additional payment as detailed in Table 5 on account of compensatory tariff and associated carrying cost of delayed recovery between FY13 and FY19.

Table 5: Impact of compensatory tariff due to change in law provisions for thermal power

Generator	Change in law Event	Compensation (Rs. Crore)	Carrying Cost (Rs. Crore)	Total (Rs. Crore)
APML	NCDP	3,094	1,443	4,537
	SHAKTI	2,352	242	2,594
	Lohara Block Cancellation	3,228	2,406	5,634
GMR Warora	NCDP & SHAKTI	75	40	115
	Total	8,748	4,131	12,880

Source: PEG Compilation from MERC Order in Case No. 45 of 2020.

Relief on account of NCDP and SHAKTI was also provided to Rattan India in a recent APTEL order. These three generators were awarded compensation for the shortfall based on actual SHR and GCV of the coal received which is likely to increase the compensation payable by MSEDCL. Currently, about Rs.0.20 to Rs.0.70/kWh is being provided as compensatory tariff on an ongoing basis on the variable charge for APML, JSW and Rattan India capacity. The compensatory tariff provided on this account has also resulted in shifting of positions of contracted capacity in the merit order stack. The extent of backing down of this capacity since provision of compensatory tariff needs to be ascertained.

To summarise, given uncertainty in regulatory treatment, especially with the treatment of fuel risks, the gains of competitive tariffs were not realized and instead the risk of fuel availability along with associated carrying cost are ultimately being borne by consumers, similar to cost plus projects.

[32]This is significant given that some developers quoted a fuel rates which were non-escalable or only partly escalable for 25 years even though the bidding framework provided a transparent passing on of costs. Through a series of litigations over a decade, majority of the contracted capacity was able to obtain additional compensatory tariff on account of increase in price associated with coal availability risks.

Table 6: Details of thermal private capacity contracted via competitive bidding

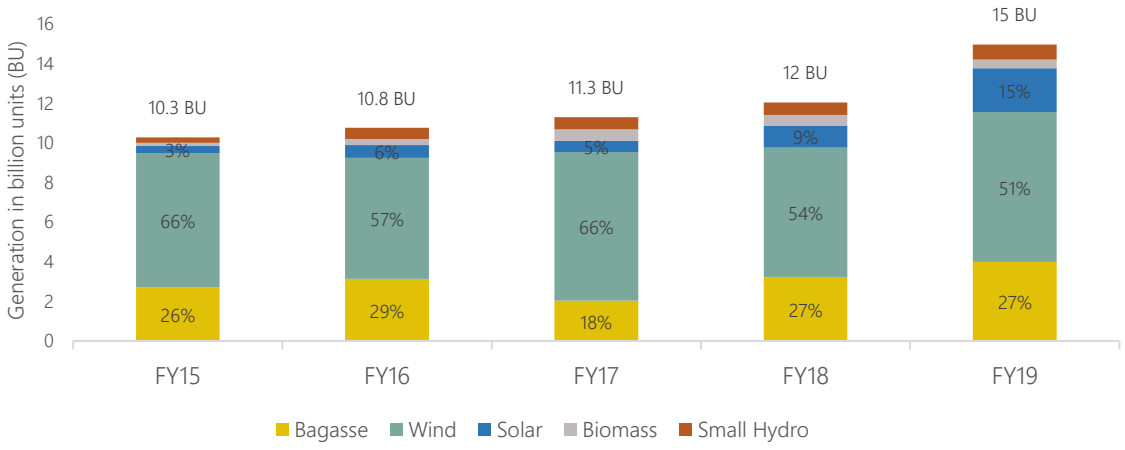
Company	Contracted Capacity	Date of PPA	Location	Fuel Source	Annual Capacity charge (Rs. Million/MW) (FY19)	Variable charge (Rs. /kWh) (FY19)	Compensatory tariff on account of change in law w.r.t NCDP, SHAKTI Policy
JSW Energy Limited	300	23.02.2010	Jaigad, Ratnagiri	Mix of imported coal and linkage coal	5.5	2.62	No
Coastal Gujarat Power Limited (subsidiary of Tata Power)	800	22.04.2007	Mundra, Kutch	Imported Coal (Back to back contracts with Indonesian mines)	6.0	2.01	No
Adani Power Maharashtra Limited (APML) (	125	09.08.2010	Tiroda, Gondia	Lohara coal block allocated for 800 MW in 2007, deallocated in 2009. Requirement met with combination of linkage, imported coal and through e-auctions.	10.0	2.59	Yes
	1200	31.03.2010			10.0	4.17	Yes
	440	16.02.2013			10.2	2.70	Yes
	1320	08.09.2008			7.7	1.71	Yes
GMR Warora Energy Limited	200	17.03.2010	Warora, Chandrapur	South Eastern Coalfields (Subsidiary of Coal India Limited)	8.4	2.23	Yes
Rattan India Power Limited (	450	22.04.2010	Nandgaonpeth, Amravati		6.9	3.05	Yes
	750	05.06.2010			6.9	3.05	Yes
Lanco Vidarbha Thermal Power Limited (LVTPL)	680	25.09.2008	Mandhva, Wardha		LVTPL filed for PPA termination. MSEDCL filed for recovery of liquidated damages. LVTPL facing NCLT proceedings for dispute resolution with its lenders.		
Coastal Andhra Power Ltd (CAPL) (subsidiary of Reliance Power)	800	23.03.2007	Krishnapatanam,	Imported Coal	Construction work has been stalled. Dispute over termination ongoing.		
Jharkhand Integrated Power Limited (JIPL)	300	10.09.2008	Tilaiya, Jharkhand	Captive coal mines	PPA terminated. Ownership transferred from Reliance Power to Jharkhand State Utility.		
Lanco Teesta Hydro Power Ltd	500	29.08.2006	Majitar, Sikkim	Hydro Electric Project	PPA has been terminated. Project taken over by NTPC.		

Source: Prayas (Energy Group) analysis based on information from tariff petitions and regulatory orders.

3.5 Renewable Energy

The increase in contribution of RE has taken place due to the rise in wind and solar capacity procurement, especially in recent years. This is driven by falling prices, an early shift from Feed in Tariff to competitive bidding as well as rising statutory requirement of RPO (Renewable Purchase Obligation). In fact, more than 90% of the RE generation in Maharashtra state (shown in Figure 10), has been purchased by MSEDCL to meet its RPO requirements.

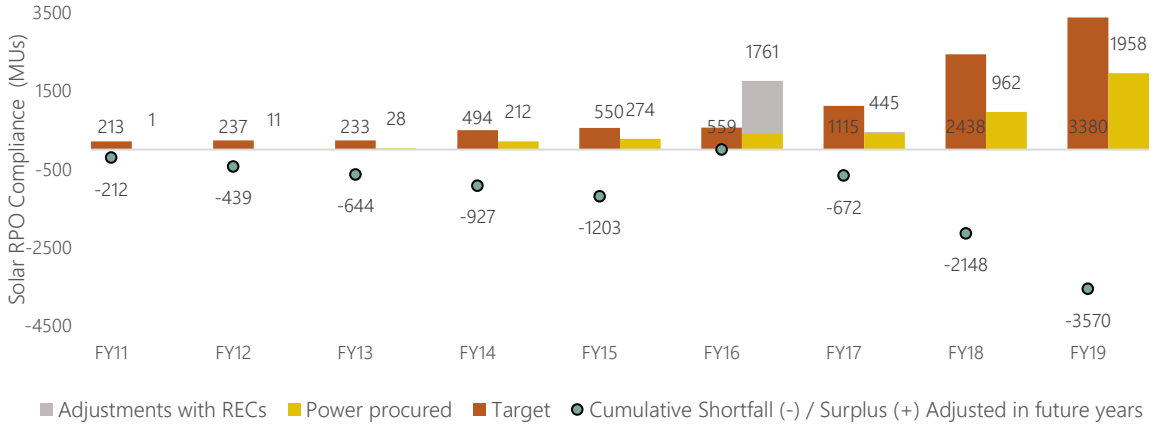
Figure 10: Source-wise RE generation in Maharashtra



Source: PEG Compilation from CEA monthly reports

Figure 10 shows that most of Maharashtra's existing RE generation and consequently, MSEDCL's procurement is from wind sources. A third of the generation is from bagasse and a 15% is from solar power. The share of solar power has seen a steady increase in recent years and will continue to see sharp increases with falling prices, increased procurement, and implementation of schemes such as the state government Mukhyamantri Saur Krishi Vahini Yojana for solarising agriculture specifically by having tail-end MW-scale plants located at the 33/11 kV feeder level. This scheme is discussed in greater detail in Section 4.1 of the report. Since RPO has been the major driver of RE procurement for MSEDCL till date, Figure 11 and Figure 12 capture targets and compliance with RPO for solar and non-solar commitments respectively.

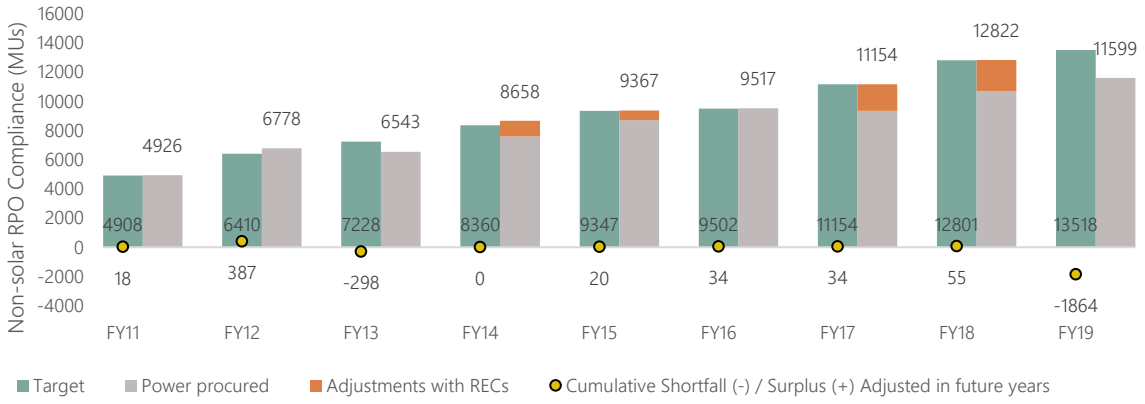
Figure 11: Solar RPO Targets, Compliance and carry forward of shortfall



Source: PEG analysis of various orders of MERC regarding RPO compliances, MERC tariff orders and analysis in the report Rising Stakes: An analysis of regulatory treatment of renewable electricity in Maharashtra from 2010-2020.[33]

[33] For more details please see: https://prayaspune.org/peg/publications/item/478

Figure 12: Non-solar RPO Targets, Compliance and carry forward of shortfall



Source: PEG analysis of various orders of MERC regarding RPO compliances, MERC tariff orders and analysis in the report Rising Stakes: An analysis of regulatory treatment of renewable electricity in Maharashtra from 2010-2020.[34]

Solar and Non-Solar RPO targets are specified by MERC as a proportion of the total energy requirement of MSEDCL. Non-Solar is dominated by wind and bagasse and includes small hydro[35] and other sources. As per the regulations, in case of non-compliance, the State Commission may direct the DISCOMs to deposit payments into a separate fund. The utilisation of the fund is to be determined by MERC.

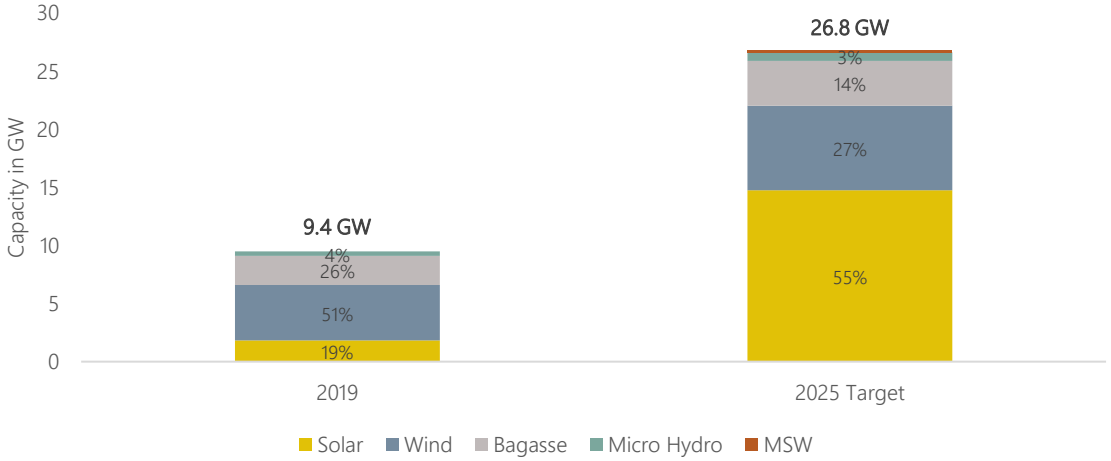
MERC was among the first Commissions to specify an RPO target for DISCOMs, open access and captive consumers in 2006[36]. MERC also specified penalties for not meeting the RPO target which were between Rs. 5/kWh for FY08 and Rs. 7/kWh for FY10. However, considering the efforts taken by DISCOMs and issues with availability, the penalties were waived in 2009[37]. Since 2011, MERC has been allowing MSEDCL and other utilities to carry forward any short-fall in purchase *vis-à-vis* the target for the control period. This practice was particularly utilised by MSEDCL for solar, as it regularly fell substantially short of target. In case of non-solar compliance, MSEDCL was able to meet and even exceed its RPO targets in many years and adjust certain shortfalls through renewable energy certificates (RECs).

In 2019, MERC revised its RPO regulations under which RPO targets for FY25 are specified at 25% (13.5% from solar and 11.5% from non-solar). This is currently the highest target in the country and has significant implications for future capacity addition by MSEDCL. A 25% RPO target implies that by FY25, about 37 BUs of MSEDCL power procurement will be from renewable energy sources.

The state RE policy released in December 2020[38] has committed to adding 17,360 MW of RE by 2025 in line with the 25% RPO target. The targets would result in Maharashtra being a solar dominated system from a wind dominated one as shown in Figure 13.

[34] For more details please see: https://prayaspune.org/peg/publications/item/478
[35] Within non-solar, MERC had also specified a small hydro target to promote adoption of the resource.
[36] Case No. 6 of 2006 dated 16th August 2006. Maharashtra Electricity Regulation Commission
[37] Case Nos. 104, 122 and 125 of 2008 dated 7th August 2009. Maharashtra Electricity Regulation Commission.
[38] For more details, please see: https://www.mahaurja.com/meda/data/other/Policy2020GridAndOffGrid.pdf

Figure 13: Potential RE capacity in Maharashtra as per policy targets for FY25



Source: PEG compilation from Maharashtra Solar Policy, regulatory orders and MEDA reports.

3.6 Future capacity addition

Most of the upcoming thermal capacity addition is from MSPGCL with marginal addition from Central Generating Stations and private thermal power plants. Like with most state-owned generating companies, MSEDCL has a standing PPA with MSPGCL for procurement of 100% of the power from its stations. The PPA, signed in 2009 has been amended multiple times. In 2010, when MSEDCL was also undertaking competitive bidding for power procurement, MERC approved additional procurement of 11,320 MW of MSPGCL capacity. Out of this, 5,230 MW has already been commissioned. Given growing surplus capacity and repeated demands by consumer groups, the Commission initiated a *suo-motu* process in 2017 to review status and requirement of the remaining 6,090 MW.

Some of the planned capacity was also intended to replace existing vintage MSPGCL capacity[39]. In a landmark order in March,2018 MERC directed MSPGCL to not take any steps for projects in the planning stage. MERC stated that any capital expenditure incurred for these projects shall be at MSPGCL's own risk and cost[40]. However, subsequently, in August 2018, MERC gave approval for Bhusawal Unit 6 proposed as a replacement capacity for Bhusawal Unit 2 and 3 and Nashik Unit 3. MERC also gave in principal approval of capacity of 1,320 MW at Koradi (Unit 11 and 12) to replace Koradi Unit 5, Nashik Unit 4 and 5, Parli Unit 4 and 5 and Chandrapur Unit 3. Details of the original 6,090 MW and its status are in Table 7.

Table 7: Status of 6090 MW proposed capacity

Name of Station	Capacity (MW)	Decisions by MERC/MSPGCL
Uran Expansion	1220	Kept in abeyance due to gas availability issues
Bhusawal Unit 6	660	Approval given
Dondaicha (Units 1 to 5)	3300	MSPGCL relinquished 1980 MW and diverted 1320 MW first to Umred (closer to coal sources) and finally to Koradi (proximity to Gare Palma captive mines of MSPGCL)
Nashik Unit 6	660	Kept in abeyance at the time.
Paras Unit 5	250	
Net capacity addition approved till 2023		1980 MW
Capacity slated for retirement by 2023		1880 MW
Net Capacity Addition by 2023		100 MW

Source: PEG compilation from Orders and petitions in Case Nos. 230 of 2019, 42 of 2017 and 322 of 2019

[39] Nashik Unit 6 was intended as a replacement for Nashik Units 1 to 5 and Paras Unit 5 was intended to replace Bhusawal Unit 2 and 3 and Koradi Unit 5

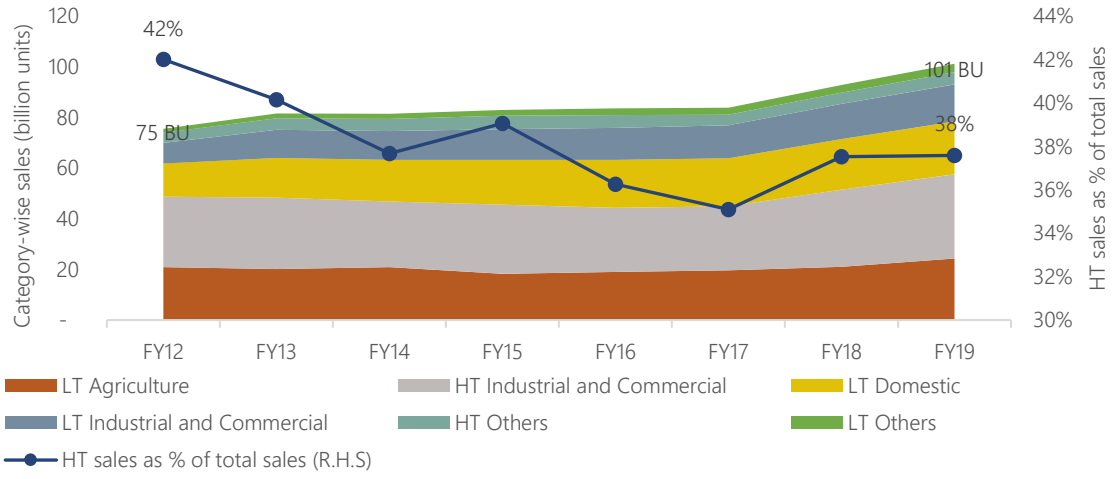
[40] Case.42 of 2017. Maharashtra Electricity Regulation Commission

Thus, currently, only a third of the earlier planned capacity has been approved by the Commission and that too as replacement for capacity that has either been retired or is slated for retirement. The effective capacity addition till FY23 is only 100 MW. Development of Koradi Units 11 & 12 has been deferred indefinitely due to Covid-19 related demand shocks and environmental concerns[41]. In addition to the 1,980 MW of new capacity from MSPGCL, MSEDCL has also contracted 336 MW from NTPC,[42] and 240 MW from Sai Wardha Power Generation Company Limited, taking the total thermal capacity in the pipeline to 2,587 MW. Given the marginal, planned net capacity addition and the revised RPO targets, any additional demand or 100% demand growth in the state will be met through renewable energy capacity addition.

4 MSEDCL's Demand and Revenue sources

MSEDCL's sales mix over a seven-year period shows that more than a third of the sales is to high tension (HT) Industrial and Commercial consumers, followed by a quarter of the sales to low tension (LT) agricultural consumers, and a fifth to residential consumers. This is shown in Figure 14. Sales grew from 75 BU to 101 BU at a steady rate of 4% per annum in this period. However, it is also clear that the contribution of HT sales to total sales has been declining over time. One of the reasons for the decline is HT sales migration via open access and captive options since FY12. The sales from commercial and industrial consumers as well as railways saw a significant reduction in growth during this period as these consumers were able to find competitive supply options in the market as compared to the tariffs they were paying. Given changes in open access charges in FY17, there was a 21% increase in commercial and industrial (C&I) sales by FY18 but it is uncertain if MSEDCL will be able to arrest migration to captive options, especially RE captive options, going forward. These trends are explored in greater detail in Section 4.2.

Figure 14: MSEDCL's changing sales mix



Note: Agricultural sales has been adjusted from FY14 onwards as per MERCs orders in Case 322 of 2019.
Source: PEG compilation from MSEDCL's true-up petitions and MERC's true-up orders over the years.

With increased sales migration, dependence on cross subsidy revenue from C&I consumers to support agricultural and residential tariff would also be increasingly limited. Trends in tariff design, cross subsidy

[41] https://timesofindia.indiatimes.com/city/nagpur/state-stays-koradi-plant-expansion-greens-rejoice/articleshow/76239979.cms

[42] This includes 25 MW from Gadarwara STPS Unit 2, 114 MW from Lara Stage 1 Unit 2 and 228 MW from Lara Stage 2 Unit 1 and 2.

and state government subsidy support are discussed in this context in Section 4.3. Figure 14 also shows a 13% dip in agricultural sales between FY14 and FY15. This dip in one of the largest consumer categories in the state is due to the re-statement of agricultural consumption by MERC stemming from the number of issues highlighted in various regulatory processes regarding the veracity of agricultural sales data. This restatement has implications for distribution losses, subsidy, cross subsidy, and costs and is detailed in Section 4.1, along with other aspects of agricultural demand and the recent initiative to solarise agricultural feeders.

4.1 Agricultural demand in Maharashtra

Sales to agricultural consumers was about 24,281 MUs in FY19 accounting for 24% of total MSEDCL sales. Despite meterisation efforts, there are a large number of unmetered consumers in MSEDCL's area of supply. The average tariff paid by agricultural consumers in FY19 is about Rs. 4.61/ kWh. As MSEDCL's average cost of supply for the year is about Rs. 7.9/kWh, this implies that the balance is probably compensated by cross subsidy. In addition, the Government of Maharashtra provides tariff subsidy amounting to Rs. 2.58/kWh, resulting in agricultural consumers finally paying Rs.2.02/kWh on average.

Over the years, there have been significant investments to ensure agricultural consumers are supplied through dedicated feeders separate from other rural loads. In fact, as of 2017 only about 12% of agricultural consumers were receiving supply from mixed or rural feeders[43]. Significant efforts have also taken place to ensure that the dedicated feeders have AMI/MRI[44] meter reading capacity to ensure data recording without manual intervention. Agricultural consumers in Maharashtra currently receive 10 hours of supply on a rotational basis, typically in off-peak hours or night time. The exception to this is consumers receiving power from solarised feeders who receive 8 or more than 8 hours, day time supply.

Agricultural demand estimation and providing quality, reliable power supply to agricultural consumers has been a vexed issue for decades. Recent developments to hold MSEDCL accountable for demand estimation and power procurement for agriculture as well as schemes to reduce the cost of supply and provide reliable power supply are detailed here.

4.1.1 Challenges with demand estimation over the years

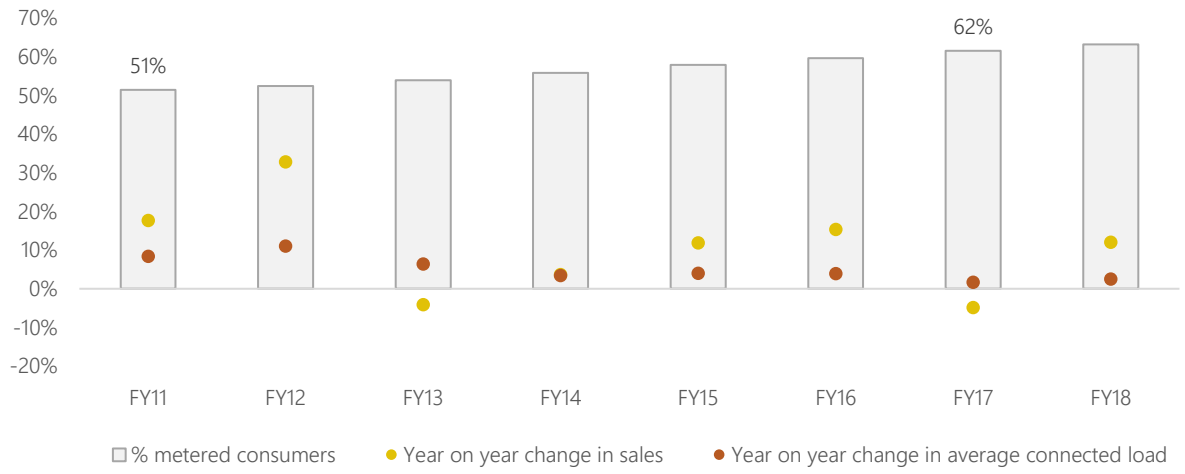
There have been several issues with estimation of agricultural demand possibly since significant number of agricultural consumers were unmetered. As the energy is estimated based on certain assumptions, DISCOMs have a perverse incentive to over-estimate agricultural consumption and underestimate distribution losses, a widely tracked performance parameter for the utility.

Till the inception of the electricity regulatory commission in Maharashtra, the accuracy of the methods employed for agriculture sales estimation was not questioned or critically examined. At the time, MSEB used to report losses in the low range of 18 to 20% and was regarded as one of the top performing utilities in the country. In the first tariff process before MERC, based on various data discrepancies and by highlighting methodological issues with estimation the Commission restated agricultural consumption by 7,497 MUs which revised the losses from 18% to a whopping 32%[45]. Similarly, another restatement of sales took place in FY07 where the Commission restated agricultural consumption by 5,266 MUs which increased the losses by 8 percentage points to 35%.

[43] Based on data submitted by MSEDCL in proceedings of Case 195 of 2017 (MERC)
[44] AMI refers to advanced metering infrastructure and MRI to meter reading instrument. Both technologies help with recording and transmission of energy related data with minimal manual intervention.
[45] Case No.1 of 1999 (dated 5th May 2000). Maharashtra Electricity Regulatory Commission.

Since its first tariff order, MERC has also been issuing multiple directives to stop the issue of unmetered connections and to meter pump sets on a sustained basis. However, issues with sales estimation persist especially with respect to the assumption used for normative consumption (kWh/HP/year).
Figure 15 captures the year-on-year change in sales and average connected load as approved by the Commission. Despite a steadily increasing share of metered consumers, the figure shows sharp dips and increases in sales and connected load on a year on year basis. In some cases, it is challenging to correlate these with change in hours of supply or agro-climatic factors.

Figure 15: Year on year variation in agricultural sales and connected load



Source: PEG compilation of data analysed by the working group on agriculture consumption study dated April 2020

A decade after the first restatement, in FY12 when MSEDCL was reeling under shortages and curtailing agricultural supply hours significantly, MSEDCL issued 1 lakh new unmetered connections and claimed increased agricultural sales by 33% in a year. This was highlighted by several consumer groups before the MERC and there was demand for more detailed assessment of disaggregated data submitted.

Again, in FY15, as part of its true-up submission, MSEDCL reported a significant increase in agricultural sales without any corresponding increase in connected load. During the proceedings, detailed assessment of disaggregated data showed that there were several feeders where the energy input was lower than the sales. Since negative losses were not possible, this highlighted issues with metering and accounting practices. Further, analysis of MSEDCL's circle-wise data for hours of pump operation per year showed that the pump operation was much higher in areas such as Nandurbar, Parbhani, Yawatmal, Beed, and Latur which are drought prone than in water-rich and better irrigated areas like Kolhapur, Sangli and Satara. Given the issues with estimation, MERC directed MSEDCL to undertake independent assessment of AG sales. The Commission decided to approve demand estimates from FY15 onwards based on the Committee report[46]. MSEDCL informed the Commission in 2016 that the MSEBHCL had constituted a committee to assess agricultural consumption. IIT Mumbai was appointed to assist the Committee with the study. However, even by September 2018, the report was not finalised and MERC decided to constitute an independent working group for agricultural consumption study (referred to subsequently as AGWG).

[46] In the interim the commission used feeder input data and a circle-wise specific consumption norm to assess sales. In doing so, MERC estimations were lower than MSEDCL estimates by 2414 MUs FY15, 3400 MUs in FY16 and 1880 MUs in FY17

4.1.2 Re-assessment of demand based on the findings of the AGWG

The AGWG used a dual approach for estimation of agricultural consumption. The working group conducted a survey of 1.33 lakh agricultural consumers using mobile app-based data collection along with geo-tagging. Further AMR/MRI data for 502 feeders provided by MSEDCL was used to estimate consumption in agricultural feeders. The results of the study showed that meters were present for only 17% of the 'metered' agricultural consumers in Maharashtra and where validation of readings were possible, more than 50% of the readings were incorrect (Figure 16).

Figure 16: Status of connections reported as metered

Source: Working group on agriculture consumption study dated April 2020

The analysis also showed that 30% to 40% of feeders consistently recorded load above total connected load of that feeder, possibly due to issues with high unregistered load or issues with consumer mapping.

While such analysis showed the need for investment to monitor and reduce technical losses at the feeder level, it also underscored that agricultural consumption (including for those deemed as metered) was over-estimated. The WG was able to establish that agricultural consumption was overestimated by 10,000 MUs and distribution losses were underestimated by 7.3 percentage points for FY19[47]. Using this analysis, the Commission re-estimated the norms to re-state distribution losses to 20.54% from the 14.7% claimed by MSEDCL for FY19[48].The impact of the restatement on various parameters are detailed in Table 8.

Table 8: Impact of restatement of agricultural consumption

Particulars for FY19	As per MSEDCL claims	MERC approved numbers based on WG report	Difference
Specific consumption norm (kWh/HP/annum)	1,515	1,181	
Agricultural consumption (MU)	32,696	25,380	-22%
Distribution loss (%)	14.7%	20.54%	5.84
Average agricultural tariff (Rs/kWh)	3.60	4.64	
Average subsidy payment (Rs. /kWh)	1.74	2.24	29%

Source: PEG analysis based on assessment in MERC order in Case 322 of 2019

Based on the re-estimation, the Commission also restated loss levels and agricultural consumption from FY15.The Commission also approved the broader methodology recommended by the AGWG for estimation of agricultural consumption in subsequent years. MSEDCL, aggrieved by the disallowance has filed an appeal before the APTEL and the proceedings are ongoing.

[47] The final report of the AGWG submitted to MERC is available here: https://www.prayaspune.org/peg/publications/item/457

[48] Case No. 322 of 2019 dated 30th March 2020. Maharashtra Electricity Regulation Commission

4.1.3 Solarisation of feeders in Maharashtra

With feeder segregation and curtailment of agricultural load, farmers were receiving power during off-peak or during the night. To address the challenge of providing reliable power to farmers during the day and to reduce the cost of supply of catering to agricultural demand, the Maharashtra State Government launched the Mukhyamantri Saur Krushi Vahini Yojana (MSKVY) in June 2017. The MSKVY scheme also served as a model for the solar feeder approach under Component A of the Union Government's KUSUM scheme launched in 2019 and the modifications to Component C of the scheme in 2020.

The idea of the scheme is to install 2-10 MW solar plants to cater to all agricultural loads on dedicated agricultural feeders. The plant is to be installed and maintained by the developer selected via competitive bidding for a fixed, levelized tariff for 25 years. As the cost of solar generation, discovered by the process would be lower than the cost incurred by the DISCOM to supply power to agricultural consumers, there will be savings in subsidy and cross subsidy. Further agricultural consumers will avail reliable day time supply. As the feeder is energised during daytime, power can also be drawn from the grid in case solar generation in unavailable. MSEDCL could claim solar generation under the scheme for its RPO compliance. Government, private or agricultural land can be used for the scheme.

As per the scheme both MSEDCL and MSPGCL are implementing agencies. In the initial rounds of bidding, there was lacklustre interest which has been attributed to issues with the timelines, limitations of the tendering process and aggressive ceiling tariff considered by MERC. To address this, MSEDCL has invited open tenders through various rounds till 3000 MW is fulfilled with a ceiling tariff of Rs. 3.30/kWh. Modifications with models including land leasing/ procurement incentives are also planned in the future to elicit interest.

Despite setbacks, as of February 2021, about 3,654 MW is under various stages procurement. This is enough to cover over a fifth of the agricultural sales[49] in Maharashtra and meet 40% of the solar RPO target in FY24. Of this, regulatory approval has been sought for 3,170 MW of which 1,826 MW has already been approved by the Commission. The weighted average approved levelised tariff is at about Rs. 3.11 over the years.[50] This is around 46% lower than the average power procurement cost (adjusted for transmission costs and losses up to 33 kV) approved by the Commission for FY24. Even assuming a nominal 2% growth in power purchase cost, this could translate to savings (in real terms) of about Rs. 14,000 crores over a 25-year period. The Government of Maharashtra recently decided[51] to target 5000 MW under this scheme in the coming three to four years. With the potential savings and political commitment, it is certain that MSEDCL will contract more capacity under the scheme going forward.

4.1.4 Feeder input based group metering and billing

Given the issues with metering, the Commission has also proposed a pilot scheme for group metering in its 2020 tariff order. Subject to a ceiling of 3000 hours/HP/annum, bills will be issued to consumers based on 11/22 kV feeder level AMR/ MRI data minus the technical losses on that particular feeder. The bills issued to the consumer will of course be proportionate to the sanctioned load of the pump. Any excess

[49] Assuming 19% CUF for the solar capacity and 6% losses between the feeder and the pump, the capacity can cater to 5717 MUs of agricultural demand. Based on its RPO regulations, the Commission estimated that 15120 MUs of solar procurement would be necessary to meet 10.5% target in Case 322 of 2019.

[50] Progress under the scheme for Maharashtra is tracked here: https://prayaspune.org/peg/maharashtra-solar-feeder.html. Details of policy and regulatory processes for the scheme are updated here: https://prayaspune.org/peg/resources/solar-feeder.html. Latest developments are critically examined here: https://prayaspune.org/peg/resources/power-perspective-portal/267-agriculture-solar-feeders-in-maharashtra.html

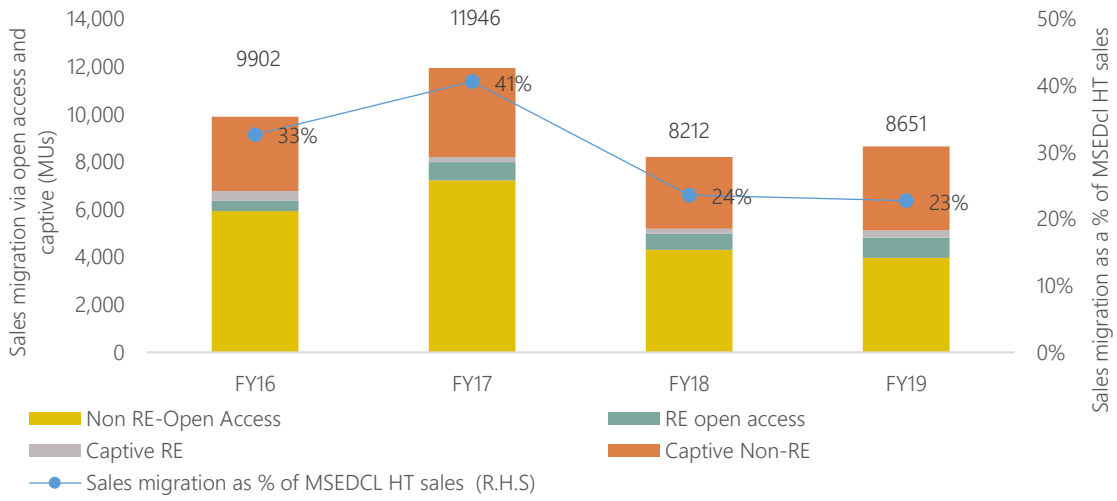
[51] https://www.prayaspune.org/peg/images/SolarFeederDocs/others/06-01-2021_Cabinet_Decision_Meeting_No50.pdf

or shortfall in billing based on the ceiling is to be adjusted pro-rata on a quarterly basis. Given heterogeneity of consumers connected to the same feeder, potential issues with consumer indexing, variation with respect to use and connected load, there could be implementation challenges to this approach which should be assessed during the pilot stage before wider implementation.

4.2 Sales migration in MSEDCL's area of supply

Figure 17 shows the trend towards sales migration of consumers with connected load of 1 MW and above between FY16 and FY19. From the figure, currently about 8,650 MUs of power used by HT consumers (predominantly industrial consumers) in MSEDCL's area is from open access and captive sources. This is comparable to about 23% of the HT sales of MSEDCL, indicative of significant impact on sales and revenue due to such migration. The estimates in the figure are an underestimate as it does not account for units that are consumed but not wheeled by captive consumers (i.e.: on-site captive consumption) as well as rooftop solar consumption.

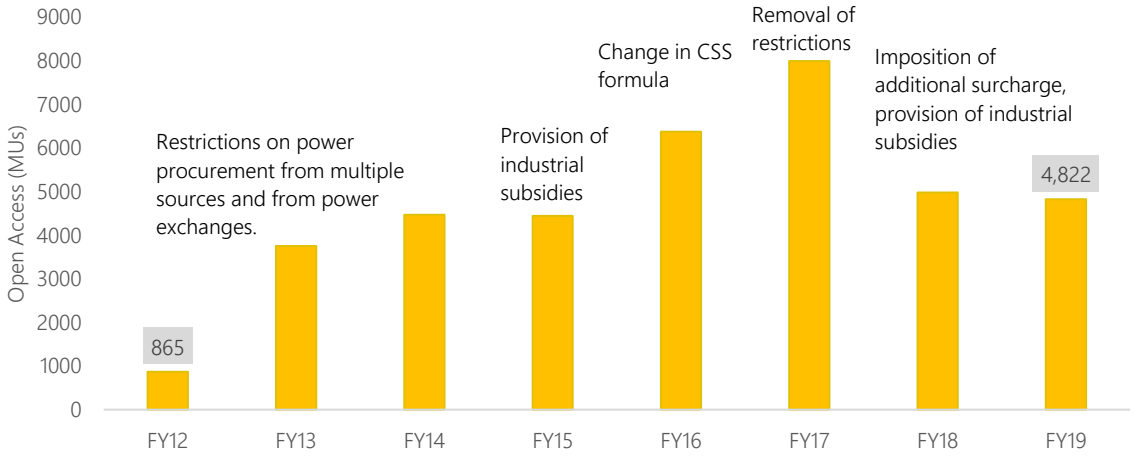
Figure 17: Extent of open access and captive sales in MSEDCL area



Source: PEG compilation of data submitted by MSEDCL in tariff and true-up processes.

As shown in Figure 18, there has been a considerable fall in open access over the years due to various policy and tariff changes.

Figure 18: Open access growth in MSEDCL's area of supply



Source: PEG compilation based on various regulatory proceedings

Open access started rising in MSEDCL area around FY12 mostly due to the rising cost of supply and non-competitiveness of MSEDCL tariffs. At the time, power was available at the exchanges on a day ahead basis for Rs. 3.5/kWh which was 50% cheaper than the energy charges being paid by industrial consumers. Thus, even with the payment of cross subsidy charges and fixed charges for contracted capacity with MSEDCL, many consumers found it lucrative to procure power via open access and reduce dependency on the DISCOM. This also provided an opportunity for consumers to opportunistically switch between the DISCOM and the market based on the price of power using open access route for short-term durations. This practice made power procurement challenging for the DISCOM.

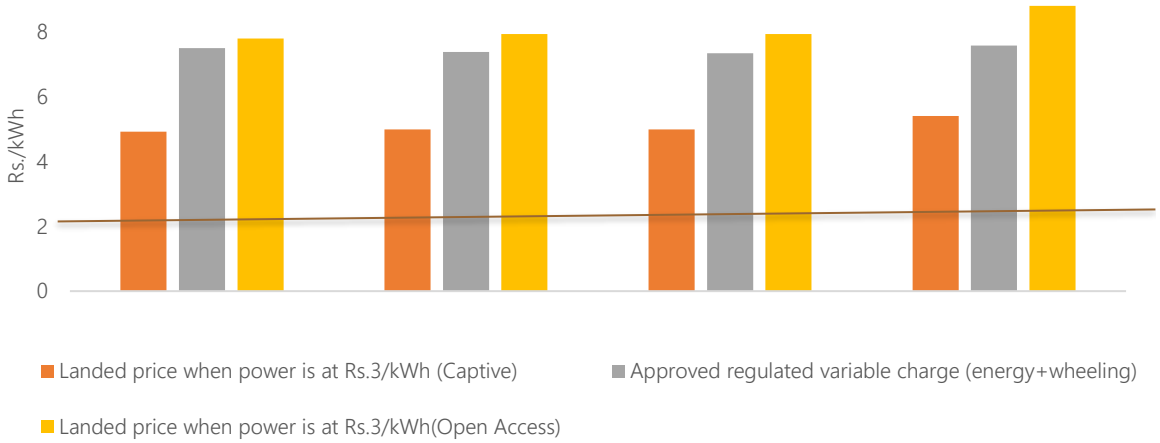
In FY14, the revised open access regulations placed restrictions on open access where power was being procured from more than one source and also restricted procurement from the power exchanges on a day-ahead basis. Since day ahead markets in the power exchanges have higher liquidity, they are preferred by consumers. Such restrictions dampened the rise of open access. Open access consumers also pay cross-subsidy surcharge based on the Commission's regulations. The CSS framework specified for the year FY16 imposed a lower CSS while energy charges paid by consumers continued to remain high. The consequent savings spurred on open access which further increased by FY17 with the removal of restrictions on procurement from day ahead market. In fact, in that year about 88% of open access was from short-term sources. In the same year, MERC in its tariff order imposed additional surcharge (AS) of about Rs.1.1/ kWh, over and above CSS on open access consumers. This and the provision of subsidy for industries in specific regions (discussed in Section 4.3) resulted in a steep reduction in open access sales which continued in FY19. As captive consumers are exempt from CSS and AS (together about Rs. 3.02 for FY21), the savings from shifting to captive options is quite significant.

Figure 19 shows the final cost of power via captive and open access mode as compared to the variable charges of MSEDCL which clearly outlines 40% to 50% savings from captive. In fact, power will have to be available at Rs. 5/ kWh if captive options have to be unviable as compared to current MSEDCL energy charges. There is significant incentive for consumers to reduce their dependence on the DISCOM. Given that modular, cost competitive RE is available at much lower rates (say, Rs. 3 to 3.5/ kWh), consumers will find captive options much more lucrative going forward, given the existing charges, subject to the availability of energy banking arrangements. In fact, the shares of RE based open access and captive migration have increased from 9% in FY16 to 13% in FY19 and will continue to increase primarily via captive route going forward.

MERC has also been gradually increasing fixed charges in a bid to ensure revenue recovery from migrating consumers. In turn, increase in energy charges have been dampened so the savings on variable charges by opting for migration can be reduced. However, this approach too, could make RE based captive more attractive. The fixed charges (of Rs. 432/kVA in FY21) implies an annual fixed cost payment of Rs. 51.84 lakhs/MW for HT Commercial and Industrial consumers. However, the annual repayment for capital expenditure for a solar plant (assuming a cost of Rs. 3.5 crores/ MW) is 50.9 lakh crores[52]. Given the financial viability of solar captive, many consumers might be incentivised to even reduce their contracted demand with the DISCOM.

[52] Assuming discount rate of 7.5% per annum and a 10 year loan tenure.

Figure 19: Landed price comparison between open access, captive and DISCOM variable charges



Note: It is assumed that both captive and open access consumers procure power at Rs. 3/ kWh. The landed price includes transmission and wheeling cost and applicable losses along with additional surcharge, CSS and applicable duty for open access consumers. For captive, the landed cost includes all the same except additional surcharge and CSS. MSEDCL price is based on regulated tariffs and does not account for subsidy.
Source: PEG analysis based on notified charges and duties.

Recognising this favourable economics and the possibility that many consumers were investing in group captive options to avoid AS and CSS payments rather than seriously committing long term to captive options, MERC imposed additional surcharge on consumers opting for group captive options post September 2018. The matter is currently sub-judice[53].

With the increase in cost competitiveness of RE, migration via grid interactive renewable energy systems is also taking place for consumers with connected load less than 1 MW. In a landmark regulation in 2020, MERC determined a framework for operationalising net metering for consumers having contracted demand less than 1 MW but above 10 kW on the payment of a grid support charge. The grid support charges approved by the Commission for FY21 is Rs. 0.72/ kWh for HT consumers and Rs. 1.16 for LT consumers. The regulations also specified registration of behind the meter systems (those not applying for net metering or net billing arrangements) and imposition of additional fixed charges on them. This framework will go a long way is ensuring adequate pricing for grid services provided by the distribution licensees for its consumers. The imposition of these charges has been deferred for a later date. In case of grid support charges, its imposition has been deferred till the cumulative rooftop capacity in the state reaches 2000 MW. Currently there are only 460 MW of such systems in MSEDCL's area. In the interim, in lieu of grid support charges, the commission has allowed recovery of a banking charge from consumers availing net metering/ net billing options. The charge, linked to wheeling losses, is approved at 7.5% of injected energy for HT consumers and 12% of energy injected for LT consumers.

4.3 Revenue and tariff

Maharashtra has been one of the states which has seen regular tariff increase over time. With implementation of fuel surcharges, *fait accompli* costs especially with respect to fuel price variation are recovered in a timely manner, reducing the carrying cost burden on consumers. However, given the rise

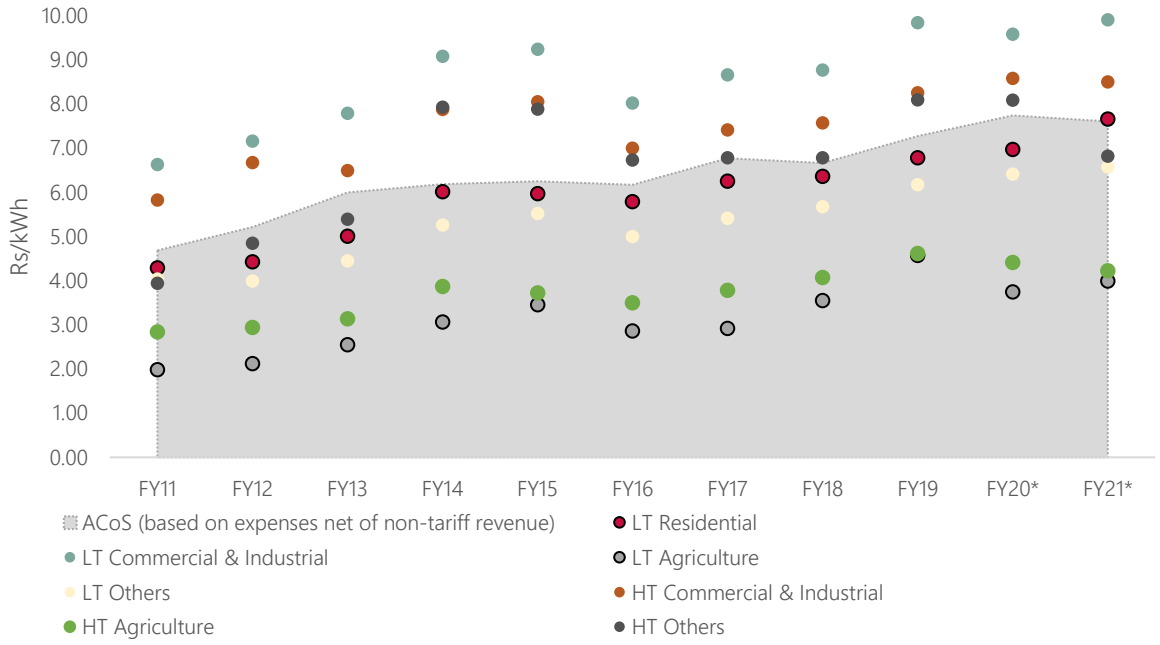
[53] APTEL in judgement dated 27th March 2019 had set aside the Commission's order in the matter. Subsequently, the Supreme Court in its Record of Proceedings dated 01.07.2019 in Civil Appeal No(s). 5074-5075/2019 has put stay on operation and implementation of APTEL's Judgement.

in cost of supply, tariffs for larger consumers are becoming non-competitive, and small consumers require measures to ensure affordable power supply.

4.3.1 Tariff trends and extent of cross subsidy

Figure 20 traces the average billing rate (inclusive of subsidy) for major consumer categories over the past decade as compared to the average cost of supply.

Figure 20: Average tariffs and cost of supply for MSEDCL

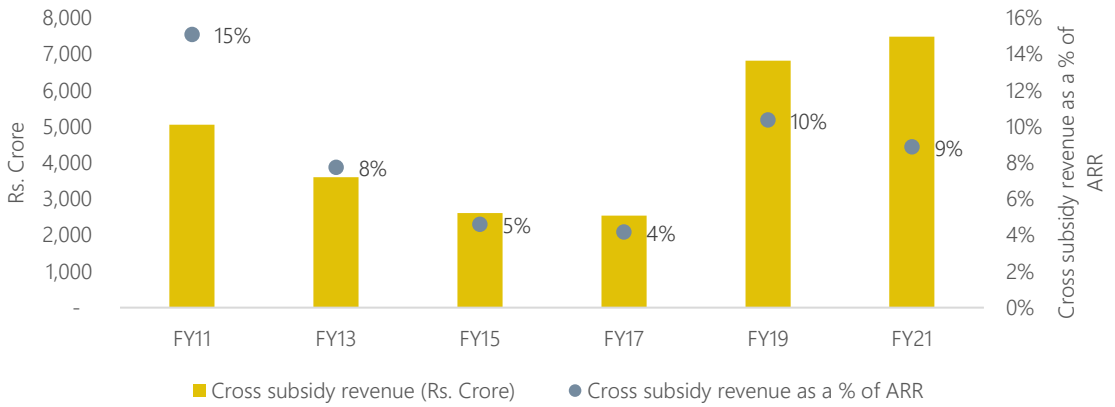


Note: Based on actuals approved by MERC, except for FY21 where it is based on MERC projections. The average cost of supply is from expenses net of non-tariff income, income from sales migration charges and from sale of surplus.
Source: PEG analysis based on data from tariff and true-up orders and petitions from various years

The figure shows that agriculture and LT Others (which includes public water works, public services, streetlights etc) are the only categories that have been consistently cross-subsidised. It is interesting to note that on an average, the tariff for residential consumers has been just marginally less than cost of supply and, in FY21, the category as a whole is cross-subsidising. While industrial and commercial consumers have been cross-subsidising, their contribution to cross subsidy has reduced over time. So, over the years, except for agricultural consumers more and more consumer categories have been moving closer to cost of supply.

The change in tariff design is also clearer when one notes the reduction in revenue from cross subsidy over the years as shown in Figure 21. Cross-subsidy contributed to 15% of the revenue requirement in FY11 which as reduced to 9% by FY19. The reduction in cross subsidy, however has not translated to increasing the financial viability of the utility. Even with such low cross-subsidy contribution in FY19, the cumulative revenue gap of MSEDCL, which is to be recovered from consumers is around Rs.15,750 crores. Even with the contribution of state government subsidy rising to take the place of cross-subsidy, revenue recovery is unable to keep pace with rising costs in Maharashtra.

Figure 21: Quantum of cross subsidy revenue (L.H.S) and its contribution to ARR (R.H.S)



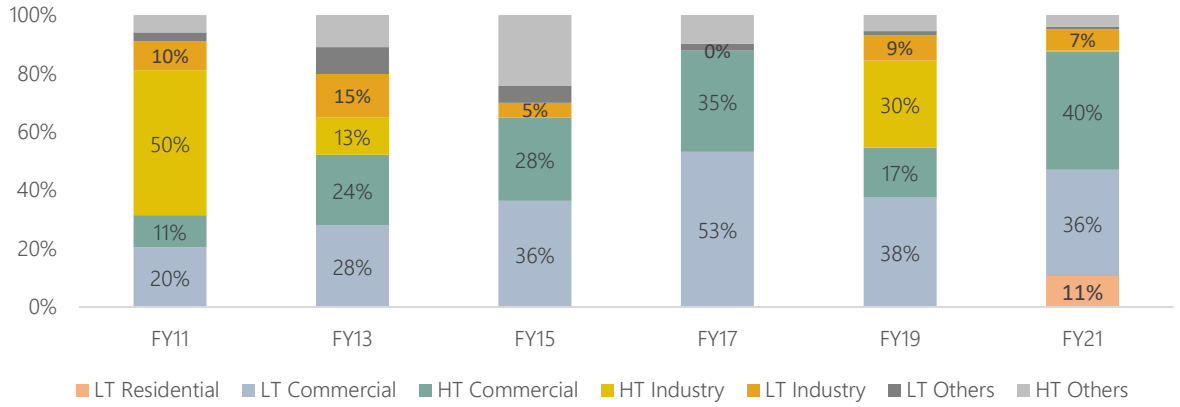
Note: The cross subsidy revenue has been estimated as the additional revenue (in Rs. Crore) paid per category in excess of average cost of supply. In FY15, the Commission had allowed the recovery of past dues to MSPGCL which resulted in significant tariff shock for consumers. However, residential, domestic, industrial, agricultural and power loom consumers were subsidised to the tune of 20% of tariff to compensate for the increase in tariff alone. Thus, significant increase in revenue was actually subsidised by the state government. This has been accounted for in the estimation of cross subsidy revenue for some categories. Values for the year FY21 are based on MERC approved projections and the numbers will change once actual audited data is available.
Source: PEG analysis based on data from various true up orders and petitions

The major contributors to cross subsidy revenue are shown in Figure 22. It is interesting to note since 2011, the share of cross subsidy from industrial consumers (LT+HT) has reduced drastically going from 60% in FY11 to 39% in FY19 and projected at 7% by FY21. In fact, the contribution to cross-subsidy revenue from HT Industrial consumers has been negligible in FY15, FY17 and FY21. The share of commercial (LT+HT) cross subsidy has seen an increase from 31% to 76%. Further, the contribution of cross subsidising LT categories has more than doubled in the past decade moving from 23% to 48%. It is highly likely that with growing revenue requirements and rising cost of supply, the share of cross-subsidy revenue will continue to decline.

In a bid to retain industrial consumers, the MERC are charging these consumers more or less at cost of supply while the bulk of the cross subsidy revenue is being envisaged from a small pool of commercial consumers. Due to increased open access and captive migration, the cross subsidy has also shifted to LT categories. Another point to note is the contribution of 11% of cross-subsidy revenue from residential consumers in FY21. With sales migration, it is likely that more and more residential consumers will be paying more than cost of supply.

However, with rooftop solar's viability, many consumers might opt for net billing, net metering and behind the meter options to reduce their dependence on MSEDCL. With increase in cost of supply, these options could be viable even with the levy of grid support and other charges.

Figure 22: Contributors to cross-subsidy revenue over the years



Source: PEG analysis based on data from tariff, true-up orders and petitions.

4.3.2 Measures to ensure affordability for small consumers

Changing tariff design also implies that industrial and residential consumers are paying closer to cost of supply. With such a design it is imperative that small consumers who are unable to reduce their dependence on the DISCOMs are not bearing the brunt of rising costs and accumulating DISCOMs liabilities. Regulatory measures to protect small consumers are crucial in such a situation. To ensure affordable power for small consumers MERC has introduced important changes in its tariff design, based on representations from various consumer groups:

- BPL tariffs: Since FY08[54], BPL concessional tariffs have been available to all consumers using less than 360 units every year. The average tariff for this category is about Rs. 2/ kWh and thus is very low. In case the consumption is greater than 360 units in the previous year, the consumer loses BPL status and is charged non-concessional tariffs (the same as residential consumers using 0-100 units). Providing BPL tariffs based on consumption rather than the identification of the poor based on BPL cards or other non-electrical parameter extends the scheme to many deserving consumers who would otherwise have been excluded. Further, having an annual limit for exclusion rather than a monthly limit provides flexibility to the recipient as consumption can exceed 30 units in some months but remain low in others. Even with applicability based on electrical parameters, only 3.5 lakh consumers (2% of residential consumers) were eligible for this tariff in FY19.
- Similar tariffs for small domestic, industry, commercial, public services consumers: As LT Commercial and Industrial consumers are charged much more than cost of supply, it is likely that small enterprises will be adversely affected. Categorisation of home-based and small enterprises in commercial or industrial category could also be a source of undue harassment and corruption. In FY12[55], MERC changed the tariff design such that LT Commercial, LT Industry and LT Public Services using less than 300 units a month and less than 3600 units in the previous year are charged tariffs in the same slabs as domestic consumers. While such a categorisation has benefitted consumers for many years, its efficacy needs to be evaluated going forward, given that currently domestic tariffs for three phase connections is comparable to LT industrial tariffs.

However, these are not sufficient to address the challenge. It has been argued that instead of retaining large industrial consumers at cost of supply, without cross subsidy revenue, policy makers should

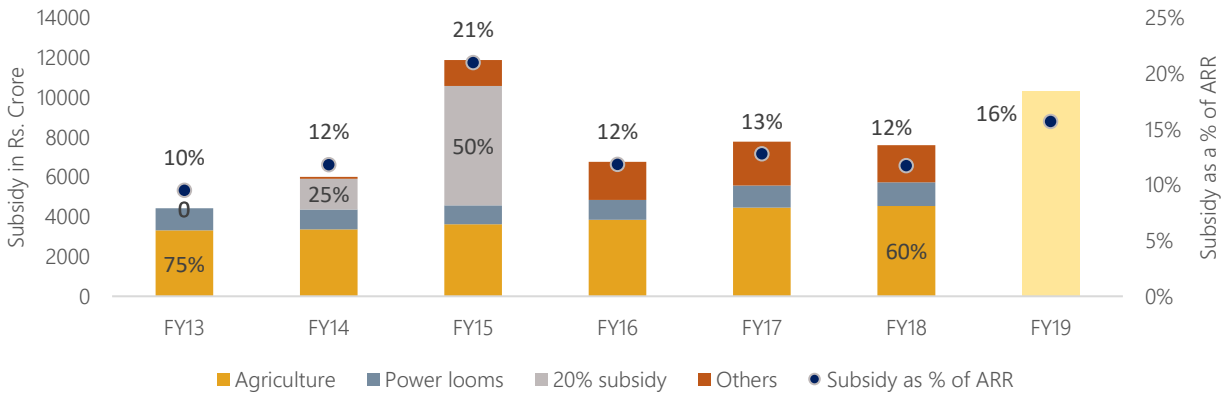
[54] Case No. 72 of 2007. Maharashtra Electricity Regulation Commission.
[55] Case No. 19 of 2012. Maharashtra Electricity Regulation Commission.

encourage long term market based procurement for such consumers such that the DISCOMs do not have the responsibility to plan for their supply and can focus on small consumers[56]. This will also enable DISCOMs to not plan for C&I demand thus reducing the requirement of tying up base-load capacity for 25 years which in turns reduces risk of underutilisation of contracted capacity and increased costs.

4.3.3 Nature and extent of state government subsidy

In addition to cross subsidy support, the Government of Maharashtra also provides subsidy to certain consumer categories in the state. While the share of cross subsidy has been reducing, government subsidy contribution has increased from 10% of ARR if FY13 to 16% of ARR in FY19. Typically, agricultural consumers as well as power loom consumers are subsidised in the state. However, as shown in Figure 23 the share of agricultural subsidy to total subsidy has been reducing as the share of other categories receiving subsidy has also increased.

Figure 23: Magnitude of subsidy (L.H.S) and contribution to ARR (R.H.S) over the years



Note: Data with break-up of subsidy for FY19 not available. Break-up for others category is also not available.
Source: Prayas compilation of data submitted by MSEDCL in various true-up processes and data from PFC reports (FY19)

In the back-drop of the impending state assembly elections in 2014, for some months in FY14 and for the whole year of FY15, Government of Maharashtra provided subsidy to residential, industrial and commercial consumers along with an additional subsidy to agricultural and power loom consumers to offer a 20% reduction in tariff to offset the tariff shock on consumers due to a regulatory dispensation to recover past due to generators in one year. This increased the subsidy significantly in these years. Along with this, there was an additional subsidy provided to agricultural consumers in drought prone areas and relief offered on existing tariffs. This subsidy accounts for about 11% of the total subsidy in FY15 but its nature and extent in future years is unclear. From FY16 to FY19, a major component of the remaining subsidies also included subsidies to industries in Vidarbha, Marathwada, Northern Maharashtra and areas marked as D, D^+ areas to denote areas that are industrially least developed. The total per unit subsidy provided varied from region to region.

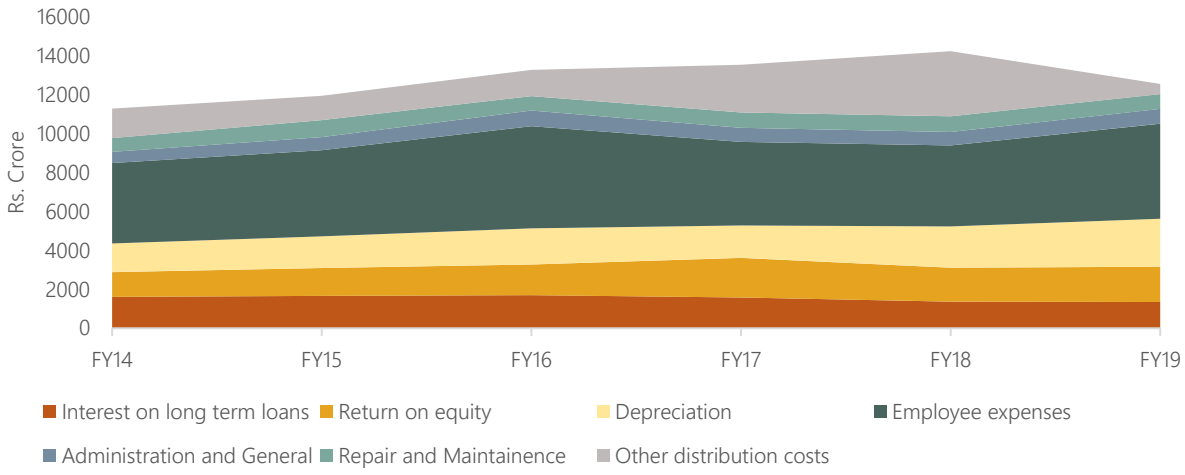
5 Distribution expenses and operations of MSEDCL

About 17% to 22% of the total expenses are on account of distribution costs which includes recovery for capital expenditure (in terms of depreciation, return on equity and interest on loans) and operation and maintenance (O&M) expenses (mainly, employee costs, administration and general expenses as well as costs of repair and maintenance). Other distribution expenses include prior period expenses, interest on

[56] For more details, please see: https://www.prayaspune.org/peg/publications/item/377

working capital, taxes, provision for bad debts etc. Figure 24 captures the trends in distribution cost between FY14 and FY19

Figure 24: Trends in components of distribution cost (Rs. Crore)



Source: PEG analysis of data from tariff petitions and true-up orders.

As can be seen from the figure, in most years O&M expenses account for about half the distribution costs and recovery for capital expenditure 40%. Additionally, about 70% of O&M expenses is on account of employee costs.

5.1 Operation and Maintenance (O&M)

Since 2011, O&M expenses are considered as a 'controllable' expense by MERC such that any additional costs beyond the norms prescribed by the regulator will only be partially allowed for recovery from consumer tariffs. The methodology for estimation of the normative expenses has changed over the years. From FY11 to FY15, the estimation was based on a per unit of sales and per consumer pre-specified norms for wires and supply business. In addition, repair and maintenance expenses were specified as a fixed proportion of the gross fixed assets. In 2015, the approach was revised such that the norms were derived by escalating the base year O&M expenses by the rate of inflation, reduced by 1% to account for efficiency improvements. The base year norm was to be determined based on actual average values for the preceding 3 years escalated by 5.72%. The rate of inflation was to be derived considering 40% weight for CPI and 60% for WPI in the previous year. By 2017, based on MSEDCLs petitions, the methodology was revised such that inflation was determined with 30% weight for WPI and 70% weight for CPI and the average inflation rate for past 5 years was considered. This would increase the escalation rate. In 2019 the methodology was again revised to change the estimation for the base year and to also provide moderating the 1% reduction to account for rise in open access.

To ensure adequate expenses were being made on repair and maintenance as it affects supply quality, R&M expense need to be at least 20% of allowed O&M expense failing which expenses are to be disallowed on a proportionate basis. Perhaps due to revision in norms or increase in the DISCOM's efficiency, MSEDCL's O&M expenses have been lower than the norm. It is hoped that the cost reduction has not resulted in reduced quality of supply and service. Thus, accountability checks for supply and service quality by the Commission are of paramount importance.

5.2 Capital expenditure

About 15% of the total capital investments have been funded by grants with the rest being financed mostly by loans and equity. Some of the major capital works by MSEDCL is summarised in Table 9.

Table 9: Major capital expenditure schemes undertaken by MSEDCL

Scheme Name	Outlay of planned/ongoing works till FY25 (Rs. Crore)	Details of scheme
Infra Plan (I & II)	21,489	Infrastructure strengthening, investment in additional substations, transformers, lines as well as upgradation of existing works. Works to be completed by FY22.
Feeder separation scheme	6,657	Scheme launched in 2007 to install dedicated 22/11 kV feeders catering to agriculture to segregate it from other rural loads. This allowed restriction of hours of supply to agricultural feeders when other rural loads could be provided longer hours of supply. This scheme also enabled solarisation of feeders and agricultural demand estimation efforts in Maharashtra. Works for this was carried out under the Infra Plan scheme as well as the Gaothan Feeder Separation Scheme. By FY20 about 5,398 feeders were separated under the scheme. A separate scheme has also been planned for segregating the remaining 4330 mixed feeders. 690 of these feeders are to be segregated under the centrally sponsored DDUGJY programme. For the rest, about Rs. 3000 crores are allocated till FY25. Efforts to extend grants under DDUJGY for remaining feeders are underway.
Single Phasing	890	The scheme installed changeover switches at sub-stations for 3,008 rural feeders to segregate agricultural load from other rural loads. This would enable single phase supply for lighting and fan load while three phase supply can be restricted to certain hours. The idea was to use this framework to restrict agricultural supply hours while ensuring reliable supply for other essential rural loads. Though the MERC did not approve this capital expenditure on the grounds of its ineffectiveness and safety related concerns, the state government sponsored it by providing grants.
IPDS	7,057	This includes all central government sponsored schemes for network strengthening in urban circles including funds provided under APDRP, RAPDRP and IPDS. Also includes funds provided for implementation of SCADA in urban circles. Investments were carried out in more than 120 towns and implementation of SCADA took place in eight urban areas (Greater Mumbai, Amravati, Solapur, Sangli, Malegaon, Pune, Nashik and Kolhapur)
SPA:PE	4,193	Special Projects for Agriculture Pump Sets Energization or SPA:PE is a capital expenditure scheme to provide agricultural connections in an accelerated manner. The works include HT Line/ LT line works and installation of distribution transformers.
DDUGJY	2,399	Under the centrally sponsored scheme for which there is a significant grant component, MSEDCL has installed new substations and transformers and has also augmented existing sub-stations and transformers in rural areas. Funds were also used to lay HT/LT lines.
HVDS	5,048	The scheme is envisaged to supply electricity through High Voltage Distribution System for 2.24 lakh agricultural connections. This would also entail establishment of 226 new substations. Almost half the investment is through state government grants for implementing the scheme in Vidarbha and Marathwada regions. About 47% of the works is to be completed between FY21 and FY25. With such investments and high voltage supply, significant reduction in line losses is expected by MSEDCL.
DPDC	3,835	Release of residential, agriculture, street light, public water works connections as well as infrastructure works related to this (HT/LT lines, distribution transformers etc)

Source: PEG Compilation from MSEDCL petitions and data gap filings in true-up and tariff proceedings.

These investments account for 70% of all recent capital investments by MSEDCL. At least 30% of these investments explicitly focus on agriculture. The outlay reported includes works that have been capitalised and where investment is planned till FY25. With supply and service quality concerns, investment in capital works is necessary. However, regulators do not undertake periodic *post-facto* cost-benefit analysis or ensure third party inspection or review completed projects to ensure stated objectives were met.

5.3 Franchisees

MSEDCL was the first DISCOM in the country to appoint an input based franchisee in Bhiwandi in January 2007 for a ten year period. In this arrangement, the appointed franchisee, typically a private company is expected to reduce AT&C losses in the area through improvement in billing and collection and increased investments. The DISCOM supplies power to the franchisee at a pre-fixed input rate. As tariff in the franchisee area are the same as the DISCOM's, the difference between the tariff and the 'input rate' translates to revenues for the franchisee. The input rate is indexed to the ratio of the current average tariff and the base year average tariff. This arrangement changes the DISCOM revenue with changes in tariff and subsidy. Under this arrangement Torrent Power Limited (TPL) was appointed as franchisee in Bhiwandi.

Though there were issues with selection of franchisee through competitive bidding[57] and weak post-franchisee monitoring,[58] the Bhiwandi model is regarded as one of the better performing franchisees in the country. As per MSEDCL[59], during its ten years of operation, TPL was able to reduce distribution losses from 42% to 22% and undertook capital expenditure worth Rs. 626 crores. On 20th December 2016, MSEDCL renewed the agreement with TPL for another 10 years in order to bring down the losses to 15% in the franchisee area. Given that the losses were reduced significantly, the need for extending the agreement and re-appointing the same party without a separate competitive bidding process remains questionable. With the renewal TPL's franchisee term would be just five years short of the term of a distribution licence. The input rate and the base billing rate were also revised while extending the agreement[60].

Since 2007, MSEDCL also appointed three franchisees and the experience with these was disappointing even when compared to Bhiwandi. These new franchisees were terminated mostly due to non-payment of dues to MSEDCL. The details of these franchisees are reported in Table 10.

Table 10: Details of franchisees terminated by MSEDCL

Area	Company Appointed	Date of agreement	Agreement period	Date of termination	Additional details
Aurangabad	Global Tower Ltd	23/02/2011	15 years	10/11/2014	Rs. 256 crores pending. Matter before the arbitration tribunal[61].
Jalgaon	Crompton Greaves	06/06/2011	10 years	10/08/2015	Final settlement completed.
Nagpur	Spanco Ltd	13/04/2011	15 years	10/09/2019	Dues of Rs. 164 crores pending

Source: PEG compilation from MSEDCL annual reports, regulatory filings and annual reports of franchisees

[57] Key aspects in the agreement were diluted after franchisee selection which is unfair to other bidders. These include provisions related to profit/ revenue sharing and the franchisee's obligation to recover consumer arrears.
[58] Even two years after the appointment for franchisees, there was no third-party verification of metering and billing data, average tariff and subsidy estimations which are crucial variables affecting DISCOM and franchisee revenue. For more details, please see: https://www.prayaspune.org/peg/publications/item/75
[59] As per data submitted in proceedings in Case 195 of 2017. Maharashtra Electricity Regulation Commission.
[60] As per third party audit reports, the base ABR was revised to Rs. 6.85/kWh as against Rs. 3.52/kWh and the annualized input rate was revised to Rs. 4.5/kWh as against Rs.2.45/kWh.
[61] As per information available till August 14th 2020 from Global Tower Limited's annual reports

Despite these setbacks, MSEDCL has recently appointed TPL as the franchisee for its Shil, Mumbra and Kalwa sub-divisions in the Thane Urban circle. MSEDCL also plans to appoint franchisees in Akola urban division as well as Malegaon town. Going forward, MSEDCL stated that it will consider appointing franchisees in divisions or towns where AT&C losses is greater than 50%.

6 Supply and service quality

Given significant investments in power procurement and capital works, a commensurate increase in quality of supply and service is expected. As compared to many other states with significant rural consumers, MSEDCL has been able to provide uninterrupted supply for reasonable durations. However, issues with metering and billing as well as poor networks especially in rural areas persist. When MSEDCL was facing acute shortages, there were two innovative schemes in operation, which helped in a more transparent and accountable management of the shortages. These are detailed in Box 3 and Box 4.

Box 3: Load shedding protocol

As with most states, there was no transparent or well-defined process for distributing shortages between consumer categories and areas in Maharashtra in 2005. All load shedding decisions were taken unilaterally by the DISCOM. To move away from this system, MERC, in June 2005[62] introduced a process for allocating shortages based on the distribution loss and collection efficiency through a mechanism known as the load shedding protocol. The use of distribution loss as a criterion was to build public pressure to reduce theft in the area. The Commission divided MSEDCL's area into various divisions depending upon losses and collection efficiency to allocate shortage proportionately. The process was finalised based on public hearings in all six revenue headquarters of MSEDCL.

For the first time, the MSEDCL had to openly announce its load-shedding plans in advance and come out with a detailed area-wise load-shedding schedule which gave people information about the duration of power cuts and more importantly enabled them to ensure that their area was not being discriminated against.

MSEDCL did not comply with the protocol on several occasions[63], and even challenged the Commission's jurisdiction in issuing the protocol before the APTEL and the Supreme Court. The apex court upheld the regulatory jurisdiction for intervention to equitably distribute shortages[64]. In April 2012, MSEDCL unilaterally modified the protocol to increase the hours of load shedding in certain high-loss areas during the peak summer season[65]. This practice continued in peak periods for years and unfortunately, the Commission issued order condoning the violation rather than holding the MSEDCL accountable. MSEDCL continues to set the protocol with hardly any public scrutiny[66].

With increase in capacity addition and consequently supply hours, the relevance or the need for the protocol has diminished.

[62] Case no. 5 of 2005 dated 16th June 2005. Maharashtra Electricity Regulation Commission
[63] Case no. 77 and 78 of 2008 (dated 28th November 2008) and Case No 82 of 2008 (dated 17th August 2008). Maharashtra Electricity Regulation Commission.
[64] The Supreme Court order dated 13th May, 2005 as well as the ATE judgment dated 31st July 2009, both upheld the MERC's jurisdiction in defining the load-shedding protocol and stipulated a need for a consultative process to change protocol.
[65] Case no. 41 of 2012 dated 26th November 2012. Maharashtra Electricity Regulation Commission
[66] https://www.mahadiscom.in/en/load-shedding-protocol/

Box 4: Pune Model

During peak shortages in Maharashtra, certain consumer segments were willing to pay more than the regulated tariff to enable MSEDCL to procure power for them. About 30 industries in Pune having stand-by / captive power plants agreed to generate electricity during peak hours. As generation cost from such liquid fuel plants was much higher (~ Rs. 11 / kWh) than the MSEDCL's average cost of supply (~ Rs. 4.5 / kWh), it was proposed that the excess cost of this power be recovered through an additional 'reliability charge' in Pune for mitigating load-shedding. Small consumers using less than 300 units per month were exempt from paying this extra charge.

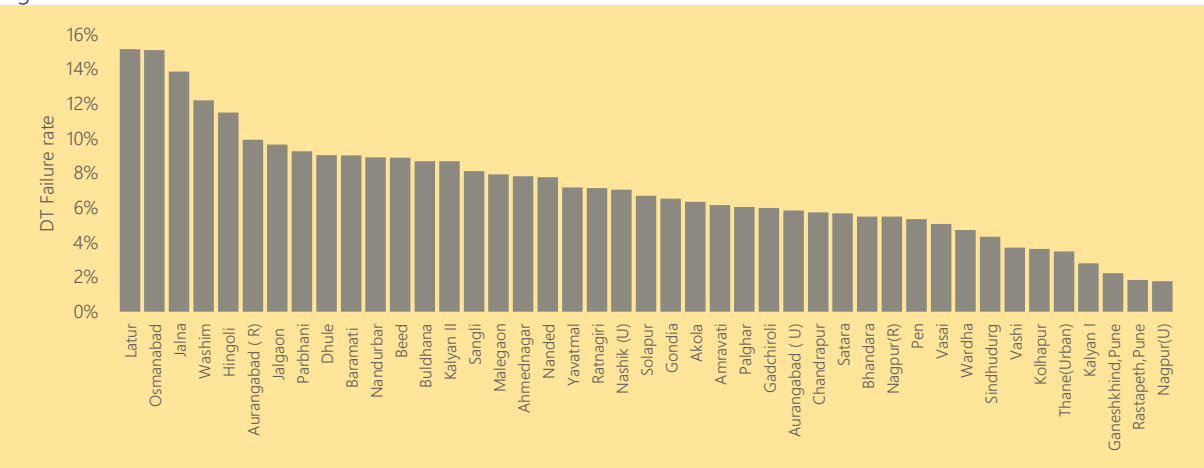
The MERC approved the scheme, which later came to be known as the 'Pune model' in May 2006[67] and load shedding in Pune was stopped from June 2006. With implementation and monitoring issues, the model was officially withdrawn in April 2008. In its place, an 'interim franchisee' was appointed for supplying additional power to Pune city to mitigate load shedding[68]. Small consumers continued to be exempted from the additional charge, although the bracket for exclusion was reduced from monthly consumption of 300 units to 100 units.

This arrangement was also adopted in three other urban and industrial circles of the MSEDCL, viz. Thane, Navi Mumbai and Vashi, benefitting 80 lakh consumers. In 2009, MERC also introduced zero load shedding (ZLS) scheme which followed a similar principle. Under the scheme, consumers in Pune, Navi Mumbai, Thane, Aurangabad, Nagpur and Amravati paid a reliability charge which ranged from Rs. 0.20 to Rs. 0.75 per unit.

The scheme were eventually stopped with the increased long term power procurement by MSEDCL. Though the model was very effective in dealing with the shortages, it is not a solution to addressing the larger and longer term issues with power procurement planning. Such measures could also lead to increasing neglect of rural or non-industrial areas which do not pay reliability changes.

Currently, measures are needed to hold DISCOMs accountable for disparate supply and service quality in the time of sustained surplus and rising costs. Figure 25 captures the DT (distribution transformer) failure rate across divisions which clearly shows the variation in failure rate between urban are rural divisions.

Figure 25: Variation in DT failure rates across divisions in FY18



Source: PEG analysis of data submitted by MSEDCL as replies to data gaps in Case 195 of 2017.

Metering and billing concerns were highlighted in Section 4.1 in the context of agricultural consumption. It is also a concern for consumers in general. As per MSEDCL reports, between June 2017 and June 2019, the number of faulty meters increased by 49%. Despite consumers raising issues related to supply and service each year before the Commission, very little has been done by the Commission in recent years to

[67] Case No. 29 of 2005 dated 2nd March 2005. Maharashtra Electricity Regulation Commission
[68] Case No 101 of 2007 dated 31st March 2008. Maharashtra Electricity Regulation Commission

address concerns and hold DISCOMs accountable for performance on this crucial front. There has been no public review of supply and service quality or evaluation of the reports on standards of performance submitted by the utilities. In fact, as of 31st March 2021, MSEDCL has not even been publishing compliance reports with respect to adherence to prescribed supply and service quality standards as per the MERC regulations since June 2019. This is despite the Section 59 of Electricity Act, MERC regulations mandating quarterly submission of such reports. In the present tariff regulations, an incentive on return on equity is provided for the wires business of MSEDCL which is linked to its performance with respect to reliability indices. However, there has been no evaluation or verification of reliability indices provided by MSEDCL in recent years. Further no benchmarks have been stipulated by the Commission with respect to these reliability indices to aid evaluation of DISCOM performance. The return on equity for the supply business is linked to collection efficiency of the utility rather than a service quality indicator. Going forward, with rising cost of supply, monitoring and accountability of supply and service quality is of paramount importance to ensure that small consumers are not neglected and regulatory oversight is crucial for such accountability.

7 Regulatory Governance in Maharashtra

The role of the regulator in shaping Maharashtra's power sector is evident in almost all sections of this document. From the narrative it is clear that the regulator was influential in some hits and many misses in sector decision making. This section provides a brief commentary on regulatory governance in the state drawing from details in previous sections of the note.

Setting up forward looking frameworks for RE promotion and viable sector operations

The MERC has been forward looking and agile in its responses to sector trends in many respects. This has especially been the case with promotion of renewable energy. MERC was among the first electricity regulators to stipulate RPO and has been steadily increasing the commitment over the years. Currently, MERC has set one of the highest RPO targets in the country. Notification of forecasting and scheduling regulations for wind and solar and determining a framework for compensation of services provided by DISCOMs for grid interactive solar (through grid support charges and additional fixed charges) has helped promote RE while ensuring DISCOM's consumers are not bearing undue risk due to RE promotion.

MERC has also been taking many proactive measures to ensure tariff certainty and affordability while ensuring DISCOMs are compensated for costs in the timely manner. Commission's decision to implement the multi-year tariff (MYT) framework since 2007 provided certainty for costs to some extent and specified performance trajectories which enabled medium-term accountability for utilities. MERC has been regularly revising DISCOM tariffs and is probably the only ERC in the country that fixes retail tariffs for multiple years at a time, subject to a mid-term review. This is a practice it has been following since 2015 to bring in certainty and clarity in tariffs. Adoption and implementation of fuel surcharges since FY02 and regular tariff determination processes has also contributed to timely recovery of costs and prevented build-up of accumulated liabilities. In many instances the Commission has provided clarity with respect to open access, metering and billing practices and operationalisation of its regulations. Its proactive and timely measures during the Covid-19 lock-downs especially its decision to move hearings online and issue practice directions for billing during the lockdown is commendable.

Support for innovative approaches to address sector issues

Over the years, the Commission through its regulations and orders has also supported innovative approaches to addressing challenges before the sector. This is quite clear in its pioneering approach over

a decade ago with the load shedding protocol and 'Pune' model to address shortages. Tariff design changes to protect small consumers, not just BPL consumers are also noteworthy. It is hoped that more efforts in this direction take place with reduction of cross subsidies. MERC's timely orders to operationalise the solar feeder approach could also be replicated in other states which face similar challenges.

Accountability of utilities

There have also been certain regulatory measures to increase accountability of the utilities especially with respect to cost and performance. The fact that Maharashtra is the only state to have its agricultural consumption norms restated substantially on more than three occasions in the past two decades is a clear testament to this. Another example of this is MERC's recent efforts to rationalise MSPGCL's capacity addition plans which drastically reduced the coal thermal capacity in the pipeline. Many of these innovative ground-breaking decisions and associated frameworks became possible due to deliberative, consultative processes involving various consumer groups enshrined in the institution's practices for the first 15 years of its existence.

Practices for public accountability and informed participation

Soon after its establishment, MERC encouraged public participation in its proceedings and instituted the practice of conducting public hearings for tariff determination and other crucial processes. In fact, public hearings for tariff determination are still conducted in multiple locations across the state. Initially, the Commission appointed four consumer representatives under Section 94 (3) of the Electricity Act. These representatives were party to all proceedings before the Commission and were also invited to participate in Technical Validation Sessions (TVS) in tariff determination proceedings. TVS are often held to scrutinise utility petitions in detail before the petitions are finalised so as to communicate and bridge data and information gaps. MERC was perhaps the only ERC is the country to have such a transparent, participatory practice of conducting TVS. By 2012, the practice of appointing consumer representatives (CRs) and their selection was formalised through MERC regulations and in that process, along with the existing four institutional CRs, the Commission also added an institutional CR and 15 individual CRs from various part of the state. In addition, to promote informed, effective participation the ERC would conduct capacity building sessions for the CRs. Due to this institutional practice, consumer groups were able to actively participate in regulatory processes and were also party to crucial matters before the APTEL and Supreme Court.

Discontinuation of progressive practices towards transparency and informed participation

In 2016 the number of institutional representatives was reduced to just one and individual representatives to five. The term of the last individual CRs ended in 2019 and no further appointments have been made. Thus, currently, Maharashtra has only one CR whose tenure expires in 2022. The practice of calling consumer representatives for TVS, regulatory proceedings and other deliberations has also stopped. There has been no call for appointment of new CRs as yet. This is a major setback for deliberative decision making processes before the ERC.

Like other ERCs, MERC has also constituted a State Advisory Committee. However, the committee has not met since January 2018. Thus, another avenue for consultative deliberation has been abandoned. With the revision of the MYT regulations in 2019, the Commission has also discontinued the requirement of public consultation for approval of power procurement via competitive bidding.

Consumers in Maharashtra also saw a major setback in terms of transparency in processes in September 2018 when MERC decided to discontinue the practice of recording proceedings before the Commission

in audio/ video form. Additionally, the Commission also announced that in due course of time all existing recordings will be destroyed and in the interim, existing records will not be made available to members of the public. With limited and shrinking possibilities for public participation and access to recordings, proceedings before the Commission are becoming more and more onerous to engage with.

Reduced independence of CGRFs

As compared to many other states, MERC also had instituted progressive measures to operationalise the grievance redressal process for supply and service quality issues. One such measure was the establishment of Consumer Grievance Redressal Forums (CGRFs) in each zone in the state.

Each CGRF consisting of one independent member, a representative of consumer protection organisations in the area, one technical member, a representative of the DISCOM and a chairperson who could be retired senior civil servant, judicial officer or academic with knowledge of the electricity sector. In 2020, the Commission amended the regulations to also extend the chairpersons eligibility to retired officer of the DISCOM and to restrict the qualification of the independent members[69]. Consumer groups across the state opposed the move as such an appointment process could result in the appointments of two members with close associations with the utility and potential vacancies for the post of the independent member due to the stricter criteria.

Areas where MERC could have played a more active role of custodian of public interest

Regulatory oversight and enforcement of MERC regulations in public interest could have resulted in better accountability and lower costs for consumers. This is particularly the case with scrutiny of MSEDCL's demand estimation and capacity addition plans where a call for analytical rigour in demand estimation and periodic review of capacity addition plans would have helped avoid high cost capacity addition, large scale underutilization of capacity and lowered power procurement costs.

MERC could have also played a more active role in safeguarding public interest in upholding contractual sanctity related to thermal competitively bid projects. This could have helped potentially avoid significant compensatory tariffs paid to these generators which has also contributed to the financial distress of MSEDCL. Increased accountability for major performance parameters such as station heat rates for MSPGCL could also have helped reduce costs recovered from consumers.

Similarly, timely and active intervention to ease transmission constraints for Mumbai would have aided time-bound capitalisation, provided Mumbai consumers with wider options for competitive power procurement and reduced the cost of such investments. Lack of regulatory clarity also contributed to the uncertainty, challenges and litigation while operationalising the parallel licensing arrangement in Mumbai, especially in the context of network rollout.

In addition, supply and service quality was an issue that was sidelined by the Commission, especially in recent years as evinced by the lack of adequate measures to hold utilities accountable for services provided.

With increase in renewable energy penetration, higher adoption of open access and captive options and reduction of cross subsidy, financial distress of DISCOMs and introduction of various models of retail competition, the role of the regulatory institution in managing the transition, safeguarding consumer

[69] The regulations state that the independent member should not have provided consultancy services to electricity consumers for a minimum of three years from prior to appointment. Consumer groups contended that as representative of consumers and being involved in consumer protection, it is unlikely that many eligible persons would qualify with this criterion.

interests and ensuring viability of the DISCOMs will be even more crucial. The regulator will play a major role in the future to steer the energy transition and minimize costs, resource lock-ins and time-intensive litigation in the sector. In this context, clarity in processes, certainty of charges and procedures, effective and innovative actions, public accountability and deliberative, participatory consensus building measures could play a significant role. Given past experience, it is unclear if this institution is up to the task ahead.

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