

A JOINT INITIATIVE OF



Government of India



Government of Maharashtra

Power for All

Maharashtra



Foreword



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Power, Coal and Renewable Energy

Government of India



सत्यमेव जयते
Government of India

Electricity consumption is one of the most important indices that decide the development level of a nation. The Government of India is committed to improving the quality of life of its citizens through higher electricity consumption. Our aim is to provide each household access to electricity, round the clock. The 'Power for All' program is a major step in this direction.

Maharashtra is already one of the better performing states in Power Sector.

This joint initiative of Government of India and Government of Maharashtra aims to further enhance the

satisfaction levels of the consumers and improve the quality of life of people through 24x7 power supply. This would lead to rapid economic development of the state in primary, secondary & tertiary sectors resulting in inclusive development.

I compliment the Government of Maharashtra and wish them all the best for implementation of this program. The Government of India will complement the efforts of Government of Maharashtra in bringing uninterrupted quality power to each household, small & medium enterprises and other establishments.

Foreword



Devendra Fadnavis

Chief Minister

Government of Maharashtra



The State Government of Maharashtra recognizes that improving electricity availability, quality and affordability is key to its economic development and inclusive growth. The 24X7 'Power For All' Roadmap has provided the State with the opportunity of bringing together an overarching proposal for taking its power sector outcomes to new heights.

The State is committed to achieving 100% household electrification to ensure inclusive growth. Electricity access will not only enhance the living standard of citizens but will also ensure inclusive growth by positively impacting education, awareness, health and economic development in rural and remote areas.

Additionally, Maharashtra is keen to build on its past performance and emerge as one of the most progressive states in terms of demand supply adequacy, AT&C loss reduction, renewable energy development, energy efficiency measures and customer orientation.

The State Government will provide all necessary support to the power utilities in achieving the various milestones and targets outlined in this Roadmap document.

I would like to thank the Government of India, Hon'ble Prime Minister and Hon'ble Union Minister of State for Power, for implementation of 'Power for All' in the State of Maharashtra.

Joint Statement



Government of India



Government of Maharashtra

'Power For All' Program for the State of Maharashtra will be implemented by Government of Maharashtra with active support from Government of India.

The Program aims at providing 24X7 supply to all electricity consumers and providing electricity access to all unconnected households in the State by FY19.

The PFA Roadmap document highlights all-encompassing interventions including generation, transmission, distribution, renewable energy and energy efficiency/ DSM measures proposed to be implemented during FY16 to FY19.

Government of Maharashtra shall continue to support the power sector through targeted capital subsidy schemes aimed at supporting the poor and marginal consumers and elimination of regional disparities in the State.

The State Government is committed to support the utilities and other development agencies engaged in the power sector in implementation of the various measures and targets considered in the PFA Roadmap.

The State Government will put in place appropriate/ suggested State level governance mechanisms for periodic review and monitoring of the PFA Roadmap implementation.

The Ministry of Power, GoI would supplement the efforts of State on various issues to be dealt with at the Central Government level including those listed in this document. The MoP, GoI shall also endeavor to support the State in availing concessional financing arrangements for power utilities in the State.

The State Government shall endeavor to support utilities in improving/ maintaining their financial sustainability and credit worthiness.

The Central and State Governments would meet regularly over the next four years to review and monitor the progress on the rollout plan and strive to achieve the objectives of the program by taking the necessary steps as envisaged in the PFA document.

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Government of Maharashtra (GoM)



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1. Executive Summary

1.1. Introduction

The Power for All (PFA) program is a joint initiative of Government of India (GoI) and Government of Maharashtra (GoM), aiming to achieve availability of 24X7 reliable power to all households, industries, commercial establishments and all other electricity consuming entities by the end of FY19. This document sets a roadmap to achieve the underlying objective of the PFA Program in the State of Maharashtra.

The State of Maharashtra, having the largest base of electricity consumers in the country, recorded a peak demand supply deficit of 1.7% during FY15 which is lower than national average peak demand supply deficit of 4.7%.

The State undertook structural reforms in 2005 wherein the erstwhile Maharashtra State Electricity Board (MSEB) was unbundled into MSEB Holding Company Limited, Maharashtra State Power Generation Corporation Limited (MSPGCL – Genco), Maharashtra State Electricity Transmission Company Limited (MSETCL – Transco) and Maharashtra State Electricity Distribution Company Limited (MSEDCL – Discom).

There are 4 licensees responsible for distribution of electricity in Maharashtra namely MSEDCL, Reliance Infra, BEST and TPC of which the latter three operate in Mumbai and its suburbs. Out of the total load of 20,147 MW at the State level, about 17,694 MW was catered by MSEDCL during FY15, while the remaining 2,453 MW was catered to by the other 3 distribution licensees. Except for the license area served by MSEDCL, the other utilities have

already achieved 100% electrification and are supplying 24X7 to consumers in their geographical limits. Accordingly, this PFA roadmap emphasizes on the role of MSEDCL in ensuring 24X7 power supply to all consumers in the State.

1.2. Connecting the unconnected

In terms of electrification, as on March 2014 the State has nearly 18.73 Lac rural HHs and 0.63 Lac urban HHs which are yet to be electrified. MSEDCL plans to electrify all remaining urban and rural HHs by FY19 as per the various capital investment plans.

In addition to achieving 100% electrification, the State has also plans to ensure 24X7 supply to all consumers, leading to an increase in energy consumption (sales) in MSEDCL supply area from 90 BU in FY15 to 134 BU in FY19. The total energy input in State, with all utilities put together, is expected to increase from 132.7 BU in FY15 to nearly 183.15 BU in FY19, translating into a total peak power requirement of 26,432 MW in FY19 for the State.

1.3. Power Generation and Supply Adequacy

The total installed capacity available to the State as on March 31, 2015 (including share allocated to Maharashtra) is 37,797 MW. The State is not able to realize the full generation potential due to various reasons such as poor quality of coal and non-availability of gas leading to forced shutdowns. During FY15, MSPGCL's generation capacities recorded a PLF of about 65% only.

In line with the rising demand for power in the State, MSPGCL has planned to expand its current generating capacity by 3,480 MW by the end of FY19. It is also pursuing R&M of existing plants with the objective of improving PLF and availability. MSPGCL has proposed to undertake/ initiate capital investments totaling over Rs. 47,162 crores during FY15 to FY19, The financial closure for all projects proposed for commissioning by FY19 has already been achieved and MSPGCL plans to initiate necessary steps for achieving financial closure of future projects in due course of time.

Allocated power from upcoming central generating stations for MSEDCL is projected to increase by 1,592 MW as new plants gets commissioned in the upcoming years. MSEDCL has signed PPAs totaling 5,465 MW with IPP's out of which around 4,345 MW of capacity has been commissioned as on March 2015.

In terms of renewable energy, Maharashtra is one of the states with highest installed capacity of renewable energy sources in its overall energy mix. Going forward, the share of RE sources in installed capacity is expected to increase from 25.5% in FY16 to 31.8% in FY19. In terms of energy, the share of RE sources is expected to increase marginally from 9.4% in FY16 to at 10.8% in FY 19, translating into increase in volume of energy from 14,846 MU in FY 16 to 20,233 MU in FY 19.

While MSEDCL sources over 98% of its power from various generating plants under long-term PPA's, the other utilities in the State distributing power in Mumbai and its suburban areas have significant reliance on short-term sources of power. While PPAs for procurement from long term sources are in place, utilities have replaced the same with cheaper sources of power available under ST arrangements to optimize their overall cost of supply. There is no central or sector allocation to these utilities as per the past policy adopted by the Central/ State Government.

MSEDCL is expected to continue to have a healthy power supply position in energy as well as peak terms. However, considering the wide variations in demand during the year and other peculiarities relating to competition on account of multiple licensees in common area of supply, the other licensees in Mumbai and its suburbs are expected to adopt an appropriate mix of short-term and long-term sources for bridging the demand supply deficit.

1.4. Adequacy of transmission network

Intra-state transmission of power is primarily handled by the State Transmission Utility (STU) – MSETCL and is complemented by 6 private transmission licensees. Presently, MSTECL has 608 EHV sub-stations with a total transformation capacity of 1,03,603 MVA and 45,513 ckt kms of EHV lines with about 360 ckt kms at 765 kV class. The other transmission licensees in the State have a total of 30 EHV sub-stations with transformation capacity of 14,847 MVA.

The above infrastructure is enough to meet the existing demand of the State but to meet the expected demand growth and to build in adequate redundancies in the system, MSETCL plans to add 111 substation with a total transformation capacity of 42,629 MVA and 14,816 ckt kms of EHV lines over the next four years. Other transmission licenses are also investing to strengthen their network in view of the needs arising from the anticipated demand growth. A total of Rs. 8,544 Cr. is expected to be invested in the transmission sector projects, by MSETCL.

PGCIL plans to invest Rs. 11,000 Cr. to strengthen the inter-state corridor by adding 4,025 ckt kms of transmission lines and 3 substations with transformational capacity of 3,000 MVA.

The ongoing/ proposed projects for capacity additions and augmentation will be adequate to cater to the projected increase in load and also

improve reliability of the system by building in redundancies.

1.5. Adequacy of distribution network

In order to ensure that Maharashtra achieves 24x7 power for all consumers, the State distribution utility, MSEDCL, has proposed a total investment of Rs. 28,394 Cr. from FY16 to FY19, while Rs.9,691 Cr. is expected to be invested beyond FY19. The proposed capital expenditure shall be funded through a mix of external borrowings, equity and grants (Rs. 6,899 Cr.) under various State and Central schemes including DDUGJY and IPDS.

Other distribution licensees R- Infra, BEST, TPC have proposed an investment of Rs. 2,635 Cr., Rs. 800 Cr., Rs. 1,037.3 Cr. over the next four years to augment and strengthen their network. Thus, a total investment of Rs. 42,662 Cr. is expected in the State over the next 5 years period. The utility- details of capital expenditure planned, envisaged availability of grants and balance funds to be arranged by the utilities, is provided in Table 1.

Table 1: Utility wise capex and funding (Rs. Cr.)

Entity (Rs. Cr.)	Total investments	Grants	Gap to be funded by debt and equity
MSEDCL	38,085	6,899.0	31,186.0
R-Infra	2,635	543.0	2,092.0
BEST	905	62.8	842.2
TPC-D	1,037	622.4	414.6
Total Maharashtra	42,662	8,127.2	34,534.9

With the proposed investments in distribution infrastructure and various other initiatives being undertaken by the licensees, it is expected that electricity access and 24x7 reliable power supply to all the consumers will be achieved by the end of FY19.

1.6. Clean energy and energy efficiency

Maharashtra has a non-solar renewable energy potential of about 13,750 MW, of which wind has the highest potential at 9,400 MW. In order to boost the growth of renewable energy generation, MERC has issued RPO regulations and has set specific targets for solar, mini/ micro HEPs and other Non-solar RE sources. The State has planned to add RE generation capacity (including solar) totaling to 14,400 MW over the next 5 years.

The State utilities have been progressive in adopting load management/ energy efficiency/ DSM programs and have taken up widespread implementation of various landmark initiatives such as the Gaothan Feeder Separation Scheme.

The major programs being pursued in the State during FY16 to FY19 include Solar based off-grid Agriculture Pumping Program, LED distribution under DELP, HVAC (promotion of star labelled equipment) and Energy Efficient Street Lighting Project.

1.7. Tariff impact and financial turn-around

MSEDCL has been rated as “A” by ICRA, indicating “High Operational and Financial Performance Capability”. This is based on the past performance of the utility, wherein it has achieved steady reduction in AT&C losses and has successfully implemented various operational performance improvement measures. However, the persistent gap between ACS and ABR and additional financing cost of increased working capital requirement due to lower collection efficiency has translated in to accumulated financial losses to the tune of Rs.5,974 Cr. Going forward, the expansion in consumer base, increased energy requirement and proposed infrastructure investments under the PFA program are expected to translate into a tariff implication of Rs.0.08/kWh in FY16, Rs.0.41/ kWh in FY17, Rs. 0.48/ kWh in FY18 and 0.42/kWh in FY19. This considers achievement of AT&C loss trajectory and full

availability of grants as per MSEDCL's proposals.

Despite the proposed reduction in AT&C losses from 18.71%% in FY15 to 14.39% in FY19, the annual financial losses of MSEDCL are projected to increase to Rs.5,373 Cr. in FY19 in the absence of tariff and power purchase rationalization initiatives.

It is estimated that over and above the pass-through of actual increase in power purchase costs, an additional tariff increase of nearly 1.29% YoY is required for turnaround of MSEDCL by FY19. Some contingent events related to compensatory tariff are also impending, that may adversely impact the financial position if not dealt appropriately.

On the basis of above considerations, a plan to achieve '24x7 Power for All' along with a proposed rollout plan has been formulated and detailed in this document.



2. Background

2.1. The State of Maharashtra

Situated in the western part of India, Maharashtra is the second most populous State with over 110 million inhabitants. The State capital of Mumbai has a population of approximately 18 million and is also known as the financial capital of the nation. Maharashtra contributes 25% of the country's industrial output and 23.2% of its GDP (as per FY11 estimates).

Maharashtra is surrounded by the states of Gujarat to the northwest, Madhya Pradesh to the north, Chhattisgarh to the east, Andhra Pradesh to the southeast, Karnataka to the south, and Goa to the southwest and by the union territory of Dadra and Nagar Haveli and the Arabian Sea to the west.

As of FY14, according to the State's economic survey the per capita income at constant prices

(FY05) was at Rs. 69,584 way ahead of the national level of Rs. 39,961. The numbers point to the fact that Maharashtra is one of the largest and economically prosperous states in India. Some of the key highlights of the State is outlined in Table 2.

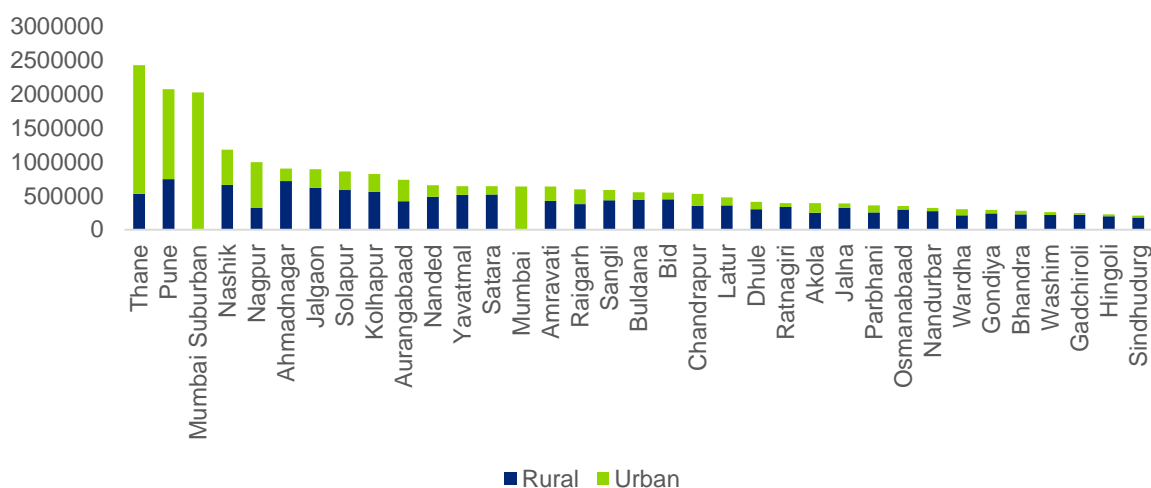
Maharashtra is the 5th most urbanized State in the country with about 45.2% urban population and is behind Goa (62.2%), Mizoram (52.1%), Tamil Nadu (48.4%) and Kerala (47.7%). Increase in urban population from 42.4% in 2001 to 45.2% in 2011 clearly indicates strong growth in the extent of urbanization and the continuance of migration of population from rural to urban areas during the last decade. The high extent of urbanization in the most populous districts of the State is shown in Figure 1.

Table 2: Key Highlights of State: Maharashtra

Parameter	Information
Year of Creation	Conceptualized in 1906, Formed on May 1, 1960
Population & Demographics	Total Population at 11.24 Crore as per 2011 census <ul style="list-style-type: none"> 55% Rural, 45% Urban Decadal population growth: 15.99%
Area	3.08 lakh square kilometers (9.35 % of country) <ul style="list-style-type: none"> Forest cover – 61,939 sq kms (7.25 % of country) Total cropped area – 24069 sq kms (12.9% of country)
Administrative Set-up	<ul style="list-style-type: none"> 6 Divisions 36 Districts 109 sub-divisions 357 Talukas 40,956 Villages (99.9% Electrified)
Coastline	<ul style="list-style-type: none"> 720 kilometers along Arabian Sea
Natural Resources	<ul style="list-style-type: none"> Coal 5,576 MT

Parameter	Information
	<ul style="list-style-type: none"> Limestone 1,371 MT Other Resources: Iron Ore, Manganese Ore, Bauxite etc.
HHs	<p>Total 2,38,30,580 HHs (83.94% Electrified) As on March 2011</p> <ul style="list-style-type: none"> Urban 1,08,13,928 (96.16% Electrified) Rural 1,30,16,652 (73.79% Electrified)

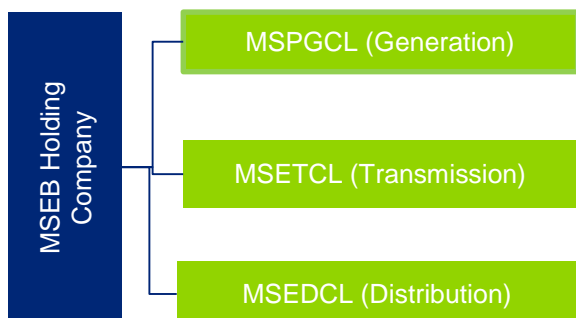
Figure 1: District wise Urban and Rural Divide (2011 Census)



2.2. Maharashtra Power Sector At a Glance

The State undertook structural reforms in 2005, the erstwhile Maharashtra State Electricity Board (MSEB) was restructured vide Government of Maharashtra G.R.No. ELA-1003/P.K.8588/Bhag-2/Urja-5 Dated 24-01-2005 into following four entities, in compliance to the Electricity Act, 2003.

- Maharashtra State Electricity Transmission Company Limited (MSETCL – Transmission Company); and
- Maharashtra State Electricity Distribution Company Limited (MSEDCL – Distribution Company).



- MSEB Holding Company Limited;
- Maharashtra State Power Generation Corporation Limited (MSPGCL – Generating Company);

Maharashtra Electricity Regulatory Commission (MERC) established in August, 1999 has been regulating the electricity sector in the State in accordance with the provisions of the Electricity Act, 2003. The MERC has put in place the key regulations governing the sector and has been issuing tariff orders for the utilities.

An overview on the present status of the power sector in the State is shown in Table 3.

Table 3: Maharashtra Power Sector at a Glance

Aspect	Key Highlights																														
Demand Supply Position	<p>The State of Maharashtra has the largest power system in the country with a peak demand of over 20,000 MW. The State has less than national average demand supply mismatch. (National Peak deficit – 4.7% and Energy deficit – 3.6%). The FY15 demand supply situation in peak and energy terms for the State is highlighted in the table below:</p> <table><tr><th>Item</th><th>Peak (MW)</th><th>Energy (MU)</th></tr><tr><td>Requirement</td><td>20,147</td><td>1,34,897</td></tr><tr><td>Availability</td><td>19,804</td><td>1,33,078</td></tr><tr><td>Gap</td><td>-1.7 %</td><td>-1.35 %</td></tr></table>	Item	Peak (MW)	Energy (MU)	Requirement	20,147	1,34,897	Availability	19,804	1,33,078	Gap	-1.7 %	-1.35 %																		
Item	Peak (MW)	Energy (MU)																													
Requirement	20,147	1,34,897																													
Availability	19,804	1,33,078																													
Gap	-1.7 %	-1.35 %																													
Generation	<p>The total generation capacity available to the State as on March, 2015 was 37,797 MW (as per CEA data), with the following break-up:</p> <table><tr><th>Mode</th><th colspan="4">Available Capacity (MW) as on March 2015</th></tr><tr><th></th><th>Thermal</th><th>Hydro</th><th>RE</th><th>Total</th></tr><tr><td>State</td><td>10,232¹</td><td>2,885</td><td>327</td><td>13,444</td></tr><tr><td>Private</td><td>11,976</td><td>447</td><td>5,303</td><td>17,726</td></tr><tr><td>Central</td><td>6,627</td><td>0</td><td>0</td><td>6,627</td></tr><tr><td>Total</td><td>28,835</td><td>3,332</td><td>5,630</td><td>37,797</td></tr></table>	Mode	Available Capacity (MW) as on March 2015					Thermal	Hydro	RE	Total	State	10,232 ¹	2,885	327	13,444	Private	11,976	447	5,303	17,726	Central	6,627	0	0	6,627	Total	28,835	3,332	5,630	37,797
Mode	Available Capacity (MW) as on March 2015																														
	Thermal	Hydro	RE	Total																											
State	10,232 ¹	2,885	327	13,444																											
Private	11,976	447	5,303	17,726																											
Central	6,627	0	0	6,627																											
Total	28,835	3,332	5,630	37,797																											
Transmission	<p>MSETCL is the STU for the State of Maharashtra and there are additional 7 transmission licensees responsible for Intra-State transmission, whereas PGCIL alone is handling the Inter-State transmission of power. The total inter and intra-State transmission capacities include the following:</p> <table><tr><th>Category</th><th>No. of EHV Substations</th><th>Transformation Capacity (MVA)</th><th>Line Length (ckt kms)</th></tr><tr><td>Intra-State</td><td>638</td><td>1,18,450</td><td>45,531</td></tr><tr><td>Inter- State</td><td>7</td><td>9,965</td><td>3,657</td></tr></table>	Category	No. of EHV Substations	Transformation Capacity (MVA)	Line Length (ckt kms)	Intra-State	638	1,18,450	45,531	Inter- State	7	9,965	3,657																		
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Intra-State	638	1,18,450	45,531																												
Inter- State	7	9,965	3,657																												
Distribution	<p>There are 4 distribution companies in Maharashtra responsible for electricity distribution – BEST, R-Infra, MSEDCL, and TPC.</p> <table><tr><th>Licensee</th><th>License Area</th><th>Number of Consumers</th><th>Energy sales (MUs)</th></tr><tr><td>MSEDCL</td><td>Entire State</td><td>2,31,28,000</td><td>90,433</td></tr><tr><td>R-Infra</td><td>Sub-urban Mumbai</td><td>23,91,639 (Retail)</td><td>7675</td></tr><tr><td>BEST</td><td>Town Area - Mumbai</td><td>10,10,299</td><td>4,419</td></tr><tr><td>Tata Power</td><td>Sub-urban Mumbai & Town Area (Parallel Licensee)</td><td>4,92.610</td><td>6261</td></tr><tr><td>Total</td><td></td><td>2,70,22,548</td><td>1,08,788</td></tr></table>	Licensee	License Area	Number of Consumers	Energy sales (MUs)	MSEDCL	Entire State	2,31,28,000	90,433	R-Infra	Sub-urban Mumbai	23,91,639 (Retail)	7675	BEST	Town Area - Mumbai	10,10,299	4,419	Tata Power	Sub-urban Mumbai & Town Area (Parallel Licensee)	4,92.610	6261	Total		2,70,22,548	1,08,788						
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¹ Current installed capacity for State Sector Thermal generation is shown as 10232 MW which includes 420 MW capacity of de-commissioned units at Koradi (Units # 1 to 4 of 105 MW each) for which CEA approval is awaited. Also this includes recently synchronised but yet under trial run units at Koradi (U # 8: 660 MW) & Chandrapur (unit # 8 : 500 MW).

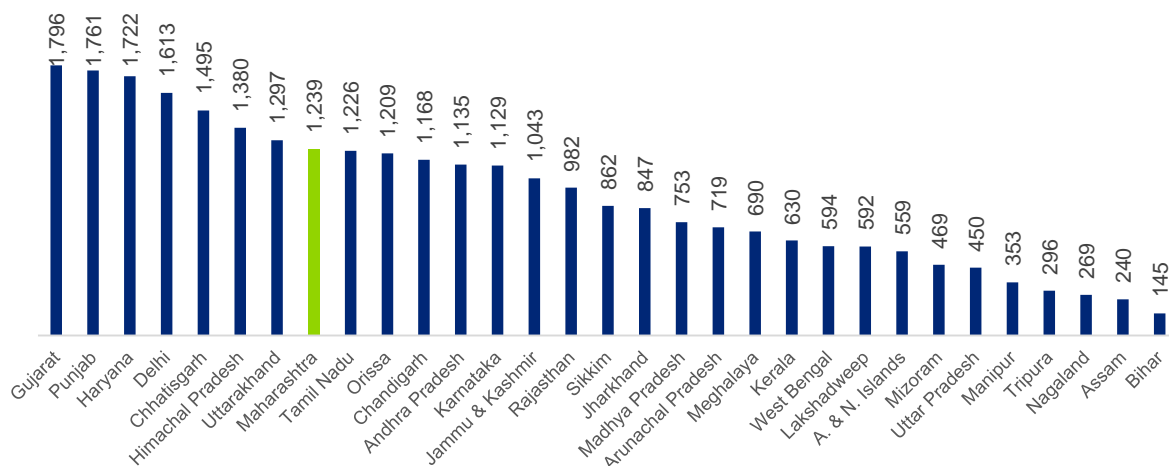
Aspect	Key Highlights
Financial Position	<p>The financial position of MSEDCL has been adversely impacted over the past few years despite having low gap in ACS and ABR, primarily due to extra-ordinary factors such as less than 100% collection efficiency and looming bad-debts. Although the yearly losses have come down to Rs.280 Cr in FY14 from Rs.1,505 Cr. in FY11, the accumulated losses as on FY14 stand at Rs. 5,947 Cr.</p>

A SWOT analysis of current power sector scenario is shown in Table 4.

Table 4: SWOT Analysis of Power Sector

Strengths	Weaknesses
<ul style="list-style-type: none"> • Largest power system amongst all states in terms of number of consumers served, managed demand and state sector installed generation capacity; • Favourable consumer mix due to higher levels of industrial development in the state; • State has abundant resources viz. coal reserves, hydro power potential; • Low AT&C loss levels; • Amongst leading states in Renewable Energy Development; • Leading state in introduction of Load Management, Energy Efficiency and Demand Side Management initiatives; • MSEDCL rated as A (high operational & financial performance capability) in 3rd Integrated Rating of State Power Distribution Utilities; • Development of large number of IPPs within the State; 	<ul style="list-style-type: none"> • Over 20 Lakh HHs yet to be provided with electricity access; • Lower PLF of State Sector thermal generating stations; • High agricultural consumer base with poor metering and high levels of tariff subsidy/ cross subsidy; • Regional imbalances (amongst Vidarbha, Marathwada and Rest of State) in per capita consumption; • Supply in Rural Areas limited to about 20 hours per day. • Accumulated losses in state distribution licensee MSEDCL to the tune of Rs. 6,000 crores due to regulatory disallowances;
Opportunities	Threats
<ul style="list-style-type: none"> • Anticipated high economic growth in the state to result into strong demand growth for power and further improvement of favourable consumer mix. • Introduce new technology initiatives and IT based systems to enhance customer service levels; • Furthering of RE Generation within the state; • Increasing focus on EE/ DSM initiatives to avoid creation of wasteful capacities 	<ul style="list-style-type: none"> • Increasing pressure due to RoW issues may lead to delay in works/ increased cost implications; • Increasing sales to subsidized/ BPL consumers under PFA Roadmap may lead to additional tariff burden on subsidizing consumers who may consequently opt for alternative sources of power under Open Access. • The state is already facing significant intra-day surplus which is expected to increase in future. With the current realization from short-term sale being lesser than the average power purchase cost, the State will need to devise a comprehensive strategy for dealing with surplus power. • With increasing RE mix in the overall supply in the State, there may be a need to additional investments to ensure grid stability/ reserves. • Continuance of annual operating losses and inability to address the accumulated outstanding losses may worsen financial position of MSEDCL going forward.

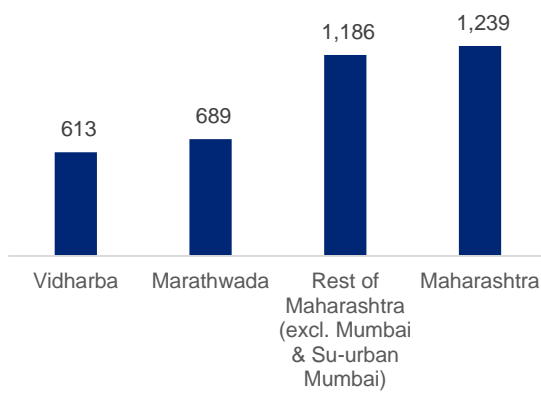
Figure 2: Per capita electricity consumption (kWh)



Maharashtra is 8th amongst all states in terms of per capita electricity consumption as can be seen in Figure 2. This compares poorly with the world average consumption of about 3,000kWh.

A further deep dive in the pattern of electricity consumption amongst the regions of Maharashtra reveals skewed electricity consumption in particular regions. As can be seen in Figure 3, per capita consumption in Vidharba and Marathwada regions is significantly lower than Rest of Maharashtra (RoM) (excluding Mumbai and Sub-urban Mumbai) and that of Maharashtra State as a whole. This is particularly due to significant industrial activity and higher standards of living in the RoM Region. Also, the majority of unconnected HHs are situated in these regions.

Figure 3: Per capita consumption - Regions (kWh)



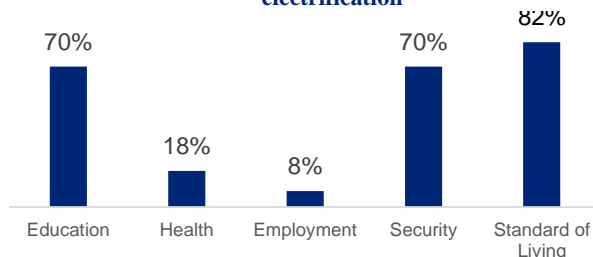
Therefore, there is a need to focus on providing adequate and reliable electricity to these regions for an inclusive growth of the State.

2.3. Socio-Economic Impact of Electrification

It is a well-established fact that access to electricity leads to a significant improvement in the socio-economic well-being of citizens. In case of rural and BPL HHs, electricity access plays the role of catalyst in uplifting their living standards considerably. Electricity access directly impacts the economy, education and health for the poor, resulting in overall social upliftment. The direct and indirect outcomes which can be related to electricity access are detailed in Table 5.

In case of Maharashtra, a survey² has been carried out to evaluate the socio-economic impact of RGGVY program. Figure 4 summarizes the perceived benefits of RGGVY

Figure 4: Survey Result - perceived benefits of electrification



² Final report on Evaluation of RGGVY Scheme in Maharashtra, July 2013

on various aspects related to socio-economic benefits. The results are based on survey of 1,215 respondents from 25 villages electrified under RGGVY program. It can be seen that

more than 70% respondents found the impact of RGGVY was significantly positive on education, security and overall standard of living.

Table 5: Parameters for assessing impact of electrification

Parameters	Enablers	Impact
Basic Infrastructure	Water Pumps, Lighting, TV, Fans, Storage (refrigeration), room coolers, Water filtration or purification, piped water supply	<ul style="list-style-type: none"> • Women's less dependent or physical effort to fetch water from community wells, • Improved awareness, • Improved health and quality of life • Less dependent on water hand pumps or community wells for washing, bathing. • Cooking beyond daylight hours • More mechanized way of cooking and storage (refrigeration) • Less time spend on gathering firewood, fetching water • More time for education and other livelihood activities
Livelihoods & Energy	Dedicated feeders, transformers, independent water pumps	<ul style="list-style-type: none"> • Shift in cropping patterns to harvest less water intensive crops • Alternate livelihoods option • Adopt alternative methods of irrigation • Shifting from conventional way of hand weaving to mechanized weaving • New entrepreneur activities in the region • Increase in Income
Health & Education	Availability of alternate fuels, Media & Communication, Piped water supply, in-house toilet facility	<ul style="list-style-type: none"> • Study beyond day time hours • Improved in Indoor air quality and relative health aspects and less dependence on biomass collection • Improved awareness aware of health issues (HIV, Swine flu, Malaria, Polio, hygiene, etc.) • Piped water supply resulted in improved hygiene condition and less open defecation

3. Power Supply Scenario

3.1. Power Supply Position

The State of Maharashtra is the largest consumer of electricity, accounting for nearly 12.6% of total energy requirement in India. It is the second most populous and third largest State in the country. The State has recorded a comparatively lower than national average peak demand supply gap of 1.7% during FY15. Owing to significant capacity additions in the past few years and steady reduction in T&D losses, there has been a significant improvement in the power supply position of the State.

As can be seen in Table 6, the power supply in the State has increased at a CAGR of 4.8% whereas the peak demand has more or less stagnated at the same level, thus reducing the overall demand supply gap over the years.

It is important to note that the annual peak requirement averages out the seasonal demand variations which is essential to be considered to

ensure the achievement of objectives under 24X7 power supply.

Additionally, the utilities operating in the State may need to undertake measures under Demand Side Management (DSM) initiatives to flatten the load curve and ensure adequate supply to their consumers at all times of the day.

A significant dip can be observed in the peak demand for FY13 in Table 6, which is mainly on account of changes in underlying methodology for estimation of peak demand. It may be noted that till February 2012 the State demand was calculated as aggregate of State demand met, load shedding and load relief from load management schemes. However, under AG Load Management Scheme, the daily supply to 3 phase agriculture pumps is limited to 8 hours only. Hence, after February 2012 the State

Table 6: State's Peak Deficit (%) Trend

Particulars	FY12	FY13	FY14	FY15
Energy requirement and availability				
Energy requirement (MUs)	141,382	123,984	126,288	134,897
Energy available (MUs)	117,772	119,972	123,672	133,078
Energy shortage	16.7%	3.2%	2.1%	1.3%
Peak power demand and supply				
Peak Demand (MW)	21,069	17,934	19,276	20,147
Peak Available (MW)	16,417	16,765	17,621	19,804
Peak Shortage (%)	22.1%	6.5%	8.6%	1.7%

demand is estimated as aggregate of State demand met and load shedding only. The load relief from load management schemes is not being considered in calculation of State demand from FY13 onwards.

3.2. Consumer & Sales Mix

As outlined earlier, there are 4 distribution licensees engaged in supplying electricity to the end consumers in the State of Maharashtra, namely MSEDCL, Reliance Infra, BEST and TPC. Amongst the four utilities, MSEDCL is the State owned distribution company responsible for providing electricity to the consumers across the State except Mumbai, having a share of nearly 82% in terms of energy sold. While TPC and R-Infra are privately owned distribution companies, BEST (Brihanmumbai Electricity Supply and Transport) is an autonomous body under Municipal Corporation of Greater Mumbai. The three utilities namely R-Infra, TPC and BEST serve the consumer base of Mumbai and its suburbs only and account for a total of about 18% energy sales in the State, as seen in

Figure 5: Share of Distribution utilities (MU Sales and %age share, FY14, as per utilities)

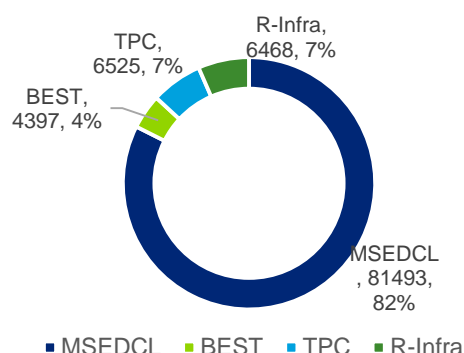
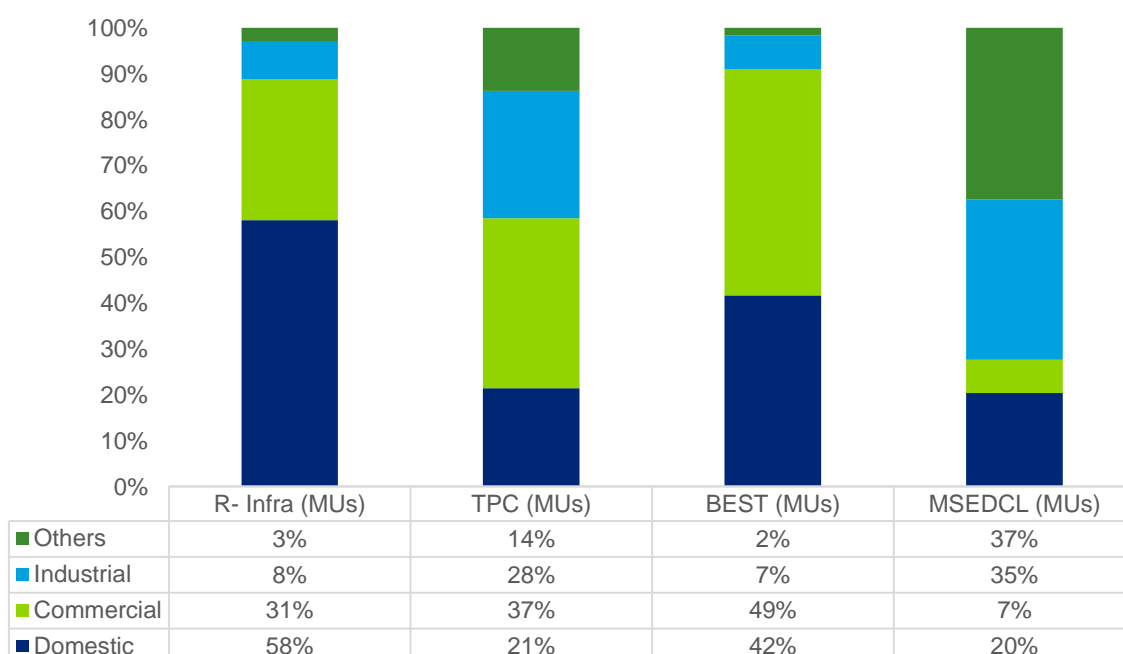


Figure 5. Further, TPC'S area of supply overlaps with that of R-infra and BEST and on account of migration of consumers between the licensees the %age share of sales keeps changing amongst licensees.

In terms of energy sold to different categories of consumers, MSEDCL accounts for over 70% of total domestic sales and 92% of total industrial sales in the State. Figure 6 summarizes the share of different utilities in total energy sold to different categories of consumers.

Figure 6: Sales mix (%age) of different utilities (FY14)



It is pertinent to mention that MSEDCL also supplies electricity to agricultural consumers in the State, which accounts for over 26% of its total sales. In case of other utilities, sales to commercial consumers is high except R-Infra which has highest proportion domestic sales.

In terms of number of consumers, out of a total of about 2.6 crore consumers in the State, nearly 2.2 Crore are being served by MSEDCL while remaining 40 lakh consumers are served by the other utilities. The category wise number of consumers connected to different utilities are summarized in Table 7.

As the other three licenses are operating in a limited geographical area, i.e. Mumbai and its suburbs, which already has almost 100% electrification and 24X7 power availability, the significance of PFA program increases for MSEDCL, which is operating across the State and is yet to achieve 100% electrification and 24X7 supply to its consumers. Accordingly, the success of PFA program largely depends upon the ability of MSEDCL to provide 24X7 adequate power to all the HHs and other consumers in the State. Therefore, the projections of latent energy requirement from existing HHs and additional energy requirement from newly constructed HHs and newly electrified HHs, has been done keeping MSEDCL in focus. It is expected that the un-electrified HHs and newly constructed HHs shall be provided electricity access by MSEDCL and the required T&D infrastructure shall be developed within the next four years.

The natural demand growth for the other licensees operating in Mumbai and its suburbs has been adopted in this roadmap as per the projections done by the respective utilities.

3.3. Methodology for Demand Projections

In line with the objective of PFA program, to provide 24X7 power to all households, the demand projections have been done separately for electrified and un-electrified rural and urban households. Whereas, for rest of the consumer categories a growth rate, based on the State's/ utilities estimation of the expected growth along with a review/ validation with the past trend has been considered. The details of various components of energy requirement are presented in the following paragraphs.

Estimation of Rural and Urban electrified and un-electrified HHs

The number of rural and urban HHs are estimated based on the available census data for 2011, which is extrapolated with past 10 years CAGR to arrive at the estimates for FY14.

In addition to the level of electrification in rural areas as per 2011 census data, the actual rural HHs electrified since 2011 under RGGVY has been considered to arrive at the present level of electrification. In case of urban areas, the same level of access as in 2011 census (in percentage terms) has been assumed on the estimated HH numbers to arrive at the number

Table 7: Category Wise Consumer Base of Distribution Utilities (FY14)

Category (nos., FY14)	MSEDCL	BEST	TPC	R-Infra
Domestic	1,62,46,938	7,59,594	4,36,341	20,53,642
Commercial	15,66,017	2,23,826	41,761	3,96,815
Industrial	3,15,133	14,080	14,119	17,031
Others	39,38,285	39	389	5,597
Total	22,066,373	997,539	492,610	2,473,085

of existing un-electrified HHs. The estimated urban and rural HHs along with the status of electrification as at the end of FY14 is provided in Table 8. Further, MSEDCL may undertake a need based survey to assess the actual number of HHs to be connected in rural and urban areas.

Table 8: Estimated Un-electrified Households (end of FY14)

Particulars	Urban	Rural	Total
Total HHs	12,367,182	13,964,773	26,331,955
Electrified	12,303,579	12,091,686	24,395,265
Balance (covered under PFA)	63,603	1,873,087	1,936,690

Estimation of energy requirement from HHs

The energy requirement from HHs has been estimated under the following three broad categories:

- Latent requirement from existing HHs on account of increase in energy availability;
- Additional energy requirement due to electrification of un-electrified HHs; and
- Additional energy requirement due to construction of new urban and rural HHs.

Latent energy requirement from existing HHs

Latent demand growth from already electrified HHs has been estimated based on expected increase in consumption levels in accordance

with the objectives of the PFA program. Such growth would not only include the increased energy requirement due to elimination of power shortages and network constraints but also the natural growth in consumption levels due to lifestyle changes. The year on year increase in per HH urban and rural consumption per day for all four utilities is presented in Table 9.

Table 9: Per HH per day consumption (kWh)

Particulars	FY15	FY16	FY17	FY18	FY19
MSEDCL - Urban	2.98	3.22	3.47	3.75	4.05
MSEDCL - Rural	1.59	1.71	1.85	2	2.16
R-Infra	5.05	5.08	5.08	5.08	5.08
BEST	7.03	7.08	7.13	7.13	7.13
Tata Power	8.05	8.13	8.21	8.29	8.38

As seen in Table 9, as the energy availability increases, per day per HH energy consumption is expected to increase mainly for urban and rural HHs served by MSEDCL. While, as the other utilities serving in limited area of Mumbai are already providing 24X7 supply, per HH per day demand is not expected to increase significantly.

Additional energy requirement due to electrification

The proposed year wise electrification plan of MSEDCL considered for the purpose of power supply related projections is summarized in Table 10.

Table 10: Grid Electrification Plan (Urban & Rural HHs Nos.) - MSEDCL

Particulars	FY15	FY16	FY17	FY18	FY19
Urban					
Opening Un-electrified HHs	63,603	1,977	-	-	-
HHs Electrified	61,626	1,977	-	-	-
Balance Un-electrified HHs	1,977	-	-	-	-
Rural					
Opening Un-electrified HHs	1,873,087	1,479,991	1,103,591	729,591	353,275
HHs Electrified	393,096	376,400	374,000	376,316	353,275

Particulars	FY15	FY16	FY17	FY18	FY19
Balance Un-electrified HHs	1,479,991	1,103,591	729,591	353,275	-

Additional energy requirement due to construction of new HHs

In order to estimate the energy requirement for newly constructed HHs, the expected number of newly constructed HHs has been estimated based on the past growth of HHs at a CAGR of 2.5% and 1.55% for urban and rural areas respectively. The corresponding energy requirement from new HHs is estimated based on the estimated per HH per day consumption detailed above in paras above.

Estimation of energy requirement from other consumer categories

The energy requirement projections from other consumer categories have been done factoring the expected natural growth as well as the additional growth arising out of increased availability of electricity in accordance with the PFA Roadmap.

For the remaining consumer categories such as commercial, public lighting, agriculture, public water works etc. the last 5 years CAGR of ~10% has been considered to arrive at the projected demand. The projected demand for different

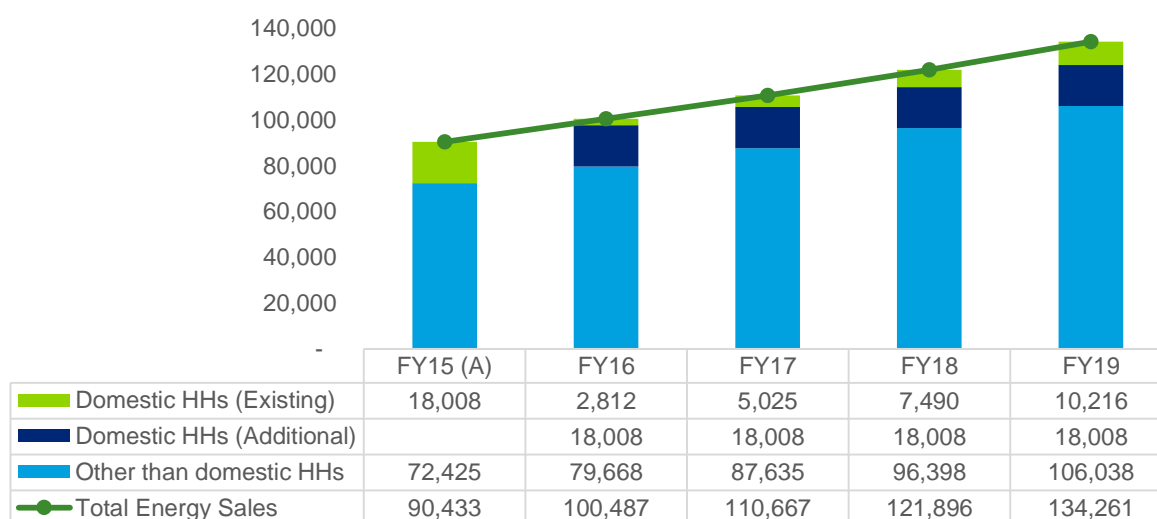
consumer categories is discussed in the following sub-section.

3.4. Demand Projections

Based on above steps, the energy requirement for Maharashtra (considering the consumers to be served by MSEDCL only) is expected to increase nearly 1.43 times, from 1,12,986 MU in FY15 to 1,61,321 MU in FY19, as represented in Table 12.

As can be seen above, despite increase in electrification of HHs and increase in per capita consumption from HHs, the share of domestic sales in MSEDCL's overall sales mix changes only marginally from 19.9% in FY15 to 21.4% in FY19. A significant proportion of increase in energy sales is attributable mainly to other than domestic sales, which is expected to grow at a CAGR of ~10% during the period. Moreover, the proportion of rural sales to total domestic sales is expected to change only marginally as the increase in per HH per day consumption of urban HHs is proposed at a faster rate than that of rural HHs.

Figure 7: Projected Energy Sales MSEDCL (MU)



As presented in Table 12, MSEDCL's energy requirement at the state periphery is likely to increase from 1,12,986 MU in FY15 to nearly 1,61,321 MU in FY19, as the T&D losses are expected to reduce from 16.6% in FY15 to around 13.3% in FY19, owing to the numerous measures proposed by the utility.

The T&D loss targets set by MSEDCL have been utilized for the purpose of energy input requirement assessment, while the intra-State transmission losses have been assumed to remain constant at 4.00% over the period. For estimation of peak demand, opening load factor has been taken as per MSEDCL estimates which was 72.9% during FY15.

A further analysis of peak demand and base load of MSEDCL entails significant requirement of measures to flatten the load curve. As can be seen in Table 11, based on the past average, the estimated peak demand in MSEDCL's area is expected to be nearly twice of assessed base load. The utility needs to carefully plan its purchase portfolio to optimize the cost considering the base load and peak load differences.

Table 11: Peak vs Base Load (MSEDCL)

MSEDCL	FY16	FY17	FY18	FY19
Peak demand	19,052	20,442	22,047	23,785
Average	16,908	18,141	19,566	21,108
Base	10,128	10,867	11,720	12,644

The projected energy requirement and peak demand for other distribution licensees, as proposed by the respective licensees is summarized in Table 13.

3.5. Overall Demand Projections – State

At a State level, from the present levels in FY15, the energy requirement is projected to grow at an annual rate of 8.4% to reach at 1,83,147 MUs in FY19 from 132,743 MU in FY15. Similarly, the peak demand is projected to grow at a CAGR of 7.0% reaching at 26,432 MW in FY19 from 20,147 MW in FY15.

While the projected energy requirement in MU terms is expected to surpass the 18th EPS estimates from FY18 onwards, the projected peak demand in MW is expected to fall short of the 18th EPS estimates. The difference in the peak demand projections is due to the significant difference in the load factor used in the 18th EPS (at 70.49% in FY15) vis-à-vis the actual load factor witnessed (75.2% in FY15). Due to the significant variation observed in the load factor, the projections in the PFA Roadmap have been based on the load factor estimates provided by the respective distribution utilities. Figure 8 provides the details of the projected peak demand and energy requirement of the State.

The subsequent chapters layout the various elements of the PFA Roadmap covering power generation, transmission, distribution, RE/EE and financial viability related aspects essential for enabling achievement of PFA objectives in the State of Maharashtra.

The overall peak demand for the State assessed as above has been analyzed in terms of the base load and average load requirements. Based on the past trend the minimum and average load has been estimated, as presented in Table 14.

Table 12: Energy Requirement & Peak Demand Projections - MSEDCL

Particulars	Units	FY15 (A)	FY16	FY17	FY18	FY19
Energy requirement/ Sales	MU	90,433	100,487	110,667	121,896	134,261
Distribution Losses	%	16.63%	16.05%	15.26%	14.29%	13.31%
Transmission Losses	%	4%	4%	4%	4%	4%

Particulars	Units	FY15 (A)	FY16	FY17	FY18	FY19
Energy Input Requirement	MU	112,986	124,689	136,038	148,144	161,321
Peak Demand	MW	17,694	19,052	20,515	22,090	23,785

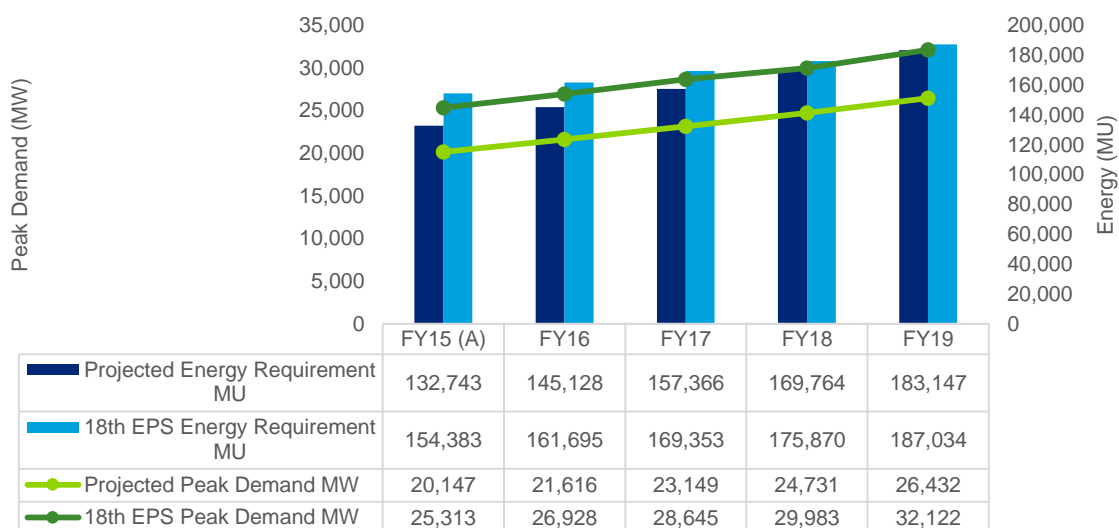
Table 13: Energy Requirement & Peak Demand Projections – Other Licensees

Particulars	Units	FY15 (RE)	FY16	FY17	FY18	FY19
R-Infra Distribution						
Energy Requirement	MU	8,864	9,208	9,373	9,604	9,842
Peak Demand	MW	1,540	1,521	1,564	1,608	1,653
BEST						
Energy Requirement	MU	4,632	4,782	4,830	4,888	4,937
Peak Demand	MW	901	1,074	1,146	1,157	1,169
TPC Distribution						
Energy Requirement	MU	6,261	6,449	6,642	6,842	7,047
Peak Demand	MW	1,028	1,059	1,091	1,123	1,157
Total Energy Requirement	MU	19,757	20,439	20,845	21,334	21,826
Total Peak Demand	MW	3,469	3,654	3,801	3,888	3,979

Table 14: Peak Load Vs Base Load (Maharashtra State)

Maharashtra	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19
Peak Load	19,764	20,907	18,268	19,635	20,795	21,616	23,079	24,690	26,432
Average Load	17,045	18,240	16,137	16,414	18,056	18,684	19,949	21,341	22,847
Base Load	9,367	10,535	11,093	9,954	9,377	10,948	11,689	12,504	13,386

Figure 8: Project Peak Demand & Energy Requirement – State



4. Generation Plan

4.1. Generation Capacity Requirement

The requirement of electricity in terms of energy requirement and peak demand are expected to increase significantly from the present level of 1,32,743 MU & 20,147 MW in FY15 to 1,83,147 MU and 26,432 MW in FY19. In order to meet the burgeoning power demand along with the existing tied up generation capacities, the State needs to carefully plan for either developing its own generation capacity or tie up with central generating stations/ IPPs. This chapter evaluates the readiness of the State for meeting the projected power demand scenario under this PFA Roadmap and highlights the steps

required and the way forward in view of the gaps and issues identified therein.

4.2. Existing Generation Capacity

The total Installed capacity as on March 31, 2015 (including share allocated to Maharashtra) is 37,797 MW. The share of thermal sources in the mix of installed generation capacity stands at 74%. Break-up of the installed capacity by ownership and fuel is provided in Table 15.

Table 16 shows the generation capacities available to the various power distribution licensees in the State under long-term PPA's:

Table 15: Installed Capacity (MW) as on March 2015

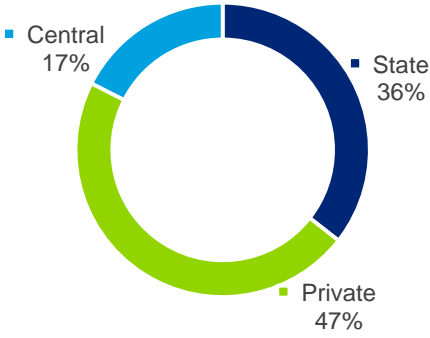
Share	Sector	Thermal	Hydro	RE	Total
	State	10,232	2,885	327	13,444
	Private	11,976	447	5,303	17,726
	Central	6,627	0	0	6,627
	Total	28,835	3,332	5,630	37,797

Table 16: Available Generation Facilities with LT PPA's With Distribution Licensees (MW)

	State	Central	Private/ IPP's	CPP	RE/NCES	Total
MSEDCL	11,237	4,356	5,636	140	5,752	27,121
R-Infra D	-	-	1,100	-	162	1,262
BEST	-	-	1,080	-	-	1,080
TPC-D	-	-	944	-	237	1,181
Total	11,237	4,356	8,760	140	6,151	30,644

Maharashtra State Power Generation Company Ltd. (MSPGCL or Mahagenco) is the State generation company carved out from the erstwhile MSEB. The State's own generation capacity is mostly comprised of coal based thermal power plants. MSPGCL is the second largest power producing company in India after NTPC. MSPGCL operates eight thermal power generating stations located in different parts of the State and 23 hydel generation stations.

The State of Maharashtra had launched a successful IPP policy which has attracted several private players to set-up power generating projects in the State. MSEDCL has entered into PPA's with 9 thermal generating IPPs in the State under MoU and Case-1 route for a tied up capacity totaling over 5,465 MW. Thermal generating capacities totaling 4,345 MW out of the same has already been commissioned by the end of FY15.

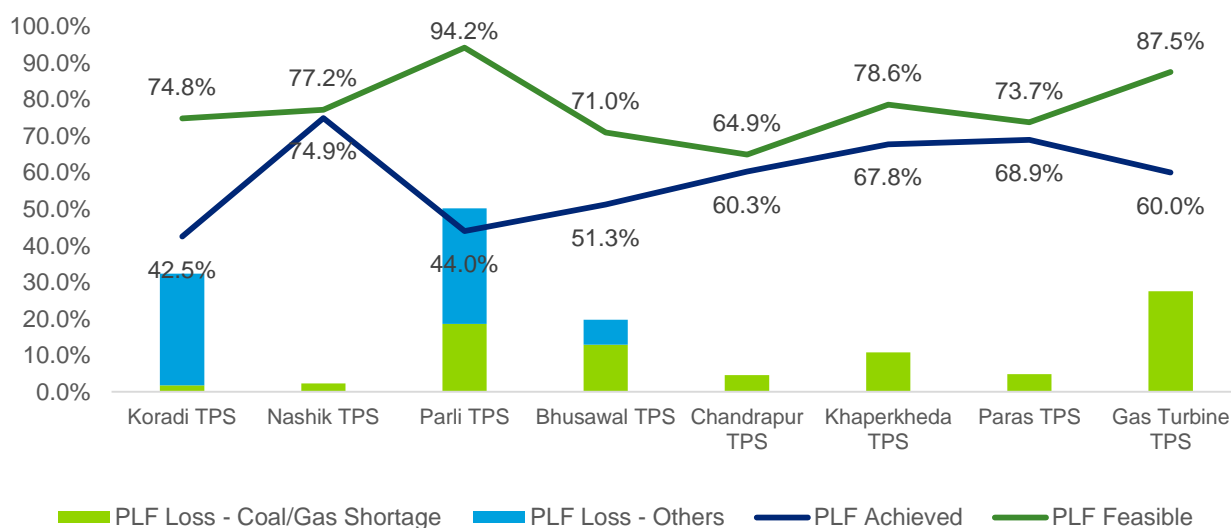
The State is not able to realize the full generation potential due to various reasons like poor quality of coal and non-availability of gas leading to forced outages as can be seen in Figure 9. In case of Koradi TPS and Bhusawal TPS, entire PLF loss is attributable to coal shortages. During FY15, MSPGCL's generation facilities recorded an overall PLF of 59%. Anticipating deteriorating coal realization and heat input deficit for FY15, MSPGCL had

approached MERC for economical shutdown of 5 units (namely Bhusawal-2, Koradi-5 & 6, Chandrapur-1 and Parli-3) which was approved in August 2014.

The actual PLF achieved during FY15, PLF lost due to shortage of coal (Koradi and Bhusawal) and various other reasons (Parli) along with the feasible PLF that could have been achieved if the constraints are not faced is illustrated in the figure below. All 7 plants faced loss of PLF due to shortage of coal ranging from 2% to 19%. Gas station faced 28% loss of generation due to non-availability of gas. While MSEDCL sources over 98% of its power from generating plants it has LT PPA's with, the other utilities in the State distributing power in Mumbai and its suburban areas have significant reliance on short-term sources of power.

The short-term power prices witnessed in FY15 have provided significant relief to R-Infra and BEST in sourcing reasonably priced power from traders under ST agreements at a price lower than the landed cost of power available to these licenses under LT PPA's. However, it may be noted that these utilities have PPAs with generating projects with a cost higher than cost of generation realized by MSEDCL from the State/ central sector sources.

Figure 9: PLF (%) Achieved & PLF Loss Due to Various Reasons - FY15



In the case of MSEDCL, which had adequate tied-up LT PPA's and has had little reliance on ST sources of power during FY15, the average cost of power available from all types of LT sources i.e. MSEDCL, CGS and IPPs has been cheaper than power available under ST arrangements. Figure 10 provides the details of the long term vs short term energy mix of distribution licensees.

Under the given scenario, if MSEDCL is left with any surplus generation from LT PPA's and is able to sell the same in ST markets at the same average price of Rs. 3.82 per unit, it would be beneficial for MSEDCL to enter into PPA's adequate (with spinning reserve margins) enough to cover for its peak power requirement. Continual tracking and analysis of short-term power prices, quantum and timing of availability of surplus generation, fixed vs. variable cost pricing structure of future PPA's would form essential inputs for such decision making process. Figure 11 provides the details of source wise power purchase cost for distribution licensees (FY15).

In case of Tata Power, the utility has long term tie up of 1,181 MW. The list of the long term contract of Tata Power is provided in Table 17. Due to high cost of generation from the oil/gas based Trombay Unit 6, TPC has been forced to increase its dependence on short-term power to optimize its cost of power procurement. TPC has proposed to replace it with a 500 MW coal based generating unit. The proposal for same is under the approval process.

Table 17: TPC –D Long term Contracts

Type	Name of Plant	Capacity (MW)	Share (MW)
Thermal	Trombay U5	500	244
Thermal	Trombay U6	500	244
Thermal	Trombay U7	180	88
Thermal	Trombay U8	250	150
Hydro	Khoploi	72	35
Hydro	Bhivpuri	75	37
Hydro	Bhira	300	146
RE	Wind	208.6	208.6
RE	Solar	28.1	28.1
Total			1,181

4.3. Generation Plan (for MSEDCL)

State Sector

In order to meet the rising demand of power and to achieve the PFA objectives, MSPGCL has planned to expand its current generating capacity by an additional 3,230 MW by the end of FY19. Year wise capacity addition planned in provided in Table 18 and details of the same is provided in Annexure 1.

The status of the key State sector projects under construction is summarized in Table 19. MSPGCL is also pursuing Renovation & Modernization (R&M) of 6 old units in existing plants, in consultation with the CEA, with the objective of improving PLF and availability of these units. The proposed R&M works are summarized in Table 20.

Figure 10: LT vs. ST Energy Mix (%) of Distribution Licensees

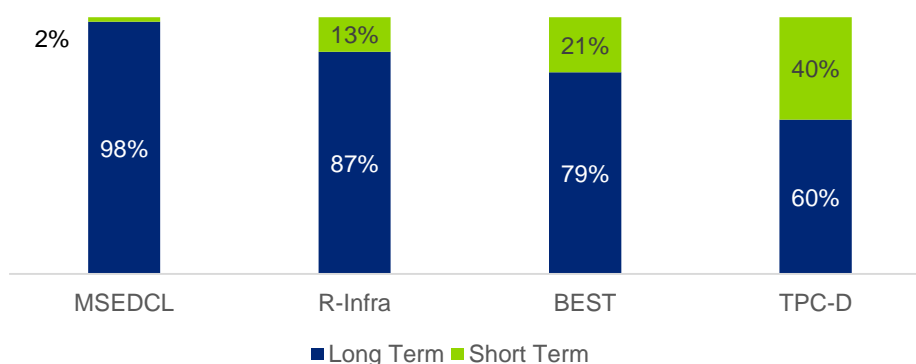


Figure 11: Source Wise Power Purchase Cost (Rs./ Unit) for Distribution Licensees (FY15)

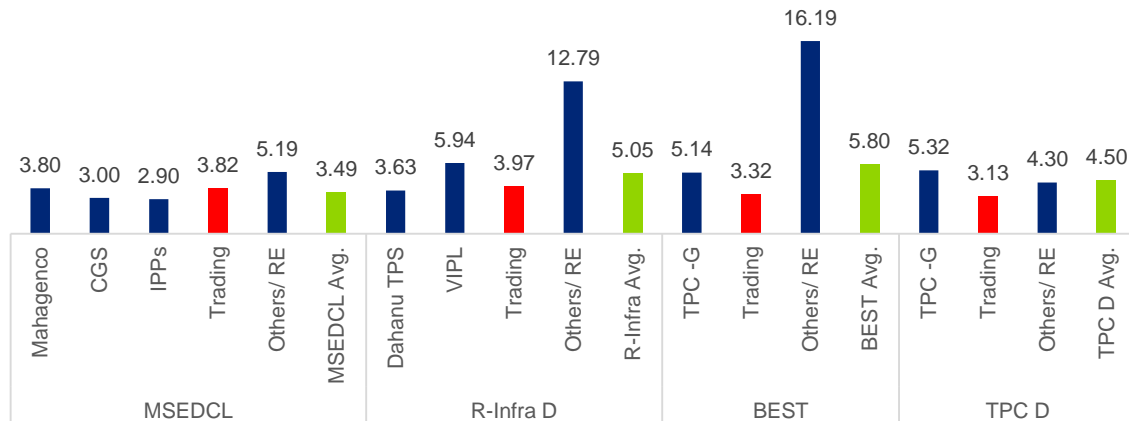


Table 18: Planned Capacity Addition (MW)

Particulars	FY 15	FY 16	FY 17	FY 18	FY 19
Current Installed Capacity	11,237	11,237	13,807	14,467	14,467
Capacity Addition during the year	0	2,570	660	0	0
Cumulative Generation Availability	11,237	13,807	14,467	14,467	14,467

Table 19: Status of MSPGCL Projects under Construction

Name of Plant	Fuel	Capacity (MW)	Revised CoD	Status
Chandrapur TPP Unit 8 & 9	Coal	2 x 500	U8 – Oct, 15 U9 – Feb, 16	Delay in BoP order and main plant equipment supply
Koradi TPP Extn. Unit 8,9 & 10	Coal	3 x 660	U8 – Sep, 15 U9 – Feb, 16 U10 – Apr, 16	Delay in Civil Work by EPC due to financial crunch
Parli TPP Extn. Unit 8	Coal	250	U8 – Jan, 16	Delay in BTG Supply

Table 20: Proposed R&M Works by MSPGCL

Plant/ Unit	R&M Plan	Completion Schedule	Expected Benefits
Koradi Unit 6	<ul style="list-style-type: none"> BTG Package Contract signed with BHEL on 16.12.2013. BoP Package re-tendering in progress. Will be finalized upto Sept-2015. Estimated Project Cost @ Rs.486 cr. 	Sep, 16	<ul style="list-style-type: none"> 228 MW HR 2,350 Kcak/ kWh LE of 15-20 Years
Nashik Unit 3	<ul style="list-style-type: none"> Technical assessment has been completed. MERC has accorded in-principle approval. DPR has been approved by Board of Directors. 	Planned to be decided on the basis of the results achieved in the Koradi Unit 6 R&M.	
Bhusawal Unit 2	<ul style="list-style-type: none"> DPR under preparation 		
Chandrapur Unit 1 & 2	<ul style="list-style-type: none"> DPR under preparation 		
Parli Unit 3	<ul style="list-style-type: none"> DPR under preparation 		

Additionally, MSPGCL is also pursuing new/ future extension and new projects, some of which are expected to be commissioned during the period covered under the PFA Roadmap. The status of proposed new thermal plants of MSPGCL is shown in Table 21. Considering the above R&M activity, commissioning of new units and resolution of issues related to fuel quality and quantity, an improvement in overall PLF of MSPGCL is expected. The overall PLF of MSPGCL is expected to improve from existing level of 59% in FY15 to 66% in FY16, 74% in FY17, 78% in FY18 and 79% in FY19, which has been considered for estimating the energy availability for the State. MSPGCL has outlined numerous measures it plans to undertake for achieving such improvement in the PLF of its generation plants, as discussed in the exhibit below.

Action Plan to Improve PLF of MSPGCL's Generating Stations

Coal Management

- Blending of imported coal.
- Swapping of SECL coal from Nasik to Khaperkheda Plant (@10 LMT).
- Improvement in coal quality after realization of Garepalma and Mahajanwadi coal block dedicated to Mahagenco.

Improvement in O&M practices

- Better monsoon management.
- Coal Mill availability improvement.
- CHP improvement.
- Overhaul planning - Timely availing annual/ capital overhauls & its period reduction.
- Formation of various improvement Committees.
- To improve reliability of units and reduce forced outages, MSPGCL has formed various State Level Committees as under:

1. BTL Committee
2. POG & Water Chemistry Committee
3. Electrical Protection Committee
4. CHP Improvement Committee
5. Coal Mill Performance Improvement Committee
6. ESP & AHP Improvement Committee

Expert Group Services to Plants

- Dedicated HO expert services groups for each power station are formed for O&M related issues/ Environmental issues for better performance of TPS.

Procurement Policy

- Procurement policy was framed in order to have timely availability of material at Power Stations.

MPD & FQAD

- In order to have quality check and also for proper maintenance planning, the two departments were formed at all TPSs as under:
 - i) Maintenance Planning Department (MPD)
 - ii) Field Quality Assurance Department (FQAD)

MSPGCL was also pursuing 1,220 MW Uran Gas Thermal Power Station which has been put on hold in view of CEA's circular dated March 19, 2012 in respect of non-availability of domestic gas. The same may be initiated under the PFA Roadmap if gas availability can be assured by the GoI.

Only Paras Unit 5, from the list of future projects under development, is expected to be commissioned by FY19.

Table 21: Proposed New Thermal Projects by MSPGCL

Name of Plant	Capacity (MW)	CoD	Status
Bhusawal Unit 6	660	FY20	<ul style="list-style-type: none"> Land, Water, Environment Clearance, AAI clearance and PPA are available. EPC contract is in the process of being awarded. Tender scrutinized, price bid opened and proposal put up for approval. Project has been approved by GoM in 2010. Fuel Linkage is proposed from Mahajanwadi Coal block subject to 100% allocation to Mahagenco.
Paras Unit 5*	660	FY19	<ul style="list-style-type: none"> Land, water, Fuel and PPA are in place. The allocated coal block of Mahajanwadi Nagpur is under preliminary stages of development. GoM approval is yet to be obtained. Process for EPC appointment not yet started.
Nashik Unit 6*	660	FY20	<ul style="list-style-type: none"> Land, water, Fuel and PPA are in place. The allocated coal block of Mahajanwadi Nagpur is under preliminary stages of development. MOEF and AAI clearance are under process. Approved by GoM in 2011. Process for EPC appointment not yet started.
Dondaicha (5 X 660 MW)*	3,300	FY23	<ul style="list-style-type: none"> MoU for JV with NTPC under approval of GoM. Water and PPA are in place. Land acquisition is under process. MoEF clearance is in process. Fuel linkage/ coal block allocation yet to be achieved.
* These projects are yet to be decided for final go ahead, considering the CEA/MoP guidelines In addition to the above, MSPGCL also plans to set up a 1,220 MW Gas based Combined Cycle Power Plant at Uran.			

Inter-State/ Central Sector Projects

Available capacities from central sector generating stations is expected to increase from 4,356 MW in FY15 to 6,423 MW in FY19 as per the envisaged commissioning schedule of the allocations to the State from upcoming projects.

Table 22 shows the year wise available capacity of the upcoming central sector projects having capacity allocation to MSEDCL.

The year wise phasing of upcoming central generating stations is shown in Annexure 1. The present status of the key central sector plants having allocation to Maharashtra is summarized in Table 23.

MSEDCL also has an allocation of 792 MW from Krishnapatnam UMPP, 300 MW from Tilaiya UMPP, 137 MW from Titaya UMPP and 133 MW from Cheyur UMPP on which construction has not yet started due to various reasons and have not been considered for commissioning under the PFA Roadmap.

Table 22: Status of upcoming central sector projects

Plant Name	FY15	FY16	FY17	FY18	FY19
Existing allocation (MW)	-	4,356	4,505	5,407	5,770
Additional capacity allocation from CGS during the year (MW)	-	149	902	364	653
Cumulative availability (MW)	4,356	4,505	5,407	5,770	6,423

Table 23: Status of Key Central Generating Stations

Name of Plant	Fuel	Capacity (MW)	Allocation (MW)	Revised CoD	Status
North Karanpura, Jharkhand (660 MW)	Coal	660	100	Unit 1: Feb'18 Unit 2: Aug'18 Unit 3: Feb'19	Under Construction
NTPC Vindhyanchal V (500 MW)	Coal	500	149	Oct-15	Under Construction
Subansiri Hydro Arunchal (2000 MW)	Hydro	2,000	183	Dec-18	Commissioning likely to be delayed further
Mauda II Unit 1 &2 (2 x 660 MW)	Coal	2 x 660	525.06	Unit 1: April'16 Unit 2: Sept'16	Under Construction
NTPC Lara (3 x 800 MW)	Coal	2 x 800	249	2017-19	Under Construction
NTPC Gadrawara Stage I	Coal	2 x 660	281	Unit 1: June'17 Unit 2: Dec'17	Under Construction
NEEPCO Kameng	Hydro	600	55	March 17	Under Construction
NTPC Sholapur	Coal	1,320	525.06	Nov'16	Under Construction
NTPC Khargone	Coal	2 x 660	232	Beyond 2019	EPC Awarded Coal linkage: yet to be tied up
NTPC Dhuvaran	Coal	2 x 660	246	Beyond FY19	Project is now being implemented by NTPC Coal linkage: yet to be tied up
NPCIL KAPP	Nuclear	1,400	379	Beyond FY19	Under Construction
Surguja Chhatisgarh	Coal	2 x 660	290	Beyond FY19	Construction yet to Start

Independent Power Producers (IPPs)

In addition to the State owned generating plants, MSEDCL has signed PPAs totaling 6,756 MW with IPP's through competitive bidding process out of which around 5,636 MW of capacity has been commissioned as on March, 2015. The status of the upcoming tied-up capacities totaling 1,120 MW is provided in Table 24. Since the works on the Lanco Vidarbha Project have been stalled for several years, the PFA Roadmap considers commissioning the AMPL Tiroda project only.

The total allocated capacity of the state is expected to increase from 24,528 MW in FY 16 to 27,786 MW in FY 19. Accordingly, the share of installed capacity from hydro sources is expected to remain same at 2,977 MW during FY 16 to FY 19.

The share of RE sources in installed capacity is expected to increase from 25.5% in FY 16 to 31.8% in FY 19. Similarly the energy available from various sources is expected to increase

from 1,36,364 MU in FY 16 to 1,87,525 MUs in FY 19. In terms of energy, the share of RE is expected to increase marginally from 9.4% in FY16 to at 10.8% in FY 19, translating into increase in volume of energy from 14,846 MU in FY 16 to 20,233 MU in FY 19.

4.4. Generation Plan (Having allocation to other Licensees of Maharashtra)

Presently, TPC Trombay Unit-6, which uses Oil and Gas as fuel, generates high cost power. TPC has planned to convert the same into a Coal fired station, the permissions and approvals for which are being pursued. Other distribution licensees in the State i.e. R-Infra D and BEST have not identified or entered into any PPA's with any upcoming power generating plants likely to be commissioned during the period covered under this PFA Roadmap. The likelihood of migration of consumers is amongst the major factors contributing to uncertainties related to future power demand for these licensees.

Table 24: IPP Capacities tied up by MSEDCL under Case-1

Name of Developer	Plant Capacity (MW)	PPA Date	Tied-up Capacity (MW)	Revised CoD	Status
Lanco Mahanadi	1,320	25.09.2008	680	-	Commissioned
JSW Energy (Ratnagiri)	1,200	23.02.2010	300	-	Commissioned
Emco Energy	600	17.03.2010	200		Commissioned
Indiabulls Amravati Phase 1	1,350	22.04.2010 & 05.06.2010	1,350	-	Commissioned
Adani Power Maharashtra	3,300	08.09.2008, 31.03.2010, and 09.08.2010	2,645	-	Commissioned
		16.02.2013	440	Feb, 17	Under construction
Lanco Vidarbha TPP	-	25.09.2008	680	13 th Plan	Work stalled due to financial constraint

Table 25: Projected Tied up/Allocation Capacity from Conventional Sources for All Distribution Licensees (MW)

Available Capacity (MW)	FY16	FY17	FY18	FY19
MSEDCL (incl CPP)	24,528	26,769	27,133	27,786
TPC	944	944	944	944
R-Infra	1,100	1,100	1,100	1,100
BEST	1,080	1,080	1,080	1,080
Total	27,652	29,893	30,257	30,910

Table 26: Projected Energy & Peak Supply Position (From LT Sources) for Distribution Utilities

Parameter	Unit	FY15	FY16	FY17	FY18	FY19
MSEDCL						
Energy requirement	MUs	112,986	124,689	136,038	148,144	161,321
Energy availability	MUs	114,447	136,153	164,524	179,038	187,525
Surplus/ (Shortage)	MUs	1,461	11,463	28,486	30,894	26,204
Peak demand	MW	17,694	19,052	20,442	22,047	23,785
Peak Availability (Incl. Renewables)	MW	16,976	19,869	22,345	23,182	24,037
Surplus/ (Deficit)	MW	(718)	817	1,902	1,134	251
Other Utilities						
Energy requirement	MUs	19,757	20,439	20,845	21,334	21,826
Energy availability	MUs	21,917	21,917	21,917	21,917	21,917
Surplus/ (Shortage)	MUs	2,160	1,478	1,072	583	91
Peak demand	MW	2,453	2,564	2,637	2,643	2,646
Peak Availability (Excl. Renewables)	MW	2,450	2,450	2,450	2,450	2,450
Surplus/ (Deficit)	MW	(3)	(114)	(188)	(193)	(197)
Maharashtra – State						
Energy requirement	MUs	132,743	145,128	156,883	169,478	183,147
Energy availability	MUs	136,364	158,070	186,441	200,955	187,525
Surplus/ (Shortage)	MUs	3,621	12,941	29,558	31,477	4,378
Peak demand	MW	20,147	21,616	23,079	24,690	26,432
Peak Availability	MW	19,804	22,318	24,794	25,631	26,487
Surplus/ (Deficit)	MW	(343)	702	1,715	941	55

These licensees plan to procure power for any future requirement through competitive procurement process with due regulatory approvals as the need arises.

There is no central sector allocation to private power distribution utilities in the State as per the

past policy adopted by the Central/ State Government.

4.5. Anticipated Power Availability Position

In view of the detailed sector wise status presented above, the various power distribution

utilities in the State are expected to have tied up/allocated capacity from conventional sources during the period FY15 to FY19 as outlined in Table 25. Based on the expected availability (considering elimination of generation loss due to coal shortage in a period of 2 years), auxiliary consumption etc. for various power plants as per their past trend and normative values for new/ upcoming plants, the power supply position for the various utilities in the State is summarized in Table 26

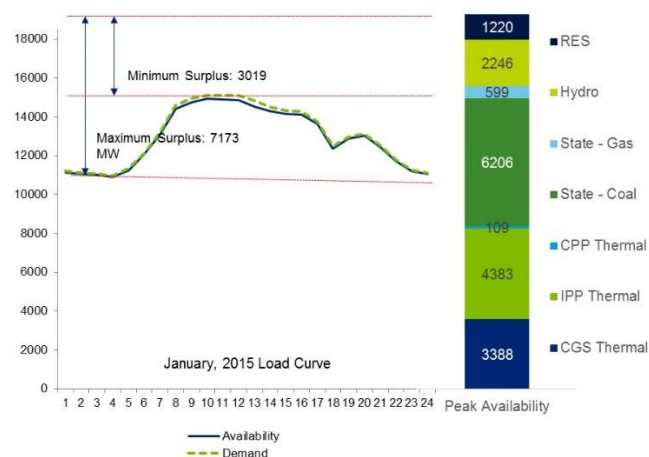
While MSEDCL is expected to continue to have a healthy power supply position in energy as well as peak terms, the Mumbai licensees plan to procure the power under appropriate short / long-term arrangements considering wide variation in demand during the year and other peculiarities relating to competition on account of multiple licensees in common area of supply.

4.6. Need for Optimizing Contracted LT Capacities

The State of Maharashtra has undertaken a sustained and successful program of generation capacity additions in accordance with the projections of the 17th and 18th EPS. However, the peak demand for power in the State has not followed the same trend as projected in the EPS. While the EPS projected a peak demand of 25,313 MW in FY15 for the State, the actual witnessed stood at a mere 20,147 MW.

Fuel side issues (both coal and gas related) have resulted in a reduced availability of installed generation capacities in the State during FY15 resulting in backing down of available generation capacities only during lean hours. However, if such fuel side constraints are eliminated the State will be forced to back down a significant proportion of its installed/ allocated generation capacities even during the peak hours of the day. Figure 12 shows the typical load curve vs full generation availability for MSEDCL.

Figure 12: MSEDCL Typical Load Curve Vs. Full Generation Availability from LT Sources (FY15 scenario)



The reasons for the subdued demand growth includes the most prominent factors of wide spread implementation of Gaothan Feeder Segregation Scheme in the State and lesser than expected industrial growth amongst others.

Given the emerging scenario where large scale energy efficiency/ DSM measures and distributed renewable energy capacity additions are proposed and the anticipated capacity additions from conventional sources, availability of surplus generation capacities for the State is expected to increase significantly.

Sub-optimal utilization of available generation capacities is adversely impacting the cost of supply and is also detrimental to the financial health of MSEDCL. MSEDCL is in the process of developing a long-term roadmap and will take an outlook on gradually reducing its power sourcing from long-term sources to the extent of say 80% to 90% of its peak demand. Such measures would also call for availability of a much more dependable and deep market for short-term/ spot procurement of power. Such a step if initiated by a larger number of states can be helpful in improving the utilization of generation facilities at a national level. The State of Maharashtra urges the Government of India to initiate necessary measures for deepening of the short-term/ spot market for power.

4.7. Other Key Issues

The key issues related to adequacy of power generation for the State of Maharashtra are outlined below:

- a) **Coal Shortage:** As outlined earlier several operational plants of MSPGCL could not operate at their design PLF due to poor quality and inadequate availability of coal. On an average MSPGCL owned thermal power plants could operate only to the extent of 65% PLF due to this issue. Ensuring adequate availability of appropriate quality of coal can save the State from procurement of expensive power from alternate sources. The projections under the PFA Roadmap consider elimination of PLF loss due to poor quality/availability of coal within a period of 2 years.
- b) **Gas Shortage at MSPGCL GTPS:** The gas based project of MSPGCL lost 28% PLF due to unavailability of gas. If the GoI can ensure allocation/ supply of affordable domestic gas for MSPGCL's GTPS, it can be effectively used for avoiding/ limiting the need for future capacity addition requirements for the State.
- c) **RGPP (Ratnagiri Gas and Power Private Limited):** The entire capacity of RGPP (~ 1,967 MW) is stand still due to non-availability of domestic gas. In order to make the project viable, the promoters, namely NTPC and GAIL, invested substantial amount (~Rs.1,000 Crore each) to restart the project under the aegis of GoI and support of Government of Maharashtra. However, repeated power block machine failures, delay in LNG terminal and unavailability of affordable gas led to not only delay in commercial operations but also affected the energy availability for the State of Maharashtra. The entire capacity of RGPP is standstill since August 2013 due

to non-availability of domestic gas as against 8.5 mmscmd allocation from KG-D6. The gas based power plant has not been supplying any energy to MSEDCL, however, RGPP has continued to bill the capacity charges by declaring its capacity based on R-LNG. If MSEDCL is to pay the capacity charges which are ~Rs.1,900 Cr p.a., in return for no energy received, its power purchase cost will further increase

Therefore, it is important that a viable solution acceptable to all stakeholders may be reached to resolve the issue, as the non-availability of domestic gas should not lead to over burdening either a State utility or its consumers.

Therefore, it needs immediate attention of State and Central Government for timely resolution of fuel and other issues.

4.8. Fund Requirement

MSPGCL has proposed to undertake/ initiate capital investments totaling over Rs. 47,162 crores during FY15 to FY19, as summarized in Table 27. MSPGCL has already achieved financial closure for all ongoing projects and some of the proposed/ future projects in the pipeline. MSPGCL has sanctioned loans totaling over Rs. 28,500 Crores from various financial institutions including the PFC, REC, Canara Bank, World Bank, IREDA, KFW etc. MSPGCL would initiate necessary steps for financial closure of the other upcoming projects at an appropriate stage when all necessary approvals are in place.

Table 27: Fund Requirement – MSPGCL (Rs. Crores)

Description	FY15	FY16	FY17	FY18	FY19	Total
Projects Under Construction						
New & Extension	3,007	2,841	2,530	1,750	990	11,118
R&M	83	303	91	-	-	477
RE Projects (Solar + Wind)	-	350	350	-	-	700
Sub-Total	3,090	3,493	2,971	1,750	990	12,295
Future Projects						
New & Extension	-	-	-	-	-	27,813
R&M	-	-	-	-	-	7,055
Sub-Total	-	-	-	-	-	34,868
Total	3,090	3,493	2,971	1,750	990	47,162

4.9. Action Plan & Support Required

Stakeholder wise action plan for the power generation related aspects is outlined in Table 28.

Table 28: Generation Action Plan

Stakeholder	Action Points & Timelines
MSPGCL	<ul style="list-style-type: none"> Expedite mining plan and award of MDO for Mahajanwadi Nagpur coal block by October, 2015. Award of contract for Koradi Unit-6 R&M by September, 2015. Finalize DPR for other 5 units R&M works within 6 months of assessment of the result of Koradi Unit-6 R&M works which is expected to be completed by September, 2016.
MoC/ CIL	<ul style="list-style-type: none"> Mahajanwadi coal block 100% allotment to Mahagenco is under process. GoM has requested MoC, GoI for 100% allotment to Mahagenco vide letter dated 28.05.2015. MOC to confirm allotment at the earliest. Mahagenco has requested MOC for tapered linkages for Koradi (3 x 660 MW), Chandrapur STPS (2 X 500 MW) till the time Gare Palma Sector – II coal blocks becomes operational. MOC to confirm allotment at the earliest. While Mahagenco has signed FSA's for swapping under IMTF stage-I recommendation for Bhusawal, Khaperkheda and Parli TPS, realization has not increased through these linkages. CIL to review and propose appropriate remedy. CIL to ensure adequacy of coal availability at MSPGCL's operating plants. A joint monitoring committee to be set-up between MSPGCL, CIL and MoP to monitor situation on monthly basis.

5. Transmission Plan

5.1. Transmission capacity requirement

While inter-State transmission for the State of Maharashtra is undertaken by PGCIL, intra-State transmission of power is handled by the State Transmission Utility – Maharashtra State Electricity Transmission Company Ltd. (MSETCL) and is complemented by 6 private transmission licensees within the State. MSETCL is the largest State power transmission utility in the country.

A well planned and strong transmission system will ensure not only optimal utilization of transmission capacities but also of generation facilities and would further facilitate achieving the ultimate objective of supplying 24x7 cost effective and reliable power to end consumers. The requirement of electricity in energy and peak demand terms for the State are expected to increase from the present level of 1,34,743 MU & 20,147 MW in FY15 to 1,83,147 MU and 26,432 MW in FY19.

The generation plan has outlined the upcoming intra-State, inter-State projects and the need for additional capacities to be tied-up under competitive bidding processes (Case-1). The transmission plan proposed in this chapter aims at ensuring adequacy of transmission infrastructure for evacuation of power from the inter-State boundary/ proposed generating plants to the end consumers located across various geographies of the State.

5.2. Existing Transmission System

Intra State Transmission System

Including the STU, there are eight (8) transmission licenses in the State:

- i. Maharashtra State Electricity Transmission Company Limited (MSETCL)
- ii. Reliance Infrastructure Limited (R – Infra)
- iii. Tata Power Company Limited – Transmission (TPC-T)
- iv. Jaigad Power Transmission Limited (JPTL)
- v. Adani Power Maharashtra Limited (APML - T)
- vi. Amravati Power Transmission Company Limited (APTCL)
- vii. Sinnar Power Transmission Company Limited (SPTCL)
- viii. Maharashtra Eastern Grid Power Transmission Company Limited (MEGPTCL)
- ix. Vidarbha Industries Power Limited (VIPL-T)

While Reliance Infrastructure Ltd. (R-Infra) and Tata Power Co. Ltd. (TPC) are transmission licensees by the virtue of being legacy vertically integrated utilities in the Mumbai and its suburban areas, the other transmission licensees own and operate generation project specific power evacuation transmission lines and sub-stations.

MSETCL is the largest intra-State transmission utility in the State having 608 EHV sub-stations with a total transformation capacity of 1,03,603 MVA. The other transmission licensees in the State have a total of 30 EHV sub-stations with transformation capacity of 14,847 MVA.

Presently, MSETCL has 42,578 ckt kms of EHV lines with about 360 ckt Kms lines at 765 kV Class. The existing intra-state transmission systems in the State of Maharashtra is shown in Table 29.

MSETCL's transmission system availability for HVAC systems is over 99.68% against MERC benchmark of 98% and over 97.10% for HVDC systems against MERC benchmark of 95% and transmission losses are at 3.98% which are at par with other leading inter and intra-State transmission utilities in the country.

Table 29: Intra-State Transmission System (As on March 31, 2014)

Particulars	765 kV	500 kV	400 kV	220 kV	132 kV	110/ 100 kV	66 kV	Total
MSETCL								
No. of S/ Stns (No.)	-	2	26	193	282	71	34	608
Transformation Capacity (MVA)	-	3,582	22,280	45,733	25,555	5,309	1,144	1,03,603
Line Length (ckt kms)	-	1,504	7,468	14,588	13,313	2,435	3,270	42,578
R-Infra								
No. of S/ Stns (No.)	-	-	-	8	-	-	-	8
Transformation Capacity (MVA)	-	-	-	2,975	-	-	-	2,975
Line Length (ckt kms)	-	-	-	539	-	-	-	539
TPC- T								
No. of S/ Stns (No.)	-	-	-	7	-	13	-	20
Transformation Capacity (MVA)	-	-	-	4,630	-	4,242	-	8,872
Line Length (ckt kms)	-	-	-	403	-	734	-	1,137
MEGPTCL								
No. of S/ Stns (No.)	2	-	-	-	-	-	-	2
Transformation Capacity (MVA)	3,000	-	-	-	-	-	-	3,000
Line Length (ckt kms)	360	-	62	-	-	-	-	422
JPTL								
Line Length (ckt kms)	-	-	329	-	-	-	-	329
APML-T								
Line Length (ckt kms)	-	-	438	-	-	-	-	438
APTCL								
Line Length (ckt kms)	-	-	14	-	-	-	-	14
SPTCL								
Line Length (ckt kms)	-	57	-	-	-	-	-	57
Total								
No. of S/ Stns (No.)	2	2	26	208	282	84	34	638
Transformation Capacity (MVA)	3,000	3,582	22,280	53,338	25,555	9,551	1,144	1,18,450
Line Length (ckt kms)	360	1,561	8,310	15,530	13,313	3,169	3,270	45,513

Inter-State Transmission System

Maharashtra's power system is connected to the Western Region (WR) inter-State power transmission system which in-turn has connectivity with the Northern Region, Eastern Region and Southern Region. The inter-regional connectivity of the WR with three other regions enables states in the WR, including Maharashtra, to source/ supply power with buyers and sellers located in several other states of the country.

The State has central sector generation capacity allocations totaling 6,277 MW till FY19 and has also regularly procured short-term power for meeting its peak demand using its regional and inter-regional power transmission connectivity.

At present, the inter-State transmission system comprises of 9 substations with a total transformation capacity of 21,403 MVA and associated transmission lines of about 13,175 ckt KM, with voltage wise break-up shown in Table 30.

Table 30: Inter-State Substations and Associated Transmission Lines in Maharashtra

Voltage	Transformation Capacity (MVA)	Line Length (ckt KM)
765 kV	13,500	2,775
400 kV	7,903*	10,400
Total	21,403	13,175

* Including Transformation Capacity of 2,808 MVA of conversion Transformers

In addition to the above, PGCIL's existing five interstate lines in the State of Maharashtra are shown in Table 31.

Table 31: Existing Inter- State lines in Maharashtra

Inter-State line	Line Length (KM)
400 kV Bhilai – Koradi-I S/C Line	272
400 kV Satpur – Koradi I S/C Line	149
400 kV Khandva – Dhule I D/C Line	210
400 kV Sardar Sarovar – Dhule I D/C Line	142

Inter-State line	Line Length (KM)
400 kV Kolhapur – Mhapusa D/C Line	193
Total	966

In addition to the CTU/ PGCIL owned inter-State systems, 9 lines owned by MSETCL (7 at 220 kV and 2 at 440 kV) have been identified as inter-State transmission lines and are now covered under the Point of Connection (POC) tariff determined for ISTS systems. These lines provide Maharashtra connectivity with the states of Madhya Pradesh, Goa, Karnataka and Gujarat.

5.3. Intra-State Transmission Plan

Major Transmission Licensees in the State

MSETCL

The plan covers for strengthening/ augmentation of existing systems as well as evacuation of power from upcoming generation capacities. The summarized list of planned schemes and proposed capacity addition by MSETCL for various voltage levels is given in Table 32.

More than 56% of total proposed capacity addition is by the way of addition of new substations while the remaining addition is through various augmentation schemes either by addition of new transformers in existing substations or replacement of existing transformers therein.

Around 63% of proposed new EHV lines are for providing connectivity to the proposed new substations while the remaining lines are to achieve the following objectives:

- Addition of alternate sourcing option for sub-stations where only single source and single circuit is available in the existing system; and

- b) To ensure reliability, alternate source or to strengthening of evacuation system.

The summarized list of planned schemes and proposed capacity addition by Tata Power Company Ltd. (TPC –T) for various voltage levels is given in Table 33 .

Tata Power

Table 32: Ongoing schemes of MSETCL

Parameter	FY 15	FY 16	FY17	FY18	FY19	Total
Substations (Numbers)	24	24	25	21	17	111
Transformation Capacity (MVA)	13,656	10,888	6,900	5,900	5,285	42,629
765 kV	-	3,000	-	-	-	3,000
400 kV	4,815	815	2,070	3,000	3,185	13,070
220 V	2,600	2,770	2,450	1,150	1,000	9,970
220/33 kV	3,405	2,675	1,350	1,300	600	9,330
132 kV	2,686	2,218	1,030	375	500	6,809
110-100 kV	150	225	-	75	-	450
Lines (Ckt. Kms)	2,053	3,428	3,095	3,730	2,510	14,816
765 kV Lines	-	-	-	-	-	-
400 kV /765 kV	266	942	291	928	761	3,188
220 kV/ 400 kV	767	1,325	1,440	1,359	824	5,715
132 kV / 220 kV	1,016	1,161	1,327	1,343	925	5,772
110-100 kV/ 132 kV	4	0	37	100	0	141
110-100 kV	-	-	-	-	-	--

Table 33: Transmission Capacity Addition Plan of Tata Power (TPC –T)

Parameter	FY 15	FY 16	FY17	FY18	FY19	Total
Substations (No.)	2	3	2	-	7	14
Transformation Capacity (MVA)	1,235	2,555	2,170	90	4,250	10,300
765 KV	-	-	-	-	-	-
400 KV	-	1,000	-	-	2,500	3,500
220/33 KV	250	1,250	1,310	-	1,000	3,810
132 KV	-	-	-	-	-	-
110-100 KV	985	305	860	90	750	2,990
Lines (Ckt. Kms)	142	54	43	55	662	956
765 KV	-	-	-	-	-	-
400 KV	-	46	-	-	427	473
220 KV	97	8	39	65	181	390
132 KV	-	-	-	-	-	-
110-100 KV	45	-	4	-	54	93

Reliance Infrastructure

The summarized list of planned schemes and proposed capacity addition by Reliance Infrastructure (R Infra –T) for various voltage levels is given in Table 34.

Other Transmission Licensees

The other transmission licensees in the State have the proposed capacity addition plan given in Table 35 in accordance with the upcoming power generation facilities that they are associated with.

5.4. Inter-State Transmission System Plan

The proposed expansions in PGCIL's network in the State of Maharashtra as per the system planning done is shown in Table 31.

The following ISTS plan has been planned in the state:

Through PGCIL:

- a) 765 kV Lines - About 2,025 ckm

- b) 400 kV Lines – About 2,000 ckm

- c) 765/400 kV EHV Sub stations: 3 No. of 3000 MVA Capacity at Padghe and Kolhapur

- d) Estimated cost – Rs 11,000 Cr.

Through TBCB Route

- a) 765 kV Lines - About 3,500 ckm

- b) 765/400 kV EHV Sub stations: 3 No. of 9000 MVA Capacity at Dhule, Waroa and Parli (New)

- c) Estimated cost – Rs 9,500 Cr.

The proposed schemes and their year wise rollout would enhance the inter-State transmission systems available for the State of Maharashtra, in accordance with various schemes developed by PGCIL, is summarized in Table 37.

Table 34: Transmission Capacity Addition Plan of R Infra –T

Parameter	FY 15	FY 16	FY17	FY18	FY19	Total
Substations (No.)	-	-	1	-	3	4
Transformation Capacity (MVA)	-	-	250	-	1,000	1,250
220 kV	-	-	250	-	1,000	1,250
Lines (Ckt. Kms)	-	3	54	-	24	81
400 kV	-	-	-	-	3	3
220 kV	-	3	54	-	21	78

Table 35: Transmission Capacity Addition Plan of other Transmission Licensees in the State

Licensee	Investment Plan
Sinnar Power Transmission Company Ltd. (SPTCL)	SPTCL has planned to add 56 KM of 400 kV D/C EHV Line from Sinner TPP to existing MSETCL Bableshawar Substation. The line is required to evacuate power of 1350 MW (5 x 270 MW) from Sinnar IPP Phase I.
Amravati Transmission Company Ltd. (APTCL)	APTCL has planned to add 104 KM of 400 kV D/C EHV Line from Amravati TPP to Akola – II Substation by FY16 and 7 KM LILO of 400 kV Akola to Koradi Line. The line is required to evacuate power of 1350 MW (5 x 270 MW) from Amravati IPP Phase I.
Adani Power Maharashtra Ltd. (APML)	APML has planned to add 240 KM of 400 kV D/C EHV Line from Tiroda to Warara Switching Station for evacuating the power from IPP (3 x 660 MW).

Table 36: Proposed Expansions in PGCIL's Network for WR/ Maharashtra

Scheme/ Reasoning	Proposed Works
System Strengthening through New 400 kV substation at Navi Mumbai	<ul style="list-style-type: none"> 400/220 kV, 2X315 MVA ICT with bays 400 kV Navi Mumbai (PG) – Wapi terminated at 400 kV Kudus LILO of 400 kV Padghe – Kharghar (MSETCL) S/C at Navi Mumbai (PG) with a line length of about 10 kms
Evacuation and System Strengthening Associated with New IPPs in Chhattisgarh	<ul style="list-style-type: none"> 765 kV Raipur Pooling station - Wardha line 2 x D/C. 765 kV Wardha - Aurangabad (PG) line 2 x D/C. 765/400 kV 2 x 1500 MVA substations at Aurangabad (GIS) 765 kV Aurangabad - 765 kV Padghe (PG) DC line 765 kV Aurangabad - Dhule (IPTC) S/C line – 191 K.M 400 kV Aurangabad (PG) - Boisar D/C (quad) line. 400 kV Padghe (PG) - Kudus (MSETCL) D/C (quad) line 765/400 kV 2 x 1500 MVA substations at Dhule (IPTC) 400 kV Dhule (IPTC) – Dhule (MSETCL) D/C (quad) line – 36 K.M
Systems Associated with Krishnapatnam UMPP (WR Portion)	<ul style="list-style-type: none"> Raichur – Solapur 765 kV 2 x S/c (one circuit commissioned) Solapur – Pune 765 kV S/c 765/400 kV substations at Solapur & Pune with 2 x 1500 MVA transformation capacity. LILO of both 400 kV Aurangabad- Pune DC lines at Pune (GIS) LILO of both 400 kV Parli- Pune DC lines at Pune (GIS)
Solapur STPP (660MW X 2) Transmission System	<ul style="list-style-type: none"> 400 kV Solapur (PG) – Solapur STPP D/c (Quad) Augmentation of 400/220 kV ICT by 1 X 500 MVA transformer (3rd) at Solapur (PG) by shifting 3rd transformer from Wardha (PG) to Solapur (PG)
Southern Maharashtra IPP Related Planning	<ul style="list-style-type: none"> 765 kV Narendra (PG) – 765 kV Kolhapur (PG) D/C line 765 kV Aurangabad- 765 kV Solapur (PG) D/C line LILO on circuit 765 kV Aurangabad- 765 kV Padghe (PG) D/C line at 765KV Pune (PG) 765 kV Solapur (PG) - 765 kV Pune(PG) S/C line (It is already covered under Systems associated with Krishnapatnam UMPP (WR portion))
Transmission system associated with Mundra UMPP (WR portion)	<ul style="list-style-type: none"> Wardha-Aurangabad 400 kV (Quad) DC line (with provision to upgrade at 1200KV as later stage)

Table 37: Proposed Capacity Addition in Inter- State Transmission System

Voltage	Existing Capacities	Additions Proposed From FY16 to FY19	Cumulative FY19
Transformation Capacity (MVA)			
765 kV	13,500	12,000	25,500
400 kV	7,903	-	7,903
Total	21,403	12,000	33,403
Transformation Lines (Ckt Kms)			
765 kV	2,775	5,525	8,300
400 kV	10,400	2,000	12,400
Total	13,175	7,525	20,700

5.5. Adequacy of transmission planning (intra-State)

The total capacity (including existing GSS and Lines) after implementation of all schemes which are proposed to be completed by end of FY19 is shown in Table 40.

With the total anticipated demand for power reaching 26,432 MW in FY19, the ongoing/proposed projects for capacity additions and augmentation will be adequate to cater to the increasing load and also improve reliability of the system by building in redundancies in the system.

5.6. Fund Requirement (Intra-State only)

MSETCL has proposed capital expenditure of Rs 8,544 Cr. from FY14 to FY19 as provided in Table 38.

Table 38: Year-wise fund requirement - MSETCL

Description	Fund Requirement
FY16	1,841
FY17	2,025
FY18	2,228
FY19	2,450
Total	8,544

MSETCL has planned to fund the proposed investments through debt equity in accordance. MSETCL has been able to independently arrange funds for its capital investment requirements through internal accruals and loans from financial institutions in the past.

5.7. Green Energy Corridor

MSETCL has planned to undertake development of a Green Energy Corridor in view

of the large scale renewable energy development proposed in the State. The Green Energy Corridor project would facilitate necessary evacuation arrangement for development of pockets/ zones with a large number of grid connected renewable energy projects. The Corridor is also aimed at addressing the renewable energy integration issues by facilitating better scheduling of renewable energy capacities while ensuring grid stability.

The Green Energy Corridor Project planned by MSETCL would facilitate integration of over 5,080 MW of RE projects in transmission zones of Nasik, Karad and Aurangabad with a total investment of Rs. 367 crores. MSETCL is in the process of submitting the proposal to MNRE for consideration and necessary approvals. MSETCL envisages to avail funding support under the National Clean Energy Fund (NCEF) from MNRE and KFW.

The transmission zone wise phasing of the proposed investments under the project is summarized in Table 39.

Table 39: MSETCL Green Energy Corridor Investment Plan

Zone	FY16	FY17	FY18	FY19	Total
Nasik	26	109	41	7	183
Karad	72	17		7	96
Aurangabad	-	37	17	-	54
IDC					34
Total	98	164	58	14	367

5.8. Rollout Plan

The overall Rollout Plan of the transmission systems in the State of Maharashtra is summarized in Table 40.

Table 40: Total intra-transmission capacity (in MVAs) post implementation of schemes

Parameter	Existing	Addition after implementation of Schemes					Cumulative FY19
		FY 15	FY 16	FY17	FY18	FY19	
Sub-station (No.)							
MSETCL	608	24	24	25	21	17	719

Parameter	Existing	Addition after implementation of Schemes					Cumulative FY19
		FY 15	FY 16	FY17	FY18	FY19	
TPC-T	20	2	3	2	-	7	34
R-Infra T	8	-	-	1	-	3	12
JPTL	-	-	-	-	-	-	-
APML	-	-	-	-	-	-	-
APTCL	-	1	-	-	-	-	1
SPTCL	-	1	-	-	-	-	1
MEGPCL	2	1	3	-	-	-	6
Total	638	29	30	28	21	27	773
Transformation Capacity (MVA)							
MSETCL	103,603	13,656	10,888	6,900	5,900	5,285	146,232
TPC-T	8,872	1,235	2,555	2,170	90	4,250	19,172
R-Infra T	2,975	-	-	250	-	1,000	4,225
JPTL	-	-	-	-	-	-	-
APML	-	-	-	-	-	-	-
APTCL	-	-	-	-	-	-	-
SPTCL	-	-	-	-	-	-	-
MEGPCL	3,000	1,500	4,500	-	-	-	9,000
Total	118,450	16,391	17,943	9,320	5,990	10,535	178,629
Lines (ckt KMs)							
MSETCL	42,578	2,053	3,428	3,095	3,730	2,510	57,394
TPC-T	1,137	142	54	43	55	662	2,093
R-Infra T	539	-	3	54	-	24	620
JPTL	329	-	-	-	-	-	329
APML	438	-	-	-	-	-	438
APTCL	14	14	208	-	-	-	236
SPTCL	57	112	-	-	-	-	169
MEGPCL	422	1,000	580	60	-	-	2,062
Total	45,513	3,321	4,273	3,252	3,785	3,196	63,340

5.9. Transmission Issues

Considering the load growth and ageing of the plants in Mumbai area appropriate Transmission Network Strengthening shall be carried out by STU to meet the requirement without constraints.

R-Infra has entered into Long Term Power Supply agreement with VIPL from its plant located at Butibori for supply of 600 MW power. The Long Term PPA is approved by Honorable Commission. Power supply commenced from 1st Apr 2014. However, due to local transmission constraints in Butibori area, STU has advised to avail Short Term Open Access. Considering importance of supply to Mumbai,

constraints if any should be addressed on priority.

The other issues highlighted by the State transmission utility are listed in Table 41.

Table 41: Key Transmission related issues

Issues	Details
Right of Way(RoW) issue	<p>The RoW issues are a major hindrance in the erection of an EHV lines which adversely affects the overall progress of an EHV project. A number of projects are stalled due to stiff resistance of land owners, some eventually ending up in litigation. The only remedy to this is to make the public aware of their duty towards common interest and compensating them appropriately. Also, a single window clearance should be given to all the transmission line projects passing through forest and wildlife sanctuaries in a time bound manner for early execution of transmission line projects.</p> <p><i>Proposed Change in compensation and its financial impact:</i></p> <p>MSETCL has submitted a fresh and revamped proposal to the Government of Maharashtra regarding remuneration to be given to tower affected farmers/land owners. This has been done with the objective of adopting a more balanced approach and minimizing the RoW related difficulties faced in laying of transmission lines. The cost of the revised compensation may affect the proposed investments in the transmission systems in the State.</p>
Monopole Usage	<p>Conventional EHV towers occupy more space. An in principle approval from Board of Directors of MSETCL has been obtained for laying transmission lines on 25 monopole structures across all zones (3-5 structures per zone) in FY16 on pilot/trial basis. The project is mainly for knowing the pros and cons of monopole structure. The area for implementation of monopole structure will be (1) ORC project, (2) Shifting of line, (3) Area where cable work is not techno-economical, (4) Metropolitan cities where the length of line is short. Based on the experience of MSETCL from these pilot implementations, monopole structure may be considered for widespread usage in future transmission projects in the State. The cost of proposed investments may need to be reviewed in view of the same at an appropriate stage.</p>

6. Distribution Plan

6.1. Objectives of the Distribution Plan

The power demand of the State is going to increase by the FY 2018-19 due to natural increase in demand from the present consumer base and more importantly because of the initiatives proposed under this PFA Roadmap which aims to achieve 100% electrification in urban as well as rural areas of the State and provision for 24X7 supply to all consumers in the State. This would require commensurate investments in the sub-transmission and distribution infrastructure.

Accordingly, the objectives of the distribution plan, in accordance with the 24X7 PFA objectives, includes the following:

- a) Making provision for 24X7 supply to all connected consumers through capacity augmentations and building redundancies in the upstream network for improving reliability of supply;
- b) Ensuring provision of electricity access to over 19.36 Lakhs rural and urban unconnected households in the State;
- c) Provision of 24X7 supply to demand growth from existing consumers and that arising from new consumer growth in the State; and
- d) Making system improvements for reducing AT&C losses in accordance with the targets agreed with the MoP; and
- e) Adopting appropriate technologies and systems to support RE integration and EE/ DSM measures in the State.

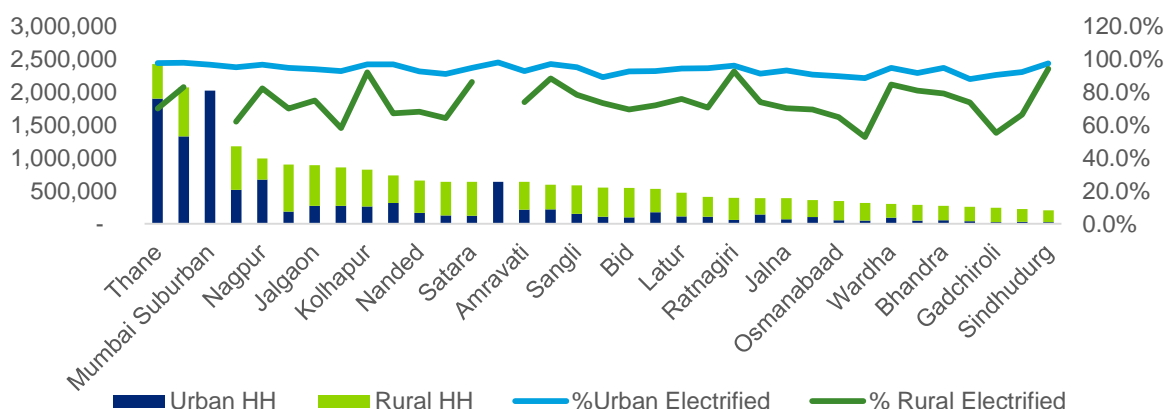
6.2. Existing Distribution System

While the extent of urban HH electrification ranges from 85% to 100% across districts, the extent of rural HH electrification ranges from 53% to 96% across districts. The most urbanized districts including Mumbai have already achieved nearly 100% household electrification levels. The districts such as Nandurbar, Gadchiroli and Solapur having lower than 60% HH electrification levels are relatively smaller in terms of population/ number of HHs. District wise rural and urban HH electrification levels are shown in Figure 13.

Power distribution in the State of Maharashtra is handled by the following four distribution licensees:

- a) **MSEDCL:** The largest utility having entire State (except areas covered by R-Infra and BEST) as its license area supplying electricity to over 2.2 crore electricity consumers in the State;
- b) **R-Infra Distribution:** It is the second largest distribution licensee in the State having its license area in the sub-urban Mumbai and supplies electricity to over 24.73 Lakh retail consumers and 29.33 lakh network consumers;
- c) **BEST:** It is responsible for electricity distribution in the town area or the island city of Mumbai and supplies electricity to over 9.97 lakh consumers in its license area; and

Figure 13: Rural & Urban HH Electrification Levels - Maharashtra (2011 Census)



d) **TPC Distribution:** It is a parallel licensee in the Town Area and the Sub-urban Mumbai (where R-Infra Distribution and BEST operate) and supplies electricity to over 4.92 Lakh consumers therein.

A comparative representation of the consumer base and energy handled by the above four distribution licensees in the State is presented in Figure 14.

The distribution network comprise of 33kV sub-transmission systems which forms the distribution backbone at the district/ block level and 11kV and LT distribution systems which deliver electricity to the majority of the end consumers. An abstract of the distributed network of all distribution licensees in the State in terms of installed transformation capacity and line lengths of feeders at sub-transmission and distribution voltage levels is provided in Table 42.

Figure 14: Comparative Representation of Consumer Base and Energy Handled by Distribution Licensees

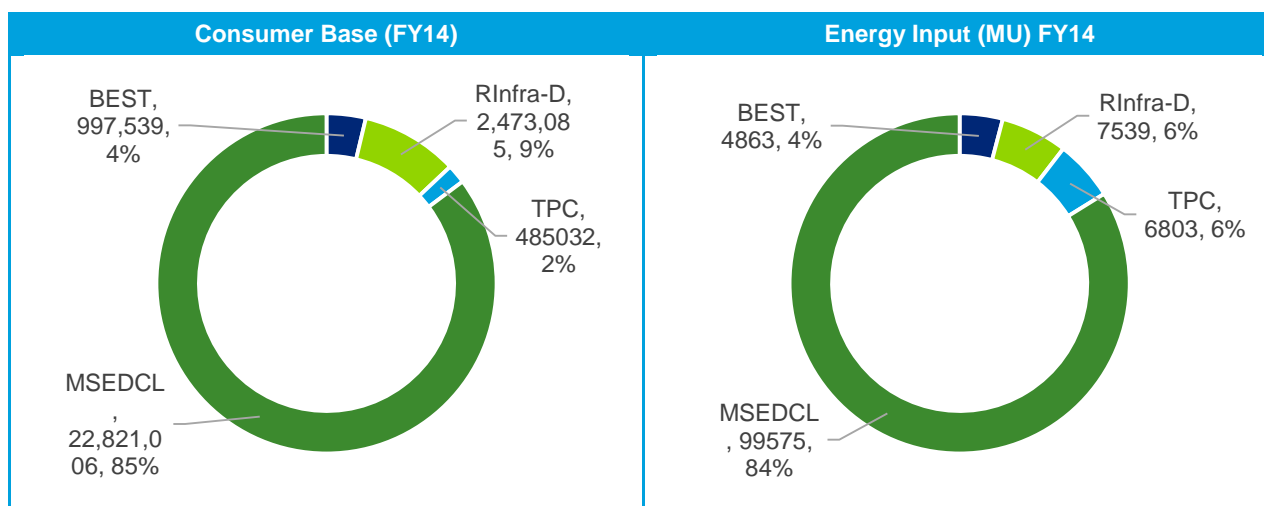


Table 42: Power Distribution Infrastructure in Maharashtra - FY14

Particulars	Units	MS&DCL	R-Infra (FY15)	BEST	TPC-D
Sub-transmission System					
33 kV Feeders	Ckt. Kms	39,360	731	453	505
Substations (33kV/ 11kV)	Numbers	2,815	78	56	31

Particulars	Units	MSEDCL	R-Infra (FY15)	BEST	TPC-D
Substation Transformation Capacity	MVA	25,105	3321	1808	645
Distribution System					
11 kV Feeders	Ckt. Kms	2,61,891	3,762	1,934	3,287
Distribution Transformers	Numbers	4,93,566	6,370	3,004	769
DT Transformation	MVA	45,628	4,784	2,402	665
LT Feeders	Ckt Kms	5,93,549	17,898	8,164	338

Majority of the 33 kV, 11 kV and LT lines within the city of Mumbai and its sub-urban areas i.e. in the license areas of R-Infra D, BEST and TPC-D are comprised of underground cables whereas, in the remaining part of the State i.e. in the license area of MSEDCL are in the form of overhead lines. The distribution network in Maharashtra also has 22kV and 6.6kV infrastructure which have been clubbed with appropriate voltage levels in the above representation, for the purpose of simplicity.

With the exception of metering levels at Agriculture consumers and Distribution Transformers under MSEDCL, 100% metering at consumer level, feeder level and DTs has been achieved in the State.

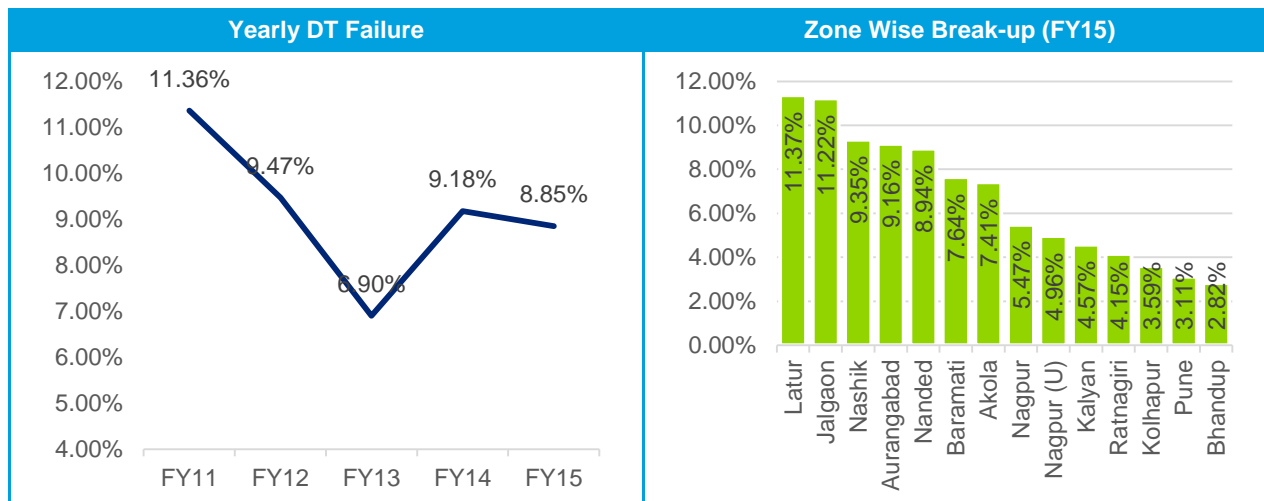
MSEDCL has proactively adopted deployment of IR and RF capabilities in consumer meters for automating the meter reading process. All utilities i.e. MSEDCL, R-Infra D, BEST and TPC – D have installed AMR devices for remote reading of high value consumers. The details of extent of metering at various levels for all utilities in the State is outlined in the Table 43.

While the DT failure rate for MSEDCL has improved over the last 4 to 5 years, it continued to remain at a high level of 8.85% in FY15. In several zones of MSEDCL, especially those with significant rural and agricultural load such as Latur, Jalgaon, Nashik, Aurangabad etc. the DT failure rate has remained at higher levels. The details of DT failure rate for past five years is shown in Figure 15.

Table 43: Metering Status

Licensee	Consumer Metering	Feeder Metering	DT Metering
MSEDCL	<ul style="list-style-type: none"> 100% HT Consumers metered 93% (2,12,05,640) LT Consumers Metered <ul style="list-style-type: none"> 19% have Infra-red (IR) capability 4% have Radio Frequency (RF) capability Balance 71% are normal meters 100% HT Consumers metered 7% LT (i.e. 16,15,366) Agriculture consumers are un-metered 	100%	Being Planned
R-Infra D	100%	100%	100%
BEST	100%	100%	80%
TPC - Distribution	100%	100%	100%

Figure 15: DT Failure Trend - MSEDCL



The DT failure rate amongst urban utilities viz. R-Infra D, BEST and TPC-D operating in Mumbai and its sub-urban areas has remained at very low levels and is amongst the best in the country. BEST has reported a DT failure rate of 0.57% only in FY15. The DT failure rate in R-Infra D license area is further lower at 0.2%.

The performance of various utilities in the State on reliability indices is summarized in Table 44.

Table 44: Reliability indices (FY15)

Licensee	SAIDI (Minutes)	SAIFI (Numbers)	CAIDI (Minutes)
MSEDCL	72.10	7.79	9.25
R-Infra D	53.94	1.69	31.91
BEST	151.11	3.64	41.51
TPC-D	16.8	0.917	18.3

The reliability and quality of power in Mumbai and its sub-urban areas is significantly better than the rest of the State because of usage of underground systems coupled with the ease of O&M due to lower geographical spread and higher load density.

MSEDCL, under Part-A of the R-APDRP has achieved Go-Live in 128 out of the total 130 towns covered therein. Modems have been installed at HT consumers, feeders, crossover-points and DTs in all 128 towns and automatic

meter reading is available for billing, analysis and energy audit related purposes.

Under RAPDRP (Part A), MSEDCL has established Data Center (DC) at Mumbai and Disaster Recovery Center (DRC) at Nagpur. The list of other achievements under RAPDRP (Part A) is given below:

- Established Centralised Customer Care Center (CCC) at Bhandup and Pune
- Completed GIS survey in all 128 towns and 85.5 lakhs consumer indexing
- Installed IT infra materials in all 128 towns
- Network connectivity has been established between Data Center, Data Recovery Centre and Customer Care Center.
- AMR modem installed at 53,397 locations
- 13 software modules developed/enhanced

The third party inspection agency has been appointed by PFC for validation of successful implementation of R-APDRP (Part A).

Further, SCADA covered for 8 towns under the scheme are under different stages of implementation in towns, namely – Amravati,

Solapur, Sangli, Kolhapur, Greater Mumbai, Malegaon, Nashik and Pune. MSEDCL has emerged as one of the leading states in successful and timely implementation of the RAPDRP Part-A works. The IT systems and the Call Centre development and implemented under the scheme have been effective used for digitize all customer interface points and have resulted in improved service delivery and customer satisfaction. Projects for 123 towns totaling Rs. 1,696.21 crores have been contracted under Part-B of the scheme out of Rs. 1,161.63 crores have been disbursed so far. The status of work done under R-APDRP (Part B) is shown in Table 45.

Table 45: Status of R-APDRP (Part B) as on June 2015

Particulars	Units	Scope	Achievement
New Sub/ Stn	No.	138	99
Augmentation of Power T/F	No.	27	26

Particulars	Units	Scope	Achievement
Additional of Power T/F	No.	32	28
HT Overhead Conductors	Km	2,120	1,097
HT Underground Cables	Km	1,497	907
LT Overhead Conductors	Km	1,121	676
LT Underground Cables	Km	1,284	976
New DTs HVDS	No.	6,421	4,736
AB Cables (80 towns only)	Km	835	409

The State has taken up a total of 35 schemes/projects under the RGGVY scheme so far, including Phase-II under the XI Plan providing free electricity connection to over 12 lakh BPL HHs in the State. The status of achievements under the RGGVY scheme is highlighted in Table 46.

Table 46: RGGVY (now DDUGJY –RE) Status (as on April, 2015)

Particulars	Units	Target	Actual	Achievement	Balance
Projects/ Schemes	Numbers	35	34	97%	1
Intensive Electrification of Villages (IEV)	Number of Villages	36,462	36,152	99%	310
BPL HH Electrification	Number of HHs	12,26,185	12,21,350	100%	4,835
Sub-stations	Numbers	3	3	100%	0

Figure 16: Gaothan Feeder Segregation Scheme

MSEDCL's Gaothan Feeder Segregation Scheme
Initiative to improve quality supply in rural areas

Gaothan Feeder Segregation Scheme: Under this scheme, MSEDCL has undertaken separation of rural feeders that service HHs from those that feed agricultural pump-sets. The scheme covers 18,095 villages and 3,482 feeders. The Total estimated cost of GFSS is Rs 2,940 Cr.

Single Phasing Scheme: The single phasing scheme has been implemented in agriculture dominated areas on mixed load feeders. The basic objective is to ensure single phase supply to rural domestic consumers, while 3 Phase agriculture load is operated only for fixed hours during a day, thereby avoiding the need for physical segregation of feeders. The scheme covers 15,482 villages and 1,954 feeders. The total estimated cost of GFSS is Rs 929 Cr.

The achievements under schemes as on October 2014 is shown below:

Particulars	Units	GFSS	Single Phasing
Feeders	No.	3,535	1,954
Villages	No.	17,023	14,947
Load Managed	MW	3,334	1,875
Actual expenditure	Rs. Cr.	2,676	842

All distribution utilities in the State have performed well on reduction of AT&C loss reduction. Utility wise AT&C losses as per actuals in FY14 and projected values until FY19 are shown in Figure 17.

It may be noted the target given by the MoP for the State of Maharashtra is at 14.39% for FY19. The actual performance of all utilities in the State, including MSEDCL has already surpassed the GoI targets for the State and accordingly, the utilities have proposed lower (better) targets for FY19 based on their internal benchmarks and various directives of the MERC.

Figure 18: AT&C loss reduction measures

Administrative Measures	Network Interventions/ Investments	IT/ New Technology Interventions
<ul style="list-style-type: none"> • Monthly energy accounting at Zone/ Divisoon/ Feeder/ DTC Level • Theft control drives & setting up of 6 dedicated police stations • Feeder wise Cash Collection/ Loss based load regulation of Supply to encourage consumer support to loss reduction • Putting feeder wise Energy Audit report in Public Domain • Introduction of Distribution Franchisee at Bhiwandi and its expansion to Nagpur and Jalgaon. 	<ul style="list-style-type: none"> • Metering of feeders/ DTCs • Agriculture Feeder Segregation Scheme; • HVDS scheme in high loss areas; • LT ABC scehem in slums/ difficult areas; • Bifurcation of LT Circuits and diversion of heavily loaded feeders • Network strengthening to ensure 24X7 supply to encourage consumer support. 	<ul style="list-style-type: none"> • Usage of IT for elimination of Human Interface on A) Metering; B) Bill Delivery; and C) Bill Collection; • 100% new connections through online applications only (with centralized monitoring); • Introduction of Centralized Call Center (breaking of employee consumer nexus); • Minimization of meter reading errors through use of RF Module, IR Ports, AMRs in energy meters along with HHDs • Accurate and timely bill delivery through Email, SMS etc.

MSEDCL has been able to achieve steep AT&C loss reduction over the last 8 years through targeted initiatives for reduction of T&D losses and improvement in collection efficiencies. The initiatives outlined in Figure 18, in particular, have been immensely useful in the loss reduction achieved by MSEDCL and are expected to be continued/ strengthened/ expanded further for pursuing the loss levels targets proposed to be achieved under this PFA Roadmap.

The proposed capital investment plan under the PFA Roadmap considers the necessary investments towards the appropriate loss reduction interventions in view of the AT&C loss targets envisaged during the period.

6.3. Agricultural Supply and Key Issues

Agriculture in the State of Maharashtra has become increasingly dependent on pumped irrigation. MSEDCL is the sole supplier of electricity for agricultural category of consumers

in the State. MSEDCL supplied nearly 26,400 MU to Agriculture (Ag) consumers in FY15, constituting about 29% of its total sales.

Nearly 54% of the agricultural sales are metered, while remaining are unmetered, estimated based on the methodology discussed in the following exhibit.

LT-Agriculture un-metered sale computation

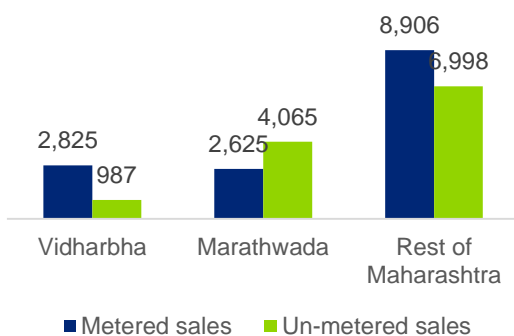
- The computation is done to estimate the sales to LT agriculture consumers, as HT consumers are all metered.
- Sub-division wise kwh/HP indices, based on sale & HP data of LT agricultural metered consumers, are prepared every quarter.
- While computing kwh/HP norm, only the consumers with normal meter status having progressive reading (negative and zero consumption excluded) are considered.
- Consumption of consumers having consumption greater than 224

kWh/hp/month is capped to 224 kWh/hp/month, considering the 10 hours of operation and 300 days of operation

- The Sub-division wise kwh/HP indices computed are used to compute quarterly consumption of unmetered agriculture consumers for each sub-division.

Amongst the three regions of Maharashtra, Marathwada region has the highest proportion of un-metered Ag sales vis-à-vis the metered Ag sales, as seen in Figure 19. In terms of energy, the un-metered as well as metered sales are highest in the Rest of Maharashtra (RoM) region, thus having highest contribution to the agricultural energy sales in the State.

Figure 19: Region-wise Metered Vs un-metered sales (MU)



The overall collection efficiency of MSEDCL is critically affected by the collection against agricultural sales, which has been extremely low and stands at about 37% in FY15. The accumulated arrears under agriculture category are Rs.11,562 Cr., constituting about 50% of total arrears of Rs. 23,211 Cr. as at the end of FY15.

One of the key reasons behind high amount of arrears is the severe draught situation faced during the last 3-4 years, affecting the paying capacity of farmers. Additionally, various amnesty schemes undertaken by the Government such as Krishi Sanjivani Yojana have also adversely affected the payment

behavior of Ag consumers in the State. Also, due to many socio-political reasons, the disconnection drives on Ag consumers is not carried out in a rigorous manner resulting in ballooning of arrears along with imposition of surcharge thereupon.

Given the sensitivities involved, the State seeks support and guidance from the Government of India in conclusively and sustainably addressing the Agriculture supply issue.

6.4. MSEDCL Proposed Investment Plan

The collective objective of all the Central/ State Government schemes has been to enhance the reach, reliability and quality of electricity to end consumers and to improve the financial position of utility by way of improving operational efficiencies and reducing the AT&C losses. The following schemes are presently underway and are at various stages of implementation in Maharashtra, which not only provide the funding assistance but also aim towards enhancing the technical capacity of MSEDCL.

Proposed Investment in Urban Areas

Under the IPDS scheme, State has proposed for strengthening works for 256 towns with a layout of Rs. 10,609 Cr. (As per Need Assessment Document (NAD)). However, the DPR's are now being prepared for Rs. 2,300 Cr. MSEDCL has planned to introduce HVDS, Arial Branch Conductor, sectionalisers, auto-reclosers, solar panel in government establishments in addition to other system improvement works such as construction of New 33/11 kV Sub-station, augmentation and R&M works of 33/11 kV sub-station, construction of new 33 kV, 11 kV, LT line, re-conductoring of 33 kV, 11 kV, LT line, new DTR installation, capacity enhancement of existing DTR etc.

Infra Plan II

MSEDCL has proposed investments under Infra II scheme towards system strengthening covering 34 districts. The break-up of the proposed schemes is outlined in Table 47.

Table 47: State Government Schemes coverage

Activities	Unit	Nos
Districts Covered	No.	34
New Sub-stations	No.	606
Augmentation of Power T/F	No.	184
Addition of Power Transformer	No.	290
HT Line + HT Cable	Kms	28,302
LT Line + LT Cable	Kms	30,763
Number DTs (New + Augmentation)	No.	49,838
Project Cost	Rs Cr.	8,304

Capitalization of Rs. 1,000 cr has already been undertaken in FY15 and the balance of Rs. 7,304 is proposed in the years covered under the PFA Roadmap.

Proposed Investment in rural areas

In wake of the issues discussed related to agricultural supply above in this document, the proposed investment plan for strengthening of rural supply gains higher significance. MSEDCL has originally submitted Need Assessment Document (NAD) amounting to Rs 13,778 Cr to REC under DDUGJY scheme.

However, the DPRs are now being prepared for Rs 2,153 Cr. under DDUGJY scheme covering 33 districts (37 projects). The activity wise proposed cost of DDUGJY scheme is listed in Table 48 and the abstract of the proposed infrastructure to be developed is provided in Table 49.

Table 48: DDUGJY Scheme cost (Rs Cr.)

Particulars	Estimated Cost (Rs Cr.)
Feeder Separation	1,016.6

Particulars	Estimated Cost (Rs Cr.)
Electrification of UE HH including BPL Consumers	350.2
Strengthening of Sub-transmission and distribution network	771.4
Sansad Adarsh Gram Yojna	14.8
Total	2,153.0

The District wise break up on estimated cost of DDUGJY Scheme and numbers of villages covered is shown in Annexure 2. The district wise break up of physical targets has been shown in Annexure 3.

Table 49: Proposed work under DDUGJY Scheme

Proposed works	Quantity
New Sub Stations (No.)	215
Augmentation/ Addition of Power Transformer (No.)	100
HT Line (in KM)	30,949
LT Line (in KM)	7,480
New DTs. (No.)	15,282

R-APDRP

PFC has sanctioned 124 towns DPRs for R-APDRP (Part B) amounting to Rs 3,314.2 Crore. Out of the 123 towns, tenders were floated for implementation of RAPDRP Part B scheme in 120 towns and LoA's were issued for all 120 Towns amounting to Rs 1,696.21 Crs.

Other Initiatives of MSEDCL

In addition to the various major schemes outlined above, MSEDCL also proposes to undertake a host of other investment programs with an overall investment requirement of Rs. 1,195 crores.

The details of few of schemes are provided below:

Non-Tribal (DPDC):

Release of connections to residential, and agriculture consumers and development of street light, public water works & infrastructure

(H.T. line, L.T. line, DTC etc.) are the main works carried out under this plan.

Special Component Plan (DPDC):

Release of residential connections & Ag. Connections to Scheduled Caste & Nav-Buddha beneficiaries & release of street light connections are the main works proposed carried to be out under this plan.

Tribal (TSP & OTSP):

Following schemes will be executed under Vidut Vikas in Tribal sub-plan area as well as other than Tribal sub-plan area by MSEDCL.

a. Tribal sub-plan (District level):

The scheme is executed in area notified as Tribal Sub-Plan (TSP) area as well as other than Tribal Sub Plan (OTSP) area. In this scheme, out of total allocation, 85% allocation is utilized for Tribal beneficiary living in TSP area and balance for Tribal beneficiary living in OTSP area. The works included under this scheme is mainly to release Ag connections, L&F Connection to tribal beneficiaries and to electrify un-electrified tribal Wadi / Pada. GoM has sanctioned outlay of Rs. 92.14 Crs. in TSP and Rs. 12.17 Crs. in OTSP as grant under this plan for the year 2015-16.

b. Tribal sub-plan (State level):

i. Scheme to Resolve problem related to power supply in Melghat area:-

Melghat area in Amravati District is not getting good quality of supply as the villages are getting low voltage supply and many a time restoration of supply is delayed specially in rainy season because feeders are located in forest. In order to overcome this problem proposal of Rs.27.07 Cr. has been sent for approval to Energy Department. Tribal Department had sanctioned Rs.14 Crs. in March 2015. Demand of balance amount of Rs.13.07 has been sent to GoM.

ii. To Electrify Tribal Un-electrified Village and Wadi-Pada:-

Proposal for electrification of 23 village & 397 padas falling in Thane, Nandurbar, Pune, Ahmednagar & Jalgaon District involving expenditure of Rs. 76.70 Cr. has been prepared. Request for funds has been sent to Energy Department. GoM has sanctioned Tribal Department in their session held in December-14 Rs. 18.25 Crs in March 2015. Demand for remaining amount has been made to GoM. Demand for remaining amount has been made to GoM.

c. AG BACKLOG Scheme:

The Backlog & Indicator Committee set up by Govt. of Maharashtra worked out Backlog for energisation of Ag. Pump Sets in March'1996. The Backlog was calculated on the basis on the ratio of total no. of Ag pumps energized in the District per one thousand hectares of net area sown. The ratio for State as a whole was 112.08. Those districts whose ratio worked out to be less than the State were identified as backlog districts and the Ag. Pumps required to be energized to reach the said average is worked out as Backlog for that particular district. The State has energized about 2,73,973 pumps so far under the scheme and another 24,252 are proposed in the future.

d. SPA: PE (Special Project for Ag. Pump electrification)

This scheme is prepared to release Ag pumps in non-backlog districts. All the Ag. Pump related work such as HT Line, LT line & DTC erection are carried out in this scheme. Scheme is executed by taking loan from funding agency such as REC Ltd. Earlier these schemes were prepared Taluka wise. Due to this scheme cost of such scheme being less than Rs. 10 Crs & these were categorized as Non- DPR schemes. However from FY10, these schemes are being prepared

circle wise & MERC approval is taken. Presently there are about 12 DPR's under processing.

e. PSI (Project for System Improvement)

This scheme is prepared to comply the statutory obligation section 57 of Electricity Act 2003 as well as to maintain quality of power supply as specify by SOP & to reduce technical loss. These schemes are prepared for reducing the technical loss & improve voltage profile by strengthening the system by taking loan from REC Ltd. Scheme is executed by taking loan from funding agency such as REC Ltd.

f. Ag. Special Action Plan (Ag Special Package for Vidarbha & Marathwada):

GoM has made provision of Rs. 819 Crs. in FY 2015-16 in order to clear paid pending Ag pump connections in Vidarbha and Marathwada, out of which Rs. 359 Crs. is for Vidarbha region and Rs. 460 Crs. is for Marathwada region.

Table 50 summarizes the proposed investment under different scheme by MSEDCL. While MSEDCL will be able to achieve 100% access by FY19, it would be available to undertake network strengthening for ensuring 24X7 supply by the year FY20.

Table 50: Total investment (Rs Cr.) - MSEDCL

Sl.	Project Title	Objective	FY16	FY17	FY18	FY19	FY20
1.	Infra Plan Works - I	Augmentation	100.0	-	-	-	-
2.	Infra Plan Works - II	Augmentation	2,922.0	2,922.0	1,460.0	-	-
3.	GFSS II	Augmentation	2.0	-	-	-	-
4.	GFSS III	Augmentation	5.0	-	-	-	-
5.	GFSS IV	Augmentation	95.0	-	-	-	-
6.	Single Phasing - Left out villages	Augmentation	20.0	-	-	-	-
7.	R APDRP A	Loss Reduction	50.0	-	-	-	-
8.	R APDRP B	Loss Reduction	1,988.5	1,325.7	-	-	-
9.	AMR	Loss Reduction	7.6	-	-	-	-
10.	ERP	Systems & Facilities	34.2	-	-	-	-
11.	RGGVY	Access	25.0	-	-	-	-
12.	DDUGJY	Access	645.8	645.8	645.8	215.3	-
13.	IPDS	Loss Reduction	690.0	690.0	690.0	230.0	I
14.	Deogad Wind Power Project	Augmentation	45.0	-	-	-	-
15.	Ag DSM-Pilot project in Mangalwedha, solapur	Loss Reduction	1.7	-	-	-	-
16.	Star rated ceiling fan Phase-II (HVAC)	Loss Reduction	8.1	-	-	-	-
17.	Evacuation	Augmentation	45.2	70.0	80.0	70.0	70.0
18.	DDF	Access	24.8	-	-	-	-
19.	Evacuation Generation ** Wind	Augmentation	30.0	40.0	35.0	30.0	30.0
20.	DPDC (General)	Access	31.8	125.0	125.0	125.0	125.0
21.	DPDC / SCP	Access	136.7	80.0	80.0	80.0	80.0

Sl.	Project Title	Objective	FY16	FY17	FY18	FY19	FY20
22.	DPDC / TSP + OTSP	Access	134.3	110.0	110.0	110.0	110.0
23.	TSP (State Plan for Amarvati Melaghat	Access	14.0	-	-	-	-
24.	TSP (State) plan Village wadi Electrification	Access	18.3	-	-	-	-
25.	SPA:PE	Access	236.2	-	-	-	-
26.	P:SI	Loss Reduction	87.8	39.8	-	-	-
27.	Back log	Access	220.0	220.0	100.0	-	-
28.	Dhadak Sinchan Yojana/ Ag special Package for vidabhra/Maraathwada	Access	819.0	-	-	-	-
29.	Infrastructure (Not Yet Sanctioned)	Augmentation	-	-	-	9,226.2	9,226.2
30.	Ag Metering	Loss Reduction	49.7	-	-	-	-
31.	Other Assets						
a	Land	Systems & Facilities	40.0	40.0	40.0	40.0	40.0
b.	Buildings	Systems & Facilities	21.0	-	-	-	-
c	Furniture & Fixtures	Systems & Facilities	2.0	2.0	2.0	2.0	2.0
d	Office Equipment (Computer , Laptop, Printer etc)	Systems & Facilities	5.5	3.0	3.0	3.0	3.0
e	Testing of equipment	Systems & Facilities	7.5	5.0	5.0	5.0	5.0
Total			8,563.7	6,318.3	3,375.8	10,136.4	9,691.2

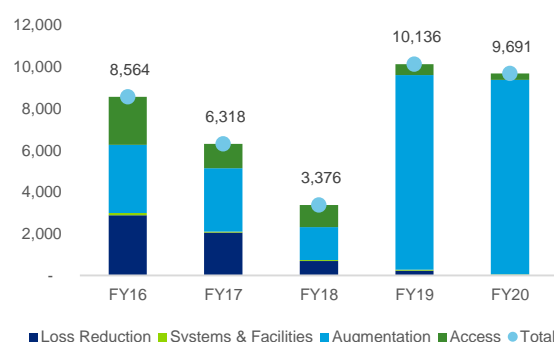
As can be seen in the above table, out of the proposed capital expenditure, nearly 70% (Rs.26,524 Cr.) is targeted towards system augmentation as the key objective, while nearly 15.4% (Rs. 5,859 Cr.) is targeted towards loss reduction. The year on year expenditure outlay towards various objectives is presented in Figure 21.

6.5. Other Distribution Licensees Investment Plan

R-Infra Distribution

R-Infra Distribution is already supplying 24X7 power to its consumers and has a reliable network in place to serve its consumers in accordance with the objectives of the PFA program. Accordingly, R-Infra D has proposed an incremental investment plan as per its routine investment requirement for the period covered under this roadmap. The year wise

Figure 20: YoY Capital Expenditure components (Rs. Cr.)



proposed physical rollout plan is as outlined in Table 51.

Additionally, R-Infra D proposes to undertake formation of 33kV ring network, implementation of Outage Management System (OMS), implementation of SCADA and DMS, introduction of Geographical Information System (GIS), Gas Insulated Switchgear (GIS) for 33kV, adoption of IEC-61850 protocol for

new HT switchgears and smart grid pilot schemes in its supply area with the objective of introducing new technologies and practices for improved quality and reliability of supply.

Table 51: R-Infra D Physical Rollout Plan

Particulars	Units	FY15	FY19	Addition
Sub-transmission				
33 kV Feeders	No.	731	971	240
33 kV S-Stns	No.	78	94	16
S-Stn. Capacity	MVA	3,321	3,961	640
Distribution				
11 kV Feeders	Kms	3,762	4,322	560
DTs	No's	6,370	7,570	1,200
DT Capacity	MVA	4,784	5,384	600
LT Feeders	Kms	17,539	20,139	2,600

The year wise proposed investments of R Infra is outlined in Table 52.

Table 52: R-Infra D Investment Plan (Rs. Cr.)

Particulars	FY16	FY17	FY18	FY19	Total
R-Infra D Proposed Investments	405	425	450	450	1,730
IPDS	905				905
Total					2,635

R-Infra D has proposed an investment of Rs. 905 crores under the IPDS covering the following:

- Theft mitigation/ loss reduction measures for clusters having AT&C losses of more than 30%;
- Implementation of Smart Grid in the BKC area;
- Introduction of smart/ pre-paid metering for other consumers (Phase-1)

R-Infra D endeavors to take up the investments with appropriate debt-equity funding as per routine process with due approval from the MERC on case to case basis.

BEST

BEST is already providing 24X7 electricity to its consumer base and has a robust network to serve its consumers. Accordingly, the proposed investments in BEST's network is incremental in nature in view of the expected load growth and proposed technology up gradations/ reliability improvement related investments.

BEST has built in adequate redundancies in its network by creating rings in its cable network, normally operated in radial mode. BEST has also introduced direct 33kV/ 415V distribution substations with the objective of improving reliability and reducing technical losses in its network.

Additional proposed investment initiatives of BEST include the following:

- Installation of SCADA in entire network of BEST, covering the balance 23 receiving sub-stations;
- Introduction of DMS for automation of distribution substations and transformers for faster response to fault detection and supply restoration;
- Digitization of records of RSS, DSS, ADPs, cable routes along with location of joints, depth of cable laying etc. on a GIS platform.
- Project for Electric Supply Automation and Customer E-service (PEACE) is under implementations, which covers various facets such as connection management, remote metering, CRM, revenue management, asset management, network management, OMS, load flow analysis, load forecasting, ABT modules and energy accounting.
- Establishment of a Unified Load Dispatch Center in view of the ABT implementation in the State;

BEST has also proposed various works under the IPDS scheme totaling Rs. 104.65 crores.

Table 53 provides the details of work proposed under IPDS.

Table 53: Project scope under IPDS proposed by BEST

Particulars	Unit	Quantity	Cost (Rs Cr.)
33/11 kV or 66/11 kV SS (New /Augmentation)	MVA	48	17.45
33/11 kV or 66/11 kV SS : R&M	No.	12	2.77
New 33 kV feeders-(New /Augmentation)	KM	22.19	42.38
New 11 kV feeders-(New /Augmentation)	KM	30	9.60
DT - New	MVA	40.19	11.44
Metering	No.	4,500	13.50
FPI	No.	3,500	7.50
Total			104.65

BEST has planned to take up the investments totaling Rs. 800 crores with appropriate debt-equity funding as per routine process with due approval from the MERC on case to case basis.

The proposed infrastructure rollout plan of BEST under the PFA Roadmap is provided in Table 54.

TPC-Distribution

TPC-D has taken measures to improve its network and is also in process of implementing advance technologies such as Distribution

Table 54: BEST Infrastructure Rollout Plan

System Equipment Details	Units	Existing		Addition during the year				Cumulative (Till FY19)
		FY 14	FY 15	FY 16	FY 17	FY 18	FY 19	
Receiving Sub-stations								
No. of Receiving Sub-stations	No's	56	4	2	2	1	1	66
Capacity of Power Transformers	MVA	1,808	54	48	48	16	16	1,990
Distribution Sub-stations								
No. of Distribution Sub-stations	No's	2,226	40	40	40	30	30	2,406
No. of Distribution Transformers	No's	3,004	60	60	60	45	45	3,274
Capacity of Distribution Transformers	MVA	2,402	49	49	49	33	33	2,615
Cable Length								

Automation System and Fault Passage Indicator (FPI)/Self-healing grid system.

TPC-D has proposed taking up priority works under the infrastructure rollout plan under the IPDS launched by the Government of India. Proposals totaling Rs. 1,037.3 crores have been proposed to be taken up under the scheme. The proposed year wise phasing of the works covered under IPDS is as shown the in Table 55.

To enhance its distribution network in order to meet future demand, TPC-D has proposed infrastructure rollout plan as shown in Table 56.

TPC-D has planned to take up other investments with appropriate debt-equity funding as per routine process with due approval from the MERC on case to case basis.

System Equipment Details	Units	Existing	Addition during the year					Cumulative (Till FY19)
		FY 14	FY 15	FY 16	FY 17	FY 18	FY 19	
Length of EHV Cable	kms	453	15	19	20	15	15	537
Length of HV Cable	kms	1,934	40	40	40	35	35	2,124
Length of LV Cable	kms	8,164	65	65	65	45	45	8,449
Length of Communication Cable	kms	227	4	2	2	1	1	237

Table 55: TPC-D Phasing of Proposed IPDS Works

Particulars	FY16	FY17	FY18	FY19	Total
IPDS Scheme Investments (Rs. Crs.)	270	270	270	226	1,037
Distribution Substation-20 MVA (No's)	2	4	1	3	10

Table 56: TPC- D Infrastructure roll Plan till FY19

Particulars	Units	End of FY15	End of FY19	Addition
Sub-transmission System				
33 kV Feeders	Ckt. Kms	505	685	180
Substations (33kV/ 11kV)	Numbers	28	46	18
Substation Transformation Capacity	MVA	995	1,435	440
Distribution System				
11 kV Feeders	Ckt. Kms	800	1,120	320
22 kV Feeders	Ckt. Kms	728	728	0
Distribution Transformers	Numbers	769	1,409	640
DT Transformation	MVA	753	1,240	487
LT Feeders	Ckt Kms	1,609	2,084	475

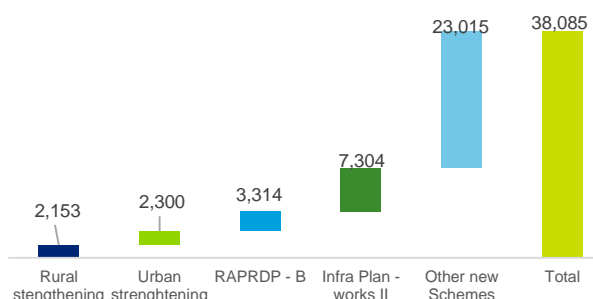
6.6. Funding Plan

MSEDCL has proposed to invest nearly Rs.38,085 Cr. in creating new and augmenting existing distribution infrastructure under various schemes over the period from FY16 to FY19 and beyond FY19, as presented in Figure 21. The proposed expenditure is necessary in view of the PFA objectives.

At this stage MSEDCL is committing to Rs. 28,394 Cr. as capital expenditure till FY 19, which is necessary for providing access to all potential consumers in the State. The remaining capital expenditure, aimed mainly towards ensuring reliability of supply shall be taken up as and when additional concessional funding from multi-lateral agencies or government becomes available. For the expenditure

envisaged till FY18, MSEDCL is expected to be

Figure 21: Capital Expenditure Plan (Rs. Cr.) FY16 FY20



able to meet the anticipated fund requirement largely from various tied-up sources and its own internal accruals. While, for the majority of expenditure to be incurred in FY19 and beyond FY19, the sources of funds are yet to be identified. The year-wise capital expenditure

phasing details till FY19 and expenditure to be taken up beyond FY19 are provided in Table 57.

The sources of funding for un-approved part of proposed schemes and remaining expenditure

proposed for FY19 and beyond FY19, need to be firmed up at an appropriate time. In an event, when concessional funding is not available, it would be difficult for MSEDCL to undertake such investments.

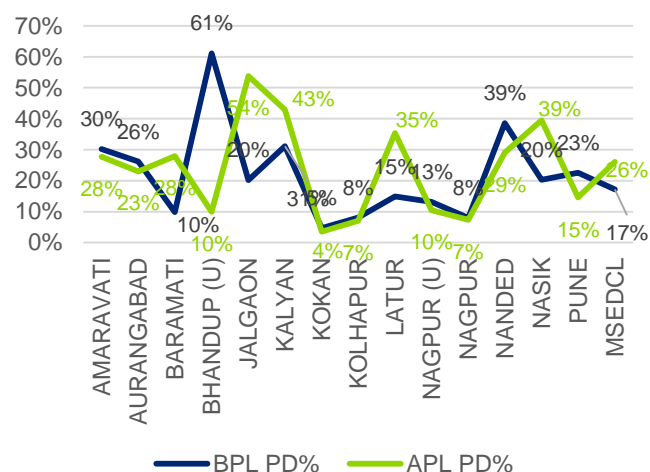
Table 57: Fund Availability & Gap (MSEDCL) – Rs. Crs.

Investment Schemes	FY16	FY17	FY18	FY19	Beyond FY19	Total
PFC	2,249	1,533	69	-	-	3,851
REC	2,823	2,567	1,233	-	-	6,623
GoM Loan	-	-	-	-	-	-
GoM Equity	718	718	426	45	-	1,906
Grant	2,176	1,386	1,748	1,114	-	6,424
Consumer Contribution	150	110	115	100	-	475
Total Availability	8,115	6,314	3,590	1,258	-	19,278
Investment	8,564	6,318	3,376	10,136	9,691	38,085
Gap (including funding from internal accruals)	(449)	(4)	215	(8,878)	(9,691)	(18,807)

6.7. Addressing the Affordability Concern

MSEDCL has pursued aggressive network expansion and electrification related investment programs over the last decade. The experience of electricity connections given at nominal/ no price under the RGGVY scheme enriches MSEDCL with valuable insights for designing future access rollout programs. Over 20% of the BPL/ APL connections issued under the RGGVY program have subsequently failed to pay for the electricity consumed which has resulted into permanent disconnection of connections issued. The level of disconnection even ranges to above 60% in some of the districts as can be seen in Figure 22.

Figure 22: District Wise Permanent Disconnection of RGGVY Connections



The status of RGGVY connections in the State, as on July, 2015 including the outstanding arrears against live and disconnected consumers is summarized in Table 58.

Table 58: Disconnection & Arrear Status of RGGVY Consumers in Maharashtra

Description	BPL	Non-BPL	Total
Connections (No's)	261,548	781,502	1,043,050
LIVE Consumers (No's)	216,493	619,775	836,268
LIVE Arrears (Rs. Cr.)	2.35	76.02	78.37

Description	BPL	Non-BPL	Total
PD Consumers (No's)	45,055	161,727	206,782
PD Arrears (Rs. Cr.)	4.00	75.53	79.53
Total Arrears (Rs. Cr.)	6	152	158

The trend of permanent disconnections that have happened over the period indicate that affordability is a key concern surrounding further electrification rollouts in the State. Several marginal consumers are unable to pay towards their electricity consumption causing financial stress on MSEDCL.

The MSEDCL intends to adopt pre-paid metering for all future access rollout programs providing electricity connections to marginal consumers in the State.

Pre-paid Metering for Marginal Consumers

MSEDCL has planned to install pre-paid meters on marginal consumers proposed to be provided with electricity connections under DDUGJY/ other State funded programs. This is expected to result in the following benefits:

- Permanent solution to piling up of arrears from sale of electricity to marginal consumers;
- Flexibility to consumers on when and how much electricity they want to consume;
- Avoidance of large scale disconnections leading to operational cost burden on MSEDCL; and
- Provide backbone for future direct subsidy transfer from State to marginal consumers;

Given MSEDCL scale of operations, it is expected that pre-paid meters can be procured at about Rs.1,200 to Rs.1,500 per unit. The investments towards the same would be taken up after due approvals from the MERC.

MSEDCL requests the Ministry of Power to extend the scope and funding under the DDUGJY to provide for installation of pre-paid meters for rural BPL/ APL consumers.

Consumers whose supply has been disconnected on grounds of non-payment are not covered under the proposed electrification plan presented in the PFA Roadmap.

6.8. Other Issues & Support Required

- Compensatory Tariff to impact the power procurement cost:** MSEDCL has signed various PPAs with IPPs/UMPPs, however, most of the PPAs signed have resulted into Regulatory petitions being filed by IPPs/UMPPs demanding 'Compensatory Tariff' on ground of events which according to them are uncontrollable in nature. Some of the events are outside the scope of PPA and has been sought for the viability of the Generation business only.

MSEDCL has opposed such compensatory tariff in all forums and has also appealed against various orders in appropriate courts of law. While Compensatory Tariff is passed through as per FSA, recovering the same is a severe challenge for MSEDCL.

- Burgeoning level of arrears:** MSEDCL has bottom of the pyramid demand by way of cumulative arrears from the PWW, Street Light, MulaPravara, Government consumers and Agricultural consumers which is ~70% of total arrears. This has resulted into lower revenue recovery which puts tremendous pressure on MSEDCL's short term finances.

MSEDCL need support of the State Government in form of guidelines to control such arrears and expediting revenue recovery from such consumers.

- Support from local authorities:** Expedition of the process for granting permission of getting excavation/pipe laying from the Government/ Semi - Government Authorities which will help in speedy execution of the jobs. Secondly, reduction/rationalization of R.I. Charges/Way leave charges which are levied by the Government / Semi-Government bodies while carrying out cable laying jobs.

- d) Loss of consumers/ revenue under Open Access: MSEDCL's tariff to the industrial/ other paying consumer categories is loaded with cross subsidies because of which other suppliers are able to supply power at a cheaper rate to such consumers. While the MERC has imposed certain charges on OA consumers, such charges do make good for the total loss to MSEDCL which has already entered into LT PPA's for its entire demand. During FY13, RE based OA cases almost contributed to the same amount as conventional sources. The impact of OA consumers is shown in Table 59.

Table 59: Impact of OA Consumers

Particulars	UoM	FY12	FY13
MW	MW	1,163	1,203
MUs	MU	3,748	4,466
Total Revenue Loss	Rs. Cr.	2,879	3,405
Income from OA Charges & Savings in PP Costq	Rs. Cr.	1,044	1,545
Net revenue loss	Rs. Cr.	1,723	1,860

The load of consumers' move of the State has increased to 1,264 MW in FY18 and Rs. 1,283 MW in FY19. The OA consumers are broadly categories into conventional CPPs/ IPP and/ or the electricity exchange.

6.9. MSEDCL Rollout Plan

In order to achieve the Power for All till FY19, MSEDCL has prepared circle wise plan for electrification of Rural and urban household's. The details has been shown in Annexure 2. Further, the discom has established circle wise AT&C loss targets till FY 19. The list has been shown as Annexure 3. Based on the ongoing and proposed schemes, MSEDCL has finalized the infrastructure rollout plan till FY18 as presented in Table 60, which shall be validated at appropriate time through field level surveys. The physical rollout plan for FY19 is yet to be prepared.

6.10. Capacity Building Initiatives

The quantum leap in undertaking the proposed infrastructure rollout, connecting all balance HHs in the State and enabling provision for 24X7 supply for all consumers in the State would require significant training and up-skilling of the workforces of the power distribution utilities in the State. In view of the same, the identified capacity building measures proposed to be undertaken by the various utilities in the State is summarized in Table 61.

Table 60: MSEDCL– Infrastructure Roll Out Plan till FY18

Particulars	Units	As on 31-03-2015	FY16	FY17	FY18	As on 31-03-2018	Addition
Sub-transmission System							
33 kV Feeders	Ckt. Kms	40,113	11,570	10,870	5,435	67,988	27,875
Substations (33kV/ 11kV)	Numbers	2,925	189	287	118	3,519	594
Substation Transformation Capacity	MVA	26,876.5	1,134	1,722	708	30,440	3,564
Distribution System							
Distribution Transformers	Numbers	5,23,583	21,164	19,364	7,261	5,71,372	47,789
DT Transformation	MVA	49,030	2,798	2,662	1,090	55,580	6,550
LT Feeders	Ckt Kms	6,07,656	14,580	13,841	7,670	6,43,747	36,091

Table 61: Capacity Building Initiatives

Name of Discoms	Capacity Building Plan
MSEDCL	<ul style="list-style-type: none"> • MSEDCL has entered into a MOA with PFC for providing support on capacity building requirements. • MSEDCL has established the following training centres for rolling out various training programs to its employee base of 47,932 technical and 8,829 non-technical employees: <ul style="list-style-type: none"> – 4 Major Regional Training Centres: including Training & Safety Department, Eklahare, Nashik; Regional Training Centre, Nashik; Regional Training Centre, Amravati; and Regional Training Centre at Aurangabad – 25 Small Training Centres have been established at circle levels across the State – Training facilities at HO Level with all necessary amenities; – 2 ITI's adopted by MSEDCL to facilitate electricity distribution trainings • Funding requirement of Rs.4.19 crores has been estimated for establishment/ commissioning of the proposed training centres. • Annual training program of 20,000 employees at Regional Training Centres and additional 20,000 employees at Circle Level Training Centers; • Nashik Regional Training & Safety Department conducts RAPDRP approved training programs on the following aspects: <ul style="list-style-type: none"> – Best Practices in Distribution Operations & Management System – Disaster Management, Electrical Safety procedures and accident preventions – Lineman Training- Operation & Maintenance of Sub-stations – Communication & Customer Care
R- Infra	<ul style="list-style-type: none"> • Training programs (for capacity building) are carried out at Reliance Energy Management Institute (REMI) & Versova Technical Training Centre (VTTC) on Generic, Behavioural & Technical Training Programs. • Technical Training programs are for Maintenance Practices, Best Practices, Regulations & Policies, New Technologies and concepts, Metering, Safety Rules etc.
BEST	<ul style="list-style-type: none"> • BEST has its in-house Training and Industrial Engineering department which imparts training to its staff and officers for activities related to their day-to-day job. In addition to these, utility undertake training programme on Safety aspect and Conservation of Energy. The in-house training department also imparts training to graduate and technician apprentices under Apprenticeship Act 1961. Besides this, BEST impart in plant training to about 300 students in a year who are undergoing Diploma and Degree Engineering courses in various institutes of Maharashtra State. • Best provides specialized training to senior level officer and for management development programmes. The company also depute officers to various National Training Institutes such as ESCI, CPRI, REC, MSME, NPTI, IPPAI, MEDA, NITIE & ASCI. Officers are also deputed for seminars organized by reputed private institutions where eminent speakers deliver lectures on Power System or related equipment. • The annual establishment cost of Training and Industrial Engineering department of BEST is around 26 lacs. The investment towards various in-house training programmes and deputations for training programmes at various reputed institutes for staff and officers in all cadres is about 104 lacs. • BEST has proposed to modernize Training dept. the Capital expenditure towards improvement of infrastructure is Rs.25 lacs.
TPC – D	<ul style="list-style-type: none"> • Tata Power Company has set up two Tata Power Skill Development Institute (TPSDI). • The following categories of training are offered – Cable & Lineman, Power System Skills, Transmission and Distribution Line Skills, Distribution System Skills, Cable Laying Skills Modular Skills, Cable Jointing and Termination Skills, Solar Power Skills, Domestic Wireman Skills.

6.11. New Technology Initiatives

The initiatives taken by Discoms in Maharashtra are enlisted in Figure 23.

Apart from above mentioned new initiatives, the discoms have installed HVDS to reduce space constraint & ensure timely installation and enhance safety of the distribution network. The utilities like Tata Power are using Mobile Sub stations to reduce commissioning time and also deployment for emergency purposes in case of outage or shutdown to consumer.

While SCADA in the Mumbai area has already been implemented by the respective licensees, MSEDCL is also in the process of introducing SCADA in 8 more towns across the State. MSEDCL has also introduced pre-paid metering which offers 5% discount in tariff to opting consumers. MSEDCL is in the process of installing about 25,000 such prepaid meters in the initial phase in Pune, Satara, Thane and

Figure 23: New Technology Initiatives

Self-Healing Grid (SHG) at 11 KV Level	<ul style="list-style-type: none"> Helps to automate the process of restoration of power supply to keep interruptions to a bare minimum
Radio Frequency Metering	<ul style="list-style-type: none"> Provides error free bills and eliminating the entry process of a utility person in premises for meter reading
Natural Ester filled Power transformers	<ul style="list-style-type: none"> Helps in increasing transformation capacity with reduced carbon footprint
Power Quality Monitoring (PQM) Meters	<ul style="list-style-type: none"> Measure the quality parameters of power for analysis of voltage fluctuations, system disruption
Prepaid Meters	<ul style="list-style-type: none"> Error free billing, Improved Collection Efficiency, Reduced O&M Costs

Raigad districts, after which the program shall be rolled out to more consumers across the State.



7. Renewable Energy Plan

7.1. Introduction

Maharashtra Energy Development Agency (MEDA) is the nodal agency for development of RE in the State of Maharashtra. The State has positioned itself as a favorable destination for renewable energy projects. The State has an installed capacity of 6,705 MW from RE sources as on March, 2015 as per MEDA. The RE installed capacity base is mainly contributed by the 4,442 MW of wind energy projects and the balance is from biomass/ bagasse based co-generation plants, SHPs and solar projects. Maharashtra is second only to Tamil Nadu in terms of installed capacity of RE generation amongst all states.

The RE source wise potential and grid-connected installed capacity for the State is shown in Table 62.

Table 62: Grid Connected RE Sources and potential (MW) – March, 2015 (as per MEDA)

RE Source	Potential (MW)	Installed Capacity (MW)
Wind	9,400	4,442
Small Hydro	732	284
Bagasse based Co-gen	2,200	1,415
Biomass Power Project	781	200
MSW & Liquid Waste	287	3
Industrial waste power project	350	32
Solar Power Project	49/Sq. Km.	330
Total	13,750	6,705

Wind energy in the State has highest potential at 9,400 MW and the installed capacity has penetrated due to attractive policies of State

and central government. These enablers have opened up the private sector investment in the State. Amongst all, Dhule district has the largest share of wind power in the State with an installed capacity of 581 MW.

The Government of Maharashtra in July, 2015 has declared a composite policy for development of generation of electricity from Renewable Energy (RE) sources. The policy aims at a capacity addition to 14,900 MW in the next 5 years. Break of the targeted capacity addition under the composite policy is outlined in Table 63.

Table 63: 5 year RE Capacity Addition Target as per Govt. of Maharashtra Policy (dated July, 2015)

RE Source	Capacity (MW)
Wind	5,000
Solar	7,500
Bagass (Co-gen)	1,000
Small Hydro	400
Biomass	300
Municipal/ Indl. Waste	200
Total	14,400

The MERC has issued Renewable Purchase Obligation (RPO) regulations which provides enabling environment for growth of RE generation in the State. The MERC regulations specify specific targets for solar, mini/ micro HEPs and other Non-solar RE sources to provide specific thrust to solar power and SHP development in the State. The Table 64 shows the RPO obligations vs achievement of the various power distribution utilities in the State.

While the State has significantly excelled in achieving the regulatory targets for Non-Solar RPO, most utilities have not been able to meet

the targets for Solar and Mini-Micro HEP power generation.

Table 64: RPO Target v Achievement for Mumbai Utilities (FY 11 to FY 14)

DISCOMs	Item	Target (MU)	Achievement (MU)	Cumulative Achievement (MU) Shortfall (+) /Surplus (-)
BEST	Solar RPO	61	25	36
	Non-Solar RPO	1,397	1,401	-4
	Mini-Micro RPO	2	9	-8
TPC	Solar RPO	78	15	64
	Non-Solar RPO	1,799	1,809	-10
	Mini-Micro Hydro RPO	2	0	2
R-Infra	Solar RPO	96	130	-34
	Non-Solar RPO	2,205	2,218	-14
	Mini-Micro RPO	3	0	3
MSEDCL	Solar RPO	684	40	644
	Non-Solar RPO	18,456	54,196	-35,649
	Mini-Micro RPO	19	2	17
Total	Solar RPO	919	210	709
	Non-Solar RPO	23,857	59,624	(35,767)
	Mini-Micro RPO	26	11	15

Further, as part of the planned 175 GW capacity addition of RE sources in the country, MNRE has targeted 22,045 MW capacity addition from RE sources till FY 22 for Maharashtra. This includes 11,926 MW from solar sources, 50 MW from SHPs, 7600 MW from wind sources and 2,469 MW from biomass. The solar PV capacity additions are a part of the 4,700 MW solar capacity addition target of the State under the 40,000 MWp national Grid Connected Solar Rooftop Systems target of MNRE. The MEDA and utilities shall plan for RE capacity additions beyond FY19 in line with the proposed targets set by MNRE till FY22.

7.2. MSPGCL Sources

MSPGCL has a total installed capacity of 180 MWp of Solar and 388 MW from SHPs in the State. The break-up of the same is provided in Table 65.

Table 65: MSPGCL Installed Capacity from RE Sources

RE Source	Number of Plants	Installed capacity (MW)
Solar	Various Plants	180
Small Hydro Power Project	22	388
Total		568

MSPGCL has planned to add 2,500 MW Solar PV projects over the 5 year period 2014-19. Under RGO obligations as per targets fixed in Energy Department, Government of Maharashtra comprehensive policy for grid connected power projects based on New & Renewable (Non-conventional) Energy Sources-2015.

The list of solar power projects completed by MSPGCL with a total installed capacity of 180 MWp, is provided in Table 65.

Table 66: Details of MSPGCLs Completed Solar Power Plants

Project	Mode	Capacity (MWp)	Cost (Rs. Cr.)
Solar PV Chandrapur	State	1	13
Solar Crystalline Chandrapur	State	2	25
Solar Thin Film Chandrapur	State	2	24
Solar Photovoltaic Sakri, Dhule	State	125	1,643
Solar PV Baramati (Est cost is only Mahagenco's share)	PPP	50	548
Total		180	2,253

Table 67: Source wise capacity addition of grid-connected renewable generation (MW)

Sl.	RE Source	FY 15	FY 16	FY 17	FY 18	FY 19
1	Wind	3,656	4,156	4,656	5,156	5,156
2	Small Hydro	296	346	396	446	446
3	Bagasse based Co-gen	1,496	1,746	1,996	2,246	2,246
4	Biomass Power Project	262	387	512	637	637
5	MSW & Liquid Waste	3	3	3	3	3
6	Solar Power Project	354	379	1,194	1,253	1,316
	Total	6,067	7,017	8,757	9,741	9,804

7.3. Distribution Utility's RE Procurement Plan

MSEDCL Action Plan

The total contracted capacity for the utility is expected to rise from the current level of 6,067 MW in FY15 to 9,804 MW in FY19, indicating a rise of 56%, as outlined in Table 67. Apart from the grid-connected renewable capacity additions mentioned above MSEDCL is also administering implementation of the Solar Based Pumping Program launched by MNRE on behalf of the State Government in coordination with the MEDA. Key features of the program are highlighted in Figure 24.

R-Infra

The Utility has tied up power purchase contracts from various private developers, as on March 2015 the total contracted capacity of the utility from renewable sources is 161.88 MW as shown in Table 69. R-Infra is anticipating substantial capacity additions from net-metering based solar roof-top installations expected to come-up in accordance with the new policy/

regulations introduced in the State. For any remaining quantum R-Infra plans to meet the same through purchase of RECs.

Figure 24: Off-Grid Solar Pumping Program

Coverage
• 10,000 Solar Ag. Pumps
Beneficiary Criteria
• Small & marginal framers, • Suicide prone criteria; • Remote and tribal areas • Unelectrified villages • Pending Ag. connections
Funding
• Total cost Rs. 587 crores • Funding - Central Government (30%), State Government (5%), Beneficiary Contribution (5%), Loan (60%)

BEST

The Utility has tied up power purchase contracts from various private developers, as on March 2015 the total contracted capacity of the utility from renewable sources is 138 MW as shown in Table 70.

Long-term contract (25 Years) with M/s. Welspun Energy Maharashtra Ltd. 20 MW Solar-PV based plant located in Mangalwedha, Pandharpur supplying RE up to 31.5 MU's solar RE per annum since 18.10.2013.

- a) Long term contract (13 years) with M/s. Spark Green Energy Pvt. Ltd. 25 + 25 MW Biomass based plants located at Ahemednagar & Satara and estimated 140 + 140 MU's Non-solar RE per annum from plants proposed to commission in FY 2015-16.

Remaining quantum of RPO is envisaged to be achieved by BEST from short term contracts and REC.

TPC Distribution

TPC Distribution has already entered into LT PPA's with a total RE generation capacity of 236 MW comprising of 208 MW of Wind and 28 MW of solar based generation as can be seen in Table 68. Remaining quantum of RPO is envisaged to be achieved by TPC from short term contracts and REC and/ or future LT PPA's, as the case may be.

Table 68: TPC Sources of Renewable Power

Project Name/ Location	Capacity (MW)
Wind Projects	
Supa , Ahemadnagar	17
Khandke, Satar	50.4
Bramanwel, Dhule	11.25
Sadawaghapur, Satar	17.5
Visapur,(Tata Power) Sangali	10
Visapur,(TPREL) Sangali	32
Agaswadi, Satara	49.5
Nivade ,Kolhapur	20.95
Total	208.6
Solar Projects	
Mulsi Pune	3.0
Palswadi,Satara	25.0
Walwhan	0.11
Total	28.11

The Source wise energy generated from renewable energy is shown in Table 71.

It is projected that the total energy available from RE sources is expected to increase from 14,750 MU in FY16 to 22,223 MU in FY19.

7.5. Fund Requirement of Renewable Energy Plan

The 4 solar based projects proposed under State sector (MSPGCL) with a total installed capacity of 130 MW are proposed to be funded through equity contributions generated from internal resources of MSPGCL and debt funding from suitable financial institutions.

The remaining RE generation projects are proposed to be developed by private sector players, the enabling mechanisms for which have already been put in place by the MERC and MEDA in the form of governing regulations and policies.

Recently, the Ministry of New and Renewable Energy (MNRE) has proposed state-wise RE generation capacity targets, totaling to 175GW by 2022. The state nodal agency will align the targets for State with that of MNRE by the end of year 2015.

7.4. Projected Energy Generation from RE sources

Table 69: R Infra Sources of renewable power (MW)

SI	Project	Location	Capacity (MW)	Type
1	Reliance Innoventures Pvt. Ltd	Satara,	45	Wind
2	Reliance Power Ltd	Sangli,	45	Wind
3	Tembhu Power Pvt. Ltd	Satara,	4.5	Small hydro
4	AAA Sons	Satara,	3.375	Wind
5	Jindal Steel & Power Ltd	Satara,	6	Wind
6	Jindal Steel & Power Ltd	Satara,	18	Wind
7	Dhursar Solar Power Private Limited	Dhursar, Rajasthan	40	Solar
	Total		161.88	

Table 70: BEST Sources of renewable power (MW)

SI	Project	Location	Capacity (MW)	Type
1	M/s. Welspun Energy	Mangalwedha	20	Solar
2	Patel Wood Syndicate	Solapur	1	Solar
3	Dr.D.H.Patel	Solapur	1	Solar
4	New Patel Saw Mill	Solapur	1	Solar
5	Saidapur Jute Co. Ltd.	Solapur	0.6	Solar
6	Triveni Sangam Holdings & Trading Co. Pvt. Ltd.	Solapur	1.2	Solar
7	G.I. Energies.	Solapur	0.6	Solar
8	Agrawal Minerals (Goa) Pvt. Ltd.	Solapur	4	Solar
9	Gangdhar Narsing Das Agrawal	Solapur	1	Solar
10	Parekh Medisales Pvt Ltd.	Solapur	0.6	Solar
11	Saraswati Industries	Solapur	0.6	Solar
12	GovindramShobharam& Co.	Solapur	0.6	Solar
13	M/s Spark Green Energy Satara Pvt Ltd	Ahemednagar	25*	Biomass
14	M/s Spark Green Energy Ahemednagar Pvt Ltd	Satara	25*	Biomass
15	Krishna Valley Power Pvt Ltd.	Shahapur	1	Mini Hydro
16	Sahyadri Renewable Energy Pvt Ltd.	Shahapur	1.5	Small Hydro
17	Lokmangal Agro Ltd	Solapur	4	Bagasse
18	Pioneer Distilleries Ltd.	Nanded	2.2	Bio-gas
19	Yash Agro Energy Ltd	Chimmur	7	Biomass
20	Greta Energy Ltd	Nagpur	13.5	Biomass
21	Maharashtra Vidyut Nigam Ltd	Nagpur	9	Biomass
22	GMT Mining & Power Pvt Ltd.	Nagpur	9	Biomass
23	A.A. Energy Ltd.	Nagpur	9	Biomass
	Total		138	

* Yet to Commissioned

Table 71: RE Generation for Maharashtra (MU)

SI	RE Source	FY 16	FY 17	FY 18	FY 19
1	Wind	6,843	7,719	8,595	9,033
2	Small Hydro	1,125	1,300	1,475	1,563
3	Bagasse based Co-gen	4,260	4,917	5,574	5,902
4	Biomass Power Project	1,990	2,756	3,523	3,906
5	MSW & Liquid Waste	18	18	18	18
6	Solar Power Project	514	1,102	1,715	1,800
	Total	14,750	17,813	20,901	22,223

There is no proposal/ request for any additional support from the State or the central government beyond the support which is available for RE projects under various schemes and programs launched by MNRE.

Based on the success of the initial rollout of the 10,000 solar based Agriculture Pumping Program, the State intends to roll-out the same on a wider scale so as to achieve Agriculture Connection on-demand status. Such extension of the Solar based Agriculture Pumping Scheme may need additional support from MNRE and State Government in the coming years.

7.6. Connecting the un-connected Villages

Presently, there are 52 villages in 9 districts of Maharashtra, which have been identified for off-grid electrification under RE/ DDG scheme. Out of these 52 villages, 20 villages are to be covered by MSEDCL while remaining 32 shall be covered by MEDA. Additionally, there are 10 more villages which were earlier electrified under DDG Schemes by MEDA which have now become inoperative. Investments towards operationalizing systems in these villages are proposed to be taken up by MEDA. The details of all villages proposed under RE based DDG Schemes are provided in Annexure 4.

One of the key issues experienced by MEDA has been related to the tenure of O&M under DDG/ RE scheme, which is limited to 5 years. It

has been observed that once the tenure ends, due to inadequate O&M, the systems become inoperative. Such a scenario requires re-electrification of these villages either by repairing and renovating the existing system or by installation of new DDG/RE system.



8. Energy Efficiency Plan

8.1 Introduction

Given the quantum of energy consumption and the peak demand for power in the State, energy efficiency initiatives assume greater significance in the case of Maharashtra. DSM interventions such as time-of-day (ToD) tariff have since long been introduced in the State and have yielded significant benefits in reducing peak demand. MSEDCL, through the Gaothan Feeder Segregation Scheme and the Single Phasing Scheme has been one of the leading states in introducing DSM measures in agriculture supply in the country.

MEDA is the State nodal agency for energy efficiency. At the State level, various energy conservation measures pursued by the MEDA and the status of achievements are:

- a) **Energy Efficient Street Lighting:** State has implemented program in more than 5,000 villages till March, 2015 covering over 1,28,230 street lighting points and has resulted in reduction of peak load to the tune of 5 MW.
- b) **Save Energy Program (Detailed Energy Audit):** 798 establishments have been covered so far under State/ MEDA support and resulted in a benefit of Rs. 82 crores.
- c) **Walk Through Energy Audit (for SMEs):** 1893 SMEs have been covered so far under the program.
- d) **Waste Heat Recovery:** 10 units have participated so far out of which 9 units have saved 3.10 MW equivalent of energy.

- e) **Demonstration Projects for Government Buildings/ Urban Local Bodies:** Over 58 buildings have been supported under this initiative.
- f) **Efficient Street Lighting in Urban Local Bodies:** Financial assistance to over 29 ULBs has been provided under this scheme. A new scheme for LED demonstration projects in 'C' class Municipal Councils has been recently introduced.
- g) **State Energy Conservation Award Scheme:** Over 763 units have participated over last 9 years and demonstrated an energy saving of over Rs. 3,036 crores annually due to various EE measures.
- h) **Capacity Building Through Awareness**
- i) **Mandatory use of 4 and 5 star labelled Energy Efficiency Equipment in State Government sector/ PPP.**
- j) **Introduction of B.Sc. course in Renewable Energy Sources in Maharashtra.**

In addition to the above steps by MEDA, the State regulator, MERC has also undertaken initiatives to support EE/DSM program in the State and issued following enabling Regulations:

- a) **DSM Implementation Framework Regulations, February 2010,** requiring licensees to make DSM as the part of day-to-day operations, with program investments to be "cost-effective" to both

licensee and consumer with reduction in overall tariff.

- b) DSM Measures' and Programs Cost Effectiveness Regulations, April 2010:- with an objective of defining specified methods & principles for assessing cost effectiveness of DSM programs & charges recoverable by licensees.

This chapter highlights the ongoing and proposed energy efficiency and DSM measures by the various power distribution licensees in the State along with an estimation of the

anticipated benefits, funding requirement, action plan and support required for the same.

8.2 MSEDCL

MSEDCL has proactively adopted DSM measures to reduce the peak load demand in the State. On Supply Side/ Load Management (SSLM) schemes like GFSS and SPP etc. having more than 7,000 MW potential of peak load reduction have been successfully implemented at wide scale over the last decade. The SSLM/ DSM/ EE initiatives already implemented by MSEDCL are summarized in Table 72:

Table 72: SSLM/ DSM/ EE Schemes Implemented by MSEDCL

Sl.	Project name	Phasing	Description	Estimated Benefits
1	GFSS	2006-15	Segregation of Agricultural and Village load by erecting new infrastructure.	Load relief of 5,209 MW
2	SPP	2005-15	Replacement of 3 phase transformers with 3 single phase transformers in villages, enabling single phase supply for villages during agriculture load shedding period.	Load relief of 1,875 MW
3	Fixed L.T. Capacitor	2010-13	23,153 Capacitors of 25 kVAR and 22,161 of 30 kVAR LT Capacitors were installed	Annual energy savings of 209.31 MU
4	Retro-fitting of 5 Star energy efficient ceiling fans project	2012-13	Replacement of 4,998 old fans with 5 star energy efficient ones in section offices and substations.	Annual energy saving of 0.408 MU
5	Ag DSM Project	2010-12	Replacement of 2,209 agricultural pumps in Solapur district with 5 star rated pumps	Annual energy saving of 6.19 MU
6	Public Building HVAC EE Program (Supported by EESL)	2014-15	Replacement of fans (20,000), AC/ chillers (15) and retrofitting of large AC/ chillers (15) with energy efficient ones under Heating, Ventilation and Air Conditioning (HVAC) EE Program in Public Buildings. The program was implemented with a budget of Rs. 2.18 crores.	Annual saving of 4.49 MU

MSEDCL has developed the following action plan for propagating DSM/ EE initiatives in coordination/ collaboration with EESL and BEE:

- a) **DELP (Domestic Efficient Lighting Program):** Replacement of 60 watt incandescent lamps and/ or 14 watt CFL lamps by 7 watt LED bulbs with a much longer life. The broad outline of the DELP program is provided in Figure 25.

Figure 25: MSEDCL DELP Program

Coverage
<ul style="list-style-type: none"> • 3.36 to 7 Crore LEDs to be offered, considering 2 to 4 LED bulbs to 1.75 Cr. consumer.
Scheme
<ul style="list-style-type: none"> • To provide two LEDs of 7 W to each participating consumer • Consumers will have to make upfront payment of Rs 10/- and balance to be recovered from electricity bills in 12 equal instalments
Benefits
<ul style="list-style-type: none"> • Annual savings of 750 MU which may save Rs 259.3 Cr.

MERC has accorded approval to MSEDCL's DELP for LED bulbs. Under this program nearly 3.36 Crore LEDs (extendable up to 7 crore) will be offered to domestic consumers. The Estimated cost of DELP for 3.86 crore bulbs is Rs. 553.96 Cr. which is proposed to be recovered from Consumers in installments. The scheme will help in annual saving of around 750 MU Of energy. It is interesting to note that nearly 5 Lac LED bulbs have already been distributed, as on August 15, 2015.

b) HVAC Program:

- b.1. Replacement of old fans with EE fans in five District Hospitals in Akola, Nagpur, Nasik, Ratnagiri and Amaravati, energy audit for which has already been completed.
- b.2. EESL has proposed energy efficient Ceiling Fan DSM program for

MSEDCL, with a scope of 8.6 Lakh 5 star Rated ceiling fans

- b.3. Replacement of chillers in 13 identified public buildings with total capacity of 1500 TR
- b.4. Analysis of feeder loading data for analysis of loading/ consumption pattern and assessment of potential for energy savings through replacement/ retrofits with EE alternatives. The scale of the DELP implementation proposed by MSEDCL/ EESL for the State of Maharashtra is yet to be finalized.
- c) MSEDCL has taken initiative of solar pumps with a target of 5 Lakh solar water pumps for agriculture consumers. The first program of installation of 10,000 solar water pumps have been initiated.
- d) A pilot AgDSM project in Solapur has been implemented, as detailed below. Furthering of the AgDSM is presently underway.

Solapur AgDSM pilot project

In an effort to demonstrate the benefits of DSM in agricultural sector, a pilot project on PPP mode has been implemented in Solapur Circle of Maharashtra. The project was being implemented under an annuity plus shared saving based ESCO model. Under this model, the ESCO makes the required initial capital investment and also maintain the pump-sets for a period of 5 years. The ESCO recovers its capital investment in 5 yearly installments and also gets share of 30% in the energy savings achieved. A snapshot of pilot project has been provided in Table 75.

8.3 R-Infra

R-Infra has estimated the potential for reduction of peak demand through adoption of various DSM measures at 55 MW from Residential/ Domestic consumers and 185 MW from Commercial consumers. This translates in an annual saving of 290 MUs and 557 MUs from

the residential and commercial categories, respectively.

R-infra has proposed the EE plan outlined in Table 74 which would be taken up after due regulatory approvals regarding recovery of charge.

8.4 BEST

BEST has initiated a program of replacement of Fluorescent Tube Lights (FTL) with energy efficiency T-5 FTLs and conventional ceiling fans with EE ceiling fans since 2003. The following progress achieved so far on these initiatives is provided in Table 76.

BEST's yearly EE/ DSM action plan and fund requirement for the period FY16 to FY19 on EE/ DSM measures are shown in Table 68.

Table 73: BEST: Progress on Ongoing EE/ DSM Schemes

Sl.	Project Scope	Progress Achieved	Load Reduction Achieved
1	Replacement of FTLs with EE T-5 FTLs	18,357 (Target: 25,000)	308.34
2	Pilot DSM program for HVAC loads	4,786 (Target: 5,000)	80.4

8.5 TPC

TPC has estimated the potential for reduction of 25 MW to 50 MW in peak demand from implementation of various EE/ DSM measures in its supply area. The list of EE/ DSM interventions evaluated by TPC includes thermal storage, demand response, EE appliance replacement/ exchange programs, energy audit etc.

Proposed action plan and fund requirement for the EE/ DSM initiatives by TPC for the period FY15 to FY19 are shown in Table 77.

Table 74: R-Infra: Action Plan & Fund Requirement

Description	Units	Y1	Y2	Y3	Total
Action Plan					
EE Fan: Replacement of old fans with 5 star rated ceiling fans	Numbers	18,000	18,000	14,000	50,000
EE Fridge: Replacement of old refrigerators with 5 star rated refrigerators	Numbers	7,000	7,000	6,000	20,000
Investment Requirement	Rs. Crores	4.23	4.23	3.54	12.00

Table 75: MSEDCL – AgDSM Project

Key Features

- MSEDCL appointed an Implementing agency (AgIA) to install 5 star rated energy efficient pump-sets, dismantle and dispose-off the old pump-sets to prevent their further use or installation.
- ESCO/ AgIA to provide O&M for 5 years after installation of pump-sets.
- An annual performance check of 10% of total pump-sets installed for 5 years by an independent M&V agency.
- AgIA entered into ownership agreements with farmers and provided a copy to MSEDCL.
- AgIA organized awareness sessions for farmers on proper use and O&M of new pump sets.
- The energy saved during the period shared between AgIA (30%) and MSEDCL (70%).

Key results

- A total of 2,209 pump-sets installed in five villages
- The total energy savings achieved are estimated to be 40.21%.

Key Issues

- Ownership issues related to verification process, change in ownership and multiple owners.
- Farmer's reluctance to enter into an agreements and have their pump HP ratings reduced. Nearly 25% farmers had relatively new pump-set, less than five years old. Also, farmers show reluctance to give back the old pump-set
- Farmers fear that metering of the pumps power consumption will be later billed to them.
- Location of pump-sets in terms of terrain and frequent shift in locations of pump-sets at the river bed.
- Low voltage issues, voltage and water level variations at several installations.
- Significant cost overrun due to replacement of pump-set accessories and replacement of very old and rusted GI pipes used and lower diameter pipe used in bore-wells.

Table 76: BEST - EE/ DSM Plan: Action Plan & Fund Requirement

Description	Units	FY16	FY17	FY18	FY19
Action Plan					
60 watt incandescent lamps and 14 watt CFL lamps with 7 watt LED lamps Replacements	Numbers	5,00,000	5,00,000	5,00,000	5,00,000
EE Ceiling Fan Replacements	Numbers	15,000	15,000	15,000	15,000
Investment Requirement	Rs. Crores	4.00	4.00	4.00	4.00

Table 77: TPC-D - EE/ DSM Plan: Action Plan & Fund Requirement

Description	FY15	FY16	FY17	FY18	FY19
Action Plan					
Year Wise Action/ Interventions	Fan, AC, Energy Audit	DR, Thermal Storage, Energy Audits, LED	DELP, AC, Refrigerator, Ceiling fan, DR, LED tube etc.	Large scale appliance exchange programs, Load shift programs and Audit services; Programs with EESL	Large scale appliance exchange programs, Load shift programs and Audit services; Programs with EESL
Investment Requirement (Rs. Crores)	3.00	5.00	7.00	8.00	10.00

8.6 Fund Requirement

MERC has introduced the concept of Load Management Charge (LMC) and Load Management Rebate (LMR) in electricity tariff to give economic signals to consumers for inculcating the habit of energy conservation. The various investment requirements proposed by the utilities in the State for EE/ DSM interventions are funded by the corpus created through the LMC imposed on consumers, with due approval from the MERC.

The MuDSM PSL EE program supported by the EESL is self-financed by the respective municipal bodies or are planned under a shared saving ESCO model for LED street light for all 6 major urban local bodies and 120 municipal councils. It is expected that with replacement of around 9 Lac street lights with LED fixtures, there will a guaranteed energy savings of about 50% and peak load reduction of about 400 MW across the State.

9. Financial Position

9.1 Introduction

Amongst the four distribution utilities in the State, MSEDCL will have the most vital role in PFA as the other utilities in Mumbai City and its suburbs have already been supplying 24X7 power to their consumers. Therefore, this section focuses on analyzing the existing financial position and assessing the impact of cost related to PFA Program, on the financial position of MSEDCL in future.

MSEDCL has been rated as “A” by ICRA, indicating “High Operational and Financial Performance Capability”. This is based from the past performance of the utility, wherein it has achieved steady reduction in AT&C losses and has implemented various operational performance improvement measures. It is worthwhile to note that MSEDCL is the first utility in the country to have successfully implemented the distribution franchisee model in Bhiwandi and which is also implemented in Jalgaon, Aurangabad and Nagpur since May 2011.

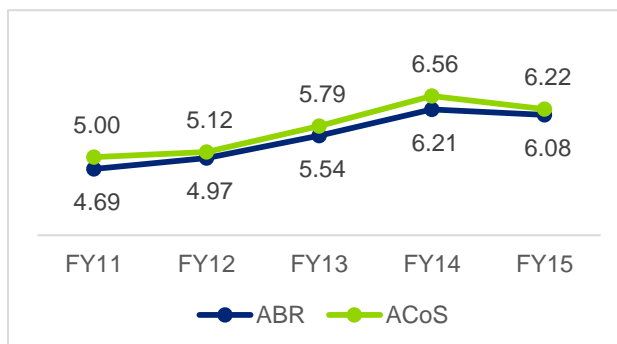
9.2 Commercial and operational performance

The commercial viability of power sector largely depends on the performance of the distribution utilities as the cash flow of the transmission and generation utilities ultimately depend on its technical and commercial performance.

One of the measures of commercial viability is the gap between the Average Cost of Supply

(ACS) and Average Billing Rate (ABR). In case of MSEDCL, as can be seen in Figure 26, the ACS and ABR have moved in tandem with each other but there is a gap that exists. The gap between ACS and ABR has increased from Rs. 0.31/kWh in FY11 to Rs.0.14/kWh in FY15. This shows that the tariff realized is not sufficient to

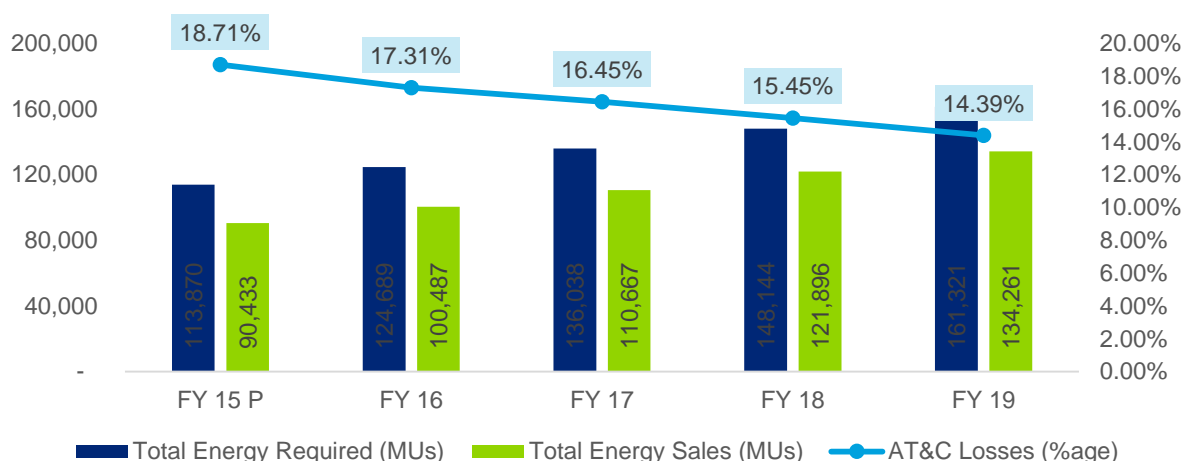
Figure 26: ACS vs ABR (based On MSEDCL data)



match the cost of supply of electricity. The unrecovered gap or delay in recovery of gap has adversely affected the working capital position of MSEDCL.

In order to bridge the gap between revenue and expenditure and to service interest on borrowing, MSEDCL has to avail short-term loans. Further, the time lag in tariff revisions leads to increase in working capital requirement which in turn leads to additional burden due to interest on additional short-term borrowings. However, MERC approves the interest on working capital based on regulatory norms only, resulting in widening of the gap between ACS and ABR.

Figure 27: Energy input Vs Sold and AT&C losses



The operational performance of MSEDCL has improved significantly, with T&D losses declining from 31% in FY07 to 14.17% in FY15. With the efforts of utility, a strong improvement has been witnessed in the collection efficiency, increasing from 82.96% in FY07 to nearly 97.5% in FY15. The utility has made concerted efforts towards transforming itself into a consumer service oriented utility. It has taken several measures, such as opening of Consumer Facilitation Centers (CFCs) and 24X7 customer call centers.

The energy handled by MSEDCL has increased from 90,341 MU in FY11 to 113,870 MU in FY15, signifying a YoY growth of nearly 6%. Going forward, during the period from FY16 to FY19, owing to significant planned electrification, the volume of energy handled is expected to grow from the level of 1,13,870 MU in FY15 to 1,61,321 MUs in FY19, as depicted in Figure 27. As the energy handled increases, the T&D loss levels approved and achieved will be key factors in ensuring commercial viability of the utility and any under achievement of the same will lead to incremental financial burden on the utility.

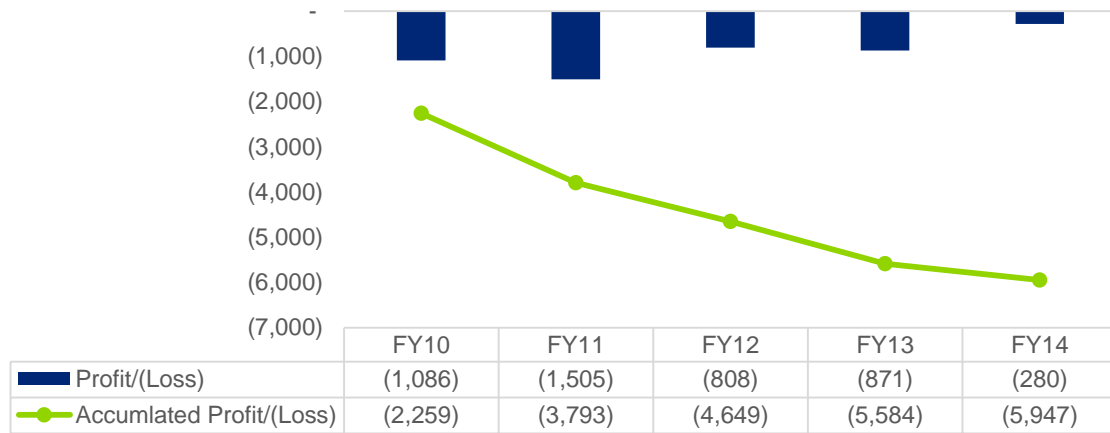
9.3 Present Financial Performance

Over the last few years, MSEDCL's financial performance has improved owing to a significant increase in revenue growing at a CAGR of 14.1% from FY08 to FY14 and

reduction in AT&C losses. However, it was during FY08 that MSEDCL had last booked profit of Rs.117 Cr. Despite a healthy mix of consumers, with the share of industrial consumption accounting for 36.6% of its energy sold in FY15, the utility has been making financial losses since last 8 years. Although the quantum of annual losses has declined, the accumulated losses have increased to Rs.5,947 Cr. in FY14, as can be seen in Figure 28.

The increase in losses is not only attributable to a significant increase in power purchase cost, employee and R&M expenses, but regulatory disallowances on extra ordinary items under the head 'other expenses', such as writing off of bad debts, have also bloated the accumulated losses. It may be noted that during FY14 only the utility has written off bad debts to the tune of Rs 2,254 Crore. In order to assess the impact of PFA program on financial performance of the utility, such extraordinary items have not been considered, as discussed in details in the following sub-section.

Figure 28: Financial Losses (in Cr.)



9.4 Financial Projections

In order to estimate the impact of PFA program on the financials of a utility, it is pertinent to assess the incidental cost of the program vis-à-vis the potential of generating additional revenue due increase in energy sales. As the utility progresses on achieving reduction in

AT&C losses, the gap between average cost of supply and average realization is expected to shrink. In line with above, an analysis has been carried out to assess the cost impact of PFA program on tariff as well as financials of the utility. Table 78 presents the assumptions which form the basis for such projections.

Table 78: Key Common Assumptions underlying financial analysis

Particulars	Assumptions
Power purchase	<ul style="list-style-type: none"> The firm allocation from the Central Generating Stations shall remain stable at current levels (July 2015) over the period of projection (FY 16 to FY19) Generation from MSPGCL plants based on targets for FY16 as per MERC order, with YoY improvement of 1% to 5% in PLF for future years Commissioning of new plants in State sector assumed as per State's projections Commissioning of new plants of central sector as per CEA's monitoring reports Transmission charges for FY16 is considered to be Rs. 0.32/kWh, based on charges approved by State commission, included in power purchase cost Transmission charges for projection period also include the impact of cost related to additional capital expenditure, projected to be incurred by the transmission utility
Power Purchase Rate	<ul style="list-style-type: none"> The present stations have been projected at current PP Rate as per the tariff petition of MSDECL New power stations are projected at Rs. 4.5/kWh In case of energy shortfall, short term power purchase rate Rs. 4.01/kWh and medium term power purchase rate Rs. 4.25/kWh has been considered Allocation from un-allocated capacity of CGS has not been considered
Surplus power purchase and sale	<ul style="list-style-type: none"> Power available beyond the requirement has been considered to be sold outside State at the rate of 3.48/kWh as approved by state commission. A separate scenario has been prepared to assess the impact of power purchase portfolio optimization, whereby surplus power is not considered to be purchased.
Revenue and Sales growth	<ul style="list-style-type: none"> Revenue calculations based on average billing rate approved by commission for FY16 for domestic, BPL and other than domestic & BPL consumers Sales growth of domestic consumer and BPL consumers is as per projections in Power Supply Scenario (Chapter 3)

Particulars	Assumptions															
	<ul style="list-style-type: none">Energy sales growth of other than domestic consumers is 10% (YoY)															
Losses (%)	<ul style="list-style-type: none">Losses projections as per following trajectory:<table><tr><th>Particulars</th><th>FY16</th><th>FY17</th><th>FY18</th><th>FY19</th></tr><tr><td>AT&C Loss (%)</td><td>17.31%</td><td>16.45%</td><td>15.45%</td><td>14.39%</td></tr><tr><td>Intra-state transmission loss</td><td>4.0%</td><td>4.0%</td><td>4.0%</td><td>4.0%</td></tr></table>Collection efficiency trajectory, as provided by the utility, expected to reach 98.75% by FY19	Particulars	FY16	FY17	FY18	FY19	AT&C Loss (%)	17.31%	16.45%	15.45%	14.39%	Intra-state transmission loss	4.0%	4.0%	4.0%	4.0%
Particulars	FY16	FY17	FY18	FY19												
AT&C Loss (%)	17.31%	16.45%	15.45%	14.39%												
Intra-state transmission loss	4.0%	4.0%	4.0%	4.0%												
Capex & capitalization	<ul style="list-style-type: none">Capex as per budgeted plans and requirement to fulfill PFA targets of MSEDCLCapitalization based on capitalization plan provided by MSEDCL															
Employee cost, R&M, A&G costs	<ul style="list-style-type: none">Employee cost: Based on employee cost for FY15 with escalation of 10% YoY over the period of projection (FY 16 to FY19) considering the CPI.A&G cost: Based on A&G cost for FY15 with escalation of 6% p.a over the period of projection (FY 16 to FY19)R&M cost:<ul style="list-style-type: none">For existing assets: Based on the actual R&M cost as percentage of GFA (Past 2 years Average has been considered)For New Assets – 1% of GFA															
Depreciation	<ul style="list-style-type: none">For existing assets: Based on the existing rate of depreciationFor new assets: Based on MERC rate of 5.28%p.a.															
Funding of capital expenditure and financing terms	<ul style="list-style-type: none">Capital expenditure to be funded through grant, debt & equity based on schemes under which it has been proposed.Under DDUGJY and IPDS, the ratio of grant debt and equity is 75%, 10% and 15%, whereby 60% grants out of 75% would be available in the same year while additional 15% after 2 years, utilized towards retiring debtUnapproved capital expenditure under proposed schemes to be funded through debt equity in the ratio of 70:30.For other ongoing schemes, funding is based on the tied up debt, equity and envisaged grant portion. For any untied expenditure, debt and equity in the ratio of 70:30 has been considered.Repayment schedule of 10 yearsInterest on existing debt is considered to be based on weighted average existing interest rate, estimate to be 12.5%Interest on new debt considered to be 12%, considering the present rating of MSEDCL and corresponding lending rates of PFC.Debt to Equity ratio assumed at 70:30 under no grants scenario, only for schemes under which funds have already not been tied up, such as DDUGJY and IPDS															
Working capital and cash deficit loan	<ul style="list-style-type: none">Working capital as per regulatory provisionsWorking capital loan assumed at 13.5% (Bank Base rate + 350bps)Cash deficit during the year is assumed to be funded from short term loan @ 13.5%p.a.															
Other income	<ul style="list-style-type: none">Based on values for FY15 with escalation of 5% YoY over the period of projection (FY 16 to FY19)															
Miscellaneous Expenses	<ul style="list-style-type: none">Rs. 648 Crores considered as per Schedule 27 of Annual Accounts for FY14.For FY 16 to FY 19 miscellaneous expenses considered in proportion to the O&M costOther prior period expenses have not been considered in the financial projections															
Regulatory parameters	<ul style="list-style-type: none">No disallowance in power purchase or any other cost elementNo regulatory assets of past have been considered															

Considering the above assumptions, the impact of PFA program on the overall financial health of the sector can be gauged from the impact on tariff due to incidental power purchase and additional capital expenditure to be incurred by MSEDCL. The details of additional capital expenditure, sources of funding and incidental costs of such expenditure are provided in Table 79.

The State utility has prepared capital expenditure plans according to the need and adequacy of network for achieving the HH electrification and consumption targets set under the 24X7 PFA roadmap for the State. The utility has proposed to fund the capital expenditure plan under various Central and

State Government schemes and support of FIs and multilateral banks. The base case assumes that the funding from State and Central Government schemes in the form of grants will be available but for any non-grant part of the scheme or un-approved part of those schemes, will be arranged by utility by its own funds through the means of borrowings from banks, including NBFCs, commercial and multilateral institutions. The debt to equity ratio is considered to be 70:30, considering that the utility will be able to arrange equity from State government/ its internal sources. In addition to above capital expenditure related cost, other revenue and expenditure related parameters considered for base case are summarized in Table 80.

Table 79: Impact of Asset addition (Rs Cr.)

Particulars	FY 16	FY 17	FY 18	FY 19
Capital expenditure	8,564	6,318	3,376	10,136
Grants	3,392	2,109	1,698	1,048
Debt	4,326	3,475	1,238	6,261
Equity	846	734	441	2,827
Incidental cost of capital expenditure due to PFA				
Depreciation on additional assets	284	977	1,727	1,960
Interest on debt – corresponding to PFA capex	404	757	896	1,157
Return on equity - corresponding to PFA capex	87	209	300	554
Total capex related Cost	774	1,943	2,923	3,670

Table 80: Parameters for base case

Particulars	Units	FY 16	FY 17	FY 18	FY 19
Energy related parameters					
Sales	MUs	100,487	110,667	121,896	134,261
T&D losses	%age	16.05%	15.26%	14.29%	13.31%
AT&C Losses	%age	17.31%	16.45%	15.45%	14.39%
Power purchase cost (inc transmission charges)	Rs./kWh	4.02	4.20	4.25	4.27
Revenue & expenditure parameters					
Tariff Increase	%age	0.00%	0.00%	0.00%	0.00%
Collection efficiency	%age	98.50%	98.60%	98.65%	98.75%
Average billing rate - Domestic	Rs./kWh	5.81	5.81	5.81	5.81
Average billing rate - Other than domestic (weighted avg.)	Rs./kWh	6.11	6.11	6.11	6.11
Employee cost escalation	%age	10.00%	10.00%	10.00%	10.00%
A&G cost escalation	%age	6.00%	6.00%	6.00%	6.00%

Based on the above parameters, the per kWh gap of incidental cost of providing additional power and revenue generated due to increase in energy sales is estimated to assess the impact of PFA program on the tariff in the State, as summarized in Table 81.

The impact on tariff due to PFA capital expenditure is expected to remain in the range of Rs. 0.08/kWh in FY16 to Rs.0.48/kWh in FY18 as can be seen in Table 81. Continuance of reduction in AT&C losses coupled with reduced capital investments and incremental power purchase from new sources are expected to result in a reduced of tariff impact in FY19 vis-à-vis FY18.

The key reason behind the increase in tariff impact is the reduction in overall average realization as the share of domestic category sales increases, but the constituents of ACS,

other than power purchase cost continue to increase. The additional cost on account of capital expenditure accounts for a considerable increase in ACS.

Therefore, in the base case, the financial statements of MSEDCL have been prepared considering that the per unit power purchase cost and tariff shall remain at the present levels, while the impact of other incidental cost is accounted.

As can be seen in the P&L statement in Table 82, the incremental cost due to PFA program may adversely impact the financial position of the utility. The financial losses are likely to increase from Rs. 251 Cr. in FY16 to Rs. 5,373 Cr. in FY19, as the recovery is not expected to be adequate enough to cover the power purchase cost and incidental PFA program cost.

Table 81: Impact on tariff due to PFA

Particulars	Derivation	FY16	FY17	FY18	FY19
Additional recovery due to incremental energy sales (Rs. Cr.)	A	10,070	22,287	29,822	35,460
Incremental power purchase cost (inc. transmission charges and incremental transmission cost due to PFA program (Rs. Cr.)	B	9,314	23,653	30,692	34,577
Add: Cost related to capital expenditure (interest, depreciation and equity return, Rs. Cr.)	B1	937	1,943	2,923	3,670
Add: Incremental O&M cost & Working capital cost		614	1,248	2,006	2,891
Gap of additional cost and additional recovery	C=(B+B1-A)	796	4,556	5,800	5,678
Energy sales (MU)	D	100,487	110,667	121,896	134,261
Cumulative Impact on tariff (Rs./kWh)		0.08	0.41	0.48	0.42

Table 82: Projected profit and loss statement – Base Case (Rs. Cr.)

Profit and Loss statement		Units	Projected			
			FY16	FY17	FY18	FY19
Revenue						
	Revenue from Sale of Power	Rs. Cr.	60,595	66,641	73,304	80,642
	Others	Rs. Cr.	5,964	12,225	13,193	11,592
	Total revenue	Rs. Cr.	66,559	78,867	86,497	92,235
Expenditure						
	Power Purchase cost	Rs. Cr.	54,742	69,080	76,120	80,005
	O&M Cost	Rs. Cr.	6,860	7,505	8,181	8,929

Profit and Loss statement		Units	Projected			
			FY16	FY17	FY18	FY19
	Employee cost	Rs. Cr.	5,317	5,849	6,434	7,077
	A&G expenses	Rs. Cr.	606	643	681	722
	R&M expenses	Rs. Cr.	937	1,013	1,066	1,130
	EBIDTA	Rs. Cr.	4,958	2,282	2,197	3,302
	Depreciation	Rs. Cr.	1,960	2,237	2,406	2,716
	Interest and finance charges	Rs. Cr.	3,249	3,913	4,785	5,958
	Miscellaneous	Rs. Cr.	-	-	-	-
	PBT	Rs. Cr.	(251)	(3,868)	(4,995)	(5,373)
	Provision for tax	Rs. Cr.	-	-	-	-
	PAT	Rs. Cr.	(251)	(3,868)	(4,995)	(5,373)

The projected cash flow statement till FY19 is shown in Table 83 and the projected balance sheet is provided in Annexure 5.1

Table 83: Projected cash flow statement – Base Case (Rs. Cr.)

Cash flow statement	FY 16	FY 17	FY 18	FY 19
Cash from Operations				
Revenue	65,650	77,934	85,507	91,227
Operating Costs	(61,602)	(76,585)	(84,300)	(88,933)
Miscellaneous expenses	-	-	-	-
Increase in Short term capital requirements	(269)	84	(614)	(1,012)
Tax	-	-	-	-
Net Cash from Operations	3,780	1,433	593	1,282
Cash from Investment Activities				
Capex	(8,564)	(6,318)	(3,376)	(10,136)
Net Cash from Investment Activities	(8,564)	(6,318)	(3,376)	(10,136)
Cash from Financing Activities				
Equity Investments	846	734	441	2,827
Debt Drawn	4,326	3,475	1,238	6,261
Loan Repayment	(2,634)	(2,982)	(3,106)	(3,732)
Increase in working capital loan	269	(84)	614	1,012
Payment of past current liabilities	-	-	-	-
Grants	3,392	2,109	1,698	1,048
Interest on cash deficit loan	(279)	(778)	(1,603)	(2,554)
Interest on Loans	(2,084)	(2,262)	(2,226)	(2,312)
Interest on Working Capital Loan	(885)	(874)	(956)	(1,093)
Net Cash from Financing Activities	2,950	(661)	(3,902)	1,458
Net Cash Balances				
Cash BF	(1,152)	(2,986)	(8,532)	(15,216)
Cash Flow during the year	(1,834)	(5,546)	(6,684)	(7,397)
Cash	(2,986)	(8,532)	(15,216)	(22,613)

9.5 Scenario Analysis

Any change in tariff or under achievement of AT&C losses considered for the base case or non-availability of funding in form of grants will translate into additional impact on the financial position of the utility. The impact of existing accumulated losses of MSEDCL or the impact of purchase and sale of surplus power available to MSEDCL also need to be evaluated. Therefore, analysis under following scenarios have been carried out:

1. Increase in tariff to ensure that utility becomes viable by FY19
2. Non-Availability of grants under the schemes where DPRs are not finalized (available only to the extent approved as per DPR) to fund the capital expenditure.
3. Under achievement of AT&C loss targets: Considering same T&D loss level as in FY15, till FY19.
4. Financial turn-around of utility (wiping off the accumulated losses of MSEDCL)
5. Impact of purchase and sale of surplus power

Scenario 1: Increase in tariff required for the utility to become viable

As the existing gap between average cost of supply and average realization is significant, an increase in tariff may be required immediately, which must be over and above any increase in power purchase cost from the existing level. Table 84 summarizes the underlying assumptions.

In order to achieve financial viability by FY19, the utility requires an annual tariff increase of 1.29%, in addition to complete pass through of increase in power purchase cost. The assessed tariff impact is expected to cover the change in power purchase cost due to change in purchase portfolio and the utility will be able to become financially viable having positive PAT (YoY) by FY19. The resultant P&L account under this scenario is presented in Table 85.

Table 84: Parameters for Scenario 1 (Tariff increase)

Particulars	Units	FY 16	FY 17	FY 18	FY 19
Energy related parameters					
Sales	MUs	100,487	110,667	121,896	134,261
T&D losses	%age	16.05%	15.26%	14.29%	13.31%
AT&C Losses	%age	17.31%	16.45%	15.45%	14.39%
Power purchase cost	Rs./kWh	4.02	4.20	4.25	4.27
Revenue & expenditure parameters					
Tariff Increase	%age	1.29%	1.29%	1.29%	1.29%
Collection efficiency	%age	98.50%	98.60%	98.65%	98.75%
Average billing rate - Domestic	Rs./kWh	5.88	5.96	6.04	6.12
Average billing rate - Other than domestic (weighted avg.)	Rs./kWh	6.19	6.27	6.35	6.43
Employee cost escalation	%age	10.00%	10.00%	10.00%	10.00%
A&G cost escalation	%age	6.00%	6.00%	6.00%	6.00%

Table 85: Profit and Loss statement - Scenario 1 (Rs Cr.)

Profit and Loss statement	Units	Projected			
		FY16	FY17	FY18	FY19
Revenue					
Revenue from Sale of Power	Rs. Cr.	61,377	68,372	76,177	84,885
Others	Rs. Cr.	5,964	12,225	13,193	11,592
Total revenue	Rs. Cr.	67,341	80,597	89,370	96,477
Expenditure					
Power Purchase cost	Rs. Cr.	54,742	69,080	76,120	80,005
O&M Cost	Rs. Cr.	6,860	7,505	8,181	8,929
Employee cost	Rs. Cr.	5,317	5,849	6,434	7,077
A&G expenses	Rs. Cr.	606	643	681	722
R&M expenses	Rs. Cr.	937	1,013	1,066	1,130
EBIDTA	Rs. Cr.	5,739	4,012	5,070	7,544
Depreciation	Rs. Cr.	1,960	2,237	2,406	2,716
Interest and finance charges	Rs. Cr.	3,160	3,671	4,207	4,821
Miscellaneous	Rs. Cr.	-	-	-	-
PBT	Rs. Cr.	619	(1,896)	(1,543)	7
Provision for tax	Rs. Cr.	210			
PAT	Rs. Cr.	409	(1,896)	(1,543)	5

The projected cash flow statement till FY19 is shown in Table 86 and projected balance sheet is provide in Annexure 5.2. It can be observed

from the cash flow statement that with 1 % tariff increase, MS&DCL will be able to have positive YoY cash-flows by FY19.

Table 86: Projected cash flow statement – Scenario 1 (Rs. Cr.)

Cash flow statement	FY 16	FY 17	FY 18	FY 19
Cash from Operations				
Revenue	66,420	79,640	88,342	95,416
Operating Costs	(61,602)	(76,585)	(84,300)	(88,933)
Miscellaneous expenses	-	-	-	-
Increase in Short term capital requirements	(281)	(74)	(804)	(1,240)
Tax	(210)	-	-	(2)
Net Cash from Operations	4,327	2,981	3,238	5,241
Cash from Investment Activities				
Capex	(8,564)	(6,318)	(3,376)	(10,136)
Net Cash from Investment Activities	(8,564)	(6,318)	(3,376)	(10,136)
Cash from Financing Activities				
Equity Investments	846	734	441	2,827
Debt Drawn	4,326	3,475	1,238	6,261
Loan Repayment	(2,634)	(2,982)	(3,106)	(3,732)
Increase in working capital loan	281	74	804	1,240
Payment of past current liabilities	-	-	-	-
Grants	3,392	2,109	1,698	1,048
Interest on cash deficit loan	(174)	(496)	(960)	(1,321)

Cash flow statement	FY 16	FY 17	FY 18	FY 19
Interest on Loans	(2,084)	(2,262)	(2,226)	(2,312)
Interest on Working Capital Loan	(903)	(913)	(1,021)	(1,189)
Net Cash from Financing Activities	3,050	(261)	(3,133)	2,823
Net Cash Balances				
Cash BF	(692)	(1,879)	(5,476)	(8,747)
Cash Flow during the year	(1,187)	(3,598)	(3,271)	(2,073)
Cash	(1,879)	(5,476)	(8,747)	(10,820)

Scenario 2: Non-Availability of grants (funding of capital expenditure through grants under various government schemes)

The dependence of utility on funding of the proposed investments through various State and Central Government schemes can be assessed by the impact on utility's finances under a scenario where grant funding is not available. Under this scenario, the grant availability for the upcoming Central Government schemes including IPDS and DDUGJY, where the DPRs have not been

finalized, has been considered to be nil. While, for the ongoing schemes where the funds have already been committed by the State or Central Government, the grants are considered to be as envisaged in the respective schemes.

Table 87 on the following page summarizes the key parameters underlying the analysis and the impact on tariff has been detailed in Table 88. The impact of availability of grants for funding the capital expenditure on the financials of MSEDCL, is summarized in Table 89.

Table 87: Parameters for Scenario 2 (Non-Availability of grants)

Particulars	Units	FY 16	FY 17	FY 18	FY 19
Energy related parameters					
Sales	MUs	100,487	110,667	121,896	134,261
T&D losses	%age	16.05%	15.26%	14.29%	13.31%
AT&C Losses	%age	17.31%	16.45%	15.45%	14.39%
Power purchase cost	Rs./kWh	4.02	4.20	4.25	4.27
Revenue & expenditure parameters					
Tariff Increase	%age	0.00%	0.00%	0.00%	0.00%
Collection efficiency	%age	98.50%	98.60%	98.65%	98.75%
Average billing rate - Domestic	Rs./kWh	5.81	5.81	5.81	5.81
Average billing rate - Other than domestic (weighted avg.)	Rs./kWh	6.11	6.11	6.11	6.11
Employee cost escalation	%age	10.00%	10.00%	10.00%	10.00%
A&G cost escalation	%age	6.00%	6.00%	6.00%	6.00%

Table 88: Impact on tariff due to PFA – Scenario 2

Particulars	Derivation	FY 16	FY 17	FY 18	FY 19
Additional recovery due to incremental energy sales (Rs. Cr.)	A	10,070	22,287	29,822	35,460

Particulars	Derivation	FY 16	FY 17	FY 18	FY 19
Incremental power purchase cost (inc. transmission charges and incremental transmission cost due to PFA program (Rs. Cr.)	B	9,314	23,653	30,692	34,577
Add: Cost related to capital expenditure (interest, depreciation and equity return, Rs. Cr.)	B1	851	2,206	3,425	4,285
Add: Incremental O&M cost & Working capital cost	B2	615	1,249	2,009	2,895
Gap of additional cost and additional recovery	C=(B+B1+B2-A)	710	4,822	6,305	6,297
Energy sales (MU)	D	100,487	110,667	121,896	134,261
Cumulative Impact on tariff (Rs./kWh)		0.07	0.44	0.52	0.47

As can be seen in Table 88, the impact on tariff is expected to increase due to non-availability of grants to fund the capital expenditure. The tariff impact for in such scenario is estimated to range between Rs.0.07/kWh to Rs.0.52/kWh as against the range of Rs.0.08/kWh to Rs.0.48/kWh in base case scenario. The impact is increasing only in FY18, as the grant portion of funds under DDUGJY and IPDS becomes available to utility only 2 years from the capital expenditure incurred.

Further, the burden of arranging the funds for capital expenditure in form of commercial borrowings and equity contribution increases, the financial position of utility is likely to see an adverse impact.

Table 88 presents the projected profit and loss statement of MSEDCL under this scenario.

Table 89.

Table 89: Profit and Loss statement - Scenario 2 (Rs. Cr.)

Profit and Loss statement		Units	Projected			
			FY16	FY17	FY18	FY19
Revenue						
	Revenue from Sale of Power	Rs. Cr.	60,595	66,641	73,304	80,642
	Others	Rs. Cr.	5,964	12,225	13,193	11,592
	Total revenue	Rs. Cr.	66,559	78,867	86,497	92,235
Expenditure						
	Power Purchase cost	Rs. Cr.	54,742	69,080	76,120	80,005
	O&M Cost	Rs. Cr.	6,860	7,505	8,181	8,929
	Employee cost	Rs. Cr.	5,317	5,849	6,434	7,077
	A&G expenses	Rs. Cr.	606	643	681	722
	R&M expenses	Rs. Cr.	937	1,013	1,066	1,130
	EBIDTA	Rs. Cr.	4,958	2,282	2,197	3,302
	Depreciation	Rs. Cr.	1,987	2,307	2,532	2,855
	Interest and finance charges	Rs. Cr.	3,284	4,025	4,998	6,278
	Miscellaneous	Rs. Cr.	-	-	-	-
	PBT	Rs. Cr.	(313)	(4,050)	(5,334)	(5,832)
	Provision for tax	Rs. Cr.	-	-	-	-
	PAT	Rs. Cr.	(313)	(4,050)	(5,334)	(5,832)

As can be seen above, the annual financial losses of MSEDCL are expected to increase to Rs. 5,832 Cr. in FY19 as against Rs.5,373 Cr. under the base case.

Further, as the utility's cost of funding declines due to availability of grants, the required tariff

increase to achieve the financial viability is likely to increase to 1.40% p.a. as against 1.29% tariff increase required in base case.

The projected cash flow statement till FY19 is shown in Table 90 is provided in Annexure 5.3.

Table 90: Projected cash flow statement – Scenario 2 (Rs. Cr.)

Cash flow statement	FY 16	FY 17	FY 18	FY 19
Cash from Operations				
Revenue	65,650	77,934	85,507	91,227
Operating Costs	(61,602)	(76,585)	(84,300)	(88,933)
Miscellaneous expenses	-	-	-	-
Increase in Short term capital requirements	(273)	76	(623)	(1,019)
Tax	-	-	-	-
Net Cash from Operations	3,776	1,425	584	1,274
Cash from Investment Activities				
Capex	(8,564)	(6,318)	(3,376)	(10,136)
Net Cash from Investment Activities	(8,564)	(6,318)	(3,376)	(10,136)
Cash from Financing Activities				
Equity Investments	1,113	1,001	708	2,916
Debt Drawn	4,860	4,009	1,972	6,639
Loan Repayment	(2,688)	(3,089)	(3,286)	(3,950)
Increase in working capital loan	273	(76)	623	1,019
Payment of past current liabilities	-	-	-	-
Grants	2,591	1,308	696	581
Interest on cash deficit loan	(285)	(804)	(1,671)	(2,684)
Interest on Loans	(2,113)	(2,345)	(2,368)	(2,497)
Interest on Working Capital Loan	(886)	(875)	(959)	(1,097)
Net Cash from Financing Activities	2,865	(871)	(4,286)	927
Net Cash Balances				
Cash BF	(1,152)	(3,075)	(8,840)	(15,917)
Cash Flow during the year	(1,923)	(5,765)	(7,078)	(7,935)
Cash	(3,075)	(8,840)	(15,917)	(23,852)

Scenario 3: Under achievement of AT&C loss reduction trajectory

One of the key assumptions in the base case analysis, scenario 1 and scenario 2 is the achievement of AT&C loss trajectory by the utility. However, in case the utility misses T&D loss reduction and it remains at the level of FY15 i.e. 16.63% till FY19, the impact on

financial position is going to be significant. The Table 91 summarizes the key parameters underlying the analysis in scenario 3.

The impact on tariff is expected to increase further and is expected to be in the range of Rs.0.09/kWh to Rs.0.60/kWh, as against Rs.0.08/kWh to Rs.0.48/kWh under the base

case. Due to additional cost and under-achievement of T&D loss trajectory there is an adverse impact on the financials of the utility, as presented in Table 92. As can be seen in

Table 93, the annual financial losses of utility are expected to increase to nearly Rs.8,326 Cr. in FY 19 vis-à-vis Rs. 5,373 Cr. in FY19 under base case, thus emphasizing the need for focusing on reduction in AT&C losses.

It may also be important to note that in this scenario, the funds available as grants under centrally sponsored schemes (IPDS, DDUGJY) are restricted to 60% of project value. Further, the cost of funding increases due to non-availability of additional grants to the tune of 15%.

The required tariff increase to achieve the financial viability is likely to increase to 1.98% p.a. as against 1.29% tariff increase required in base case.

Table 91: Parameters for Scenario 3 (Under-achievement of T&D losses)

Particulars	Units	FY 16	FY 17	FY 18	FY 19
Energy related parameters					
Sales	MUs	100,487	110,667	121,896	134,261
T&D losses	%age	16.63%	16.63%	16.63%	16.63%
AT&C Losses	%age	17.88%	17.79%	17.75%	17.67%
Power purchase cost (inc. transmission charges)	Rs./kWh	4.02	4.20	4.25	4.26
Revenue & expenditure parameters					
Tariff Increase	%age	0.00%	0.00%	0.00%	0.00%
Collection efficiency	%age	98.50%	98.60%	98.65%	98.75%
Average billing rate - Domestic	Rs./kWh	5.81	5.81	5.81	5.81
Average billing rate - Other than domestic (weighted avg.)	Rs./kWh	6.11	6.11	6.11	6.11
Employee cost escalation	%age	10.00%	10.00%	10.00%	10.00%
A&G cost escalation	%age	6.00%	6.00%	6.00%	6.00%

Table 92: Scenario 3: Impact on tariff

Particulars	Derivation	FY 16	FY 17	FY 18	FY 19
Additional recovery due to incremental energy sales (Rs. Cr.)	A	9,759	21,479	28,317	33,132
Incremental power purchase cost (inc. transmission charges and incremental transmission cost due to PFA program (Rs. Cr.)	B	9,314	23,647	30,673	34,540
Add: Cost related to capital expenditure (interest, depreciation and equity return, Rs. Cr.)	B1	774	1,943	2,940	3,717
Add: Incremental O&M cost & Working capital cost	B2	614	1,248	2,007	2,892
Gap of additional cost and additional recovery	C=(B+B1+B2 -A)	944	5,358	7,303	8,017
Energy sales (MU)	D	100,487	110,667	121,896	134,261
Cumulative Impact on tariff (Rs./kWh)		0.09	0.48	0.60	0.60

Table 93: Profit and Loss statement - Scenario 3 (Rs. Cr.)

Profit and Loss statement		Units	Projected			
			FY16	FY17	FY18	FY19
Revenue						
	Revenue from Sale of Power	Rs. Cr.	60,595	66,641	73,304	80,642
	Others	Rs. Cr.	5,653	11,417	11,688	9,264
	Total revenue	Rs. Cr.	66,248	78,059	84,992	89,906
Expenditure						
	Power Purchase cost	Rs. Cr.	54,741	69,073	76,100	79,967
	O&M Cost	Rs. Cr.	6,860	7,505	8,181	8,929
	Employee cost	Rs. Cr.	5,317	5,849	6,434	7,077
	A&G expenses	Rs. Cr.	606	643	681	722
	R&M expenses	Rs. Cr.	937	1,013	1,066	1,130
	EBIDTA	Rs. Cr.	4,647	1,481	712	1,011
	Depreciation	Rs. Cr.	1,960	2,237	2,416	2,734
	Interest and finance charges	Rs. Cr.	3,271	4,019	5,086	6,602
	Miscellaneous	Rs. Cr.	-	-	-	-
	PBT	Rs. Cr.	(584)	(4,775)	(6,790)	(8,326)
	Provision for tax	Rs. Cr.	-	-	-	-
	PAT	Rs. Cr.	(584)	(4,775)	(6,790)	(8,326)

The projected cash flow statement till FY19 is shown in Table 94 and in Annexure 5.4:

Table 94: Projected cash flow statement – Scenario 3 (Rs. Cr.)

Cash flow statement	FY 16	FY 17	FY 18	FY 19
Cash from Operations				
Revenue	65,339	77,126	84,002	88,898
Operating Costs	(61,601)	(76,578)	(84,281)	(88,895)
Miscellaneous expenses	-	-	-	-
Increase in Short term capital requirements	(269)	84	(616)	(1,015)
Tax	-	-	-	-
Net Cash from Operations	3,469	632	(894)	(1,012)
Cash from Investment Activities				
Capex	(8,564)	(6,318)	(3,376)	(10,136)
Net Cash from Investment Activities	(8,564)	(6,318)	(3,376)	(10,136)
Cash from Financing Activities				
Equity Investments	846	734	441	2,827
Debt Drawn	4,326	3,475	1,438	6,461
Loan Repayment	(2,634)	(2,982)	(3,126)	(3,772)

Cash flow statement	FY 16	FY 17	FY 18	FY 19
Increase in working capital loan	269	(84)	616	1,015
Payment of past current liabilities	-	-	-	-
Grants	3,392	2,109	1,497	848
Interest on cash deficit loan	(302)	(884)	(1,892)	(3,165)
Interest on Loans	(2,084)	(2,262)	(2,237)	(2,343)
Interest on Working Capital Loan	(885)	(874)	(957)	(1,094)
Net Cash from Financing Activities	2,927	(767)	(4,220)	777
Net Cash Balances				
Cash BF	(1,151)	(3,319)	(9,772)	(18,261)
Cash Flow during the year	(2,167)	(6,453)	(8,489)	(10,372)
Cash CF	(3,319)	(9,772)	(18,261)	(28,633)

Scenario 4: MSEDCL Financial Turn-around (Wiping off the existing accumulated losses)

It has been observed from the past financial statements of MSEDCL, that the existing accumulated losses as on FY14 have reached to Rs.5,974 Cr. As the utility prepares itself to carry out the challenging task of electrifying nearly 18 Lac rural HHs, It would be imperative to strengthen its existing financial position.

A support is envisaged from the State Government to make the financial situation viable. The scenario assumes the existing accumulated losses may be wiped off from the books with a support of matching amount

provided by the State Government. The infusion of funds by the State Government is likely to reduce the debt to the extent of Rs.5,974 Cr., resulting in lower financing costs.

Therefore, this scenario builds up on the base case discussed earlier, and the key parameters remain same as under base case presented in Table 80 and the resultant P&L statement is presented in Table 95.

Table 95: Profit and Loss statement - Scenario 4 (Rs. Cr.)

Profit and Loss statement		Units	Projected			
			FY16	FY17	FY18	FY19
Revenue						
	Revenue from Sale of Power	Rs. Cr.	60,595	66,641	73,304	80,642
	Others	Rs. Cr.	5,964	12,225	13,193	11,592
	Total revenue	Rs. Cr.	66,559	78,867	86,497	92,235
Expenditure						
	Power Purchase cost	Rs. Cr.	54,742	69,080	76,120	80,005
	O&M Cost	Rs. Cr.	6,860	7,505	8,181	8,929
	Employee cost	Rs. Cr.	5,317	5,849	6,434	7,077
	A&G expenses	Rs. Cr.	606	643	681	722
	R&M expenses	Rs. Cr.	937	1,013	1,066	1,130
	EBIDTA	Rs. Cr.	4,958	2,282	2,197	3,302

Profit and Loss statement		Units	FY16	Projected FY17	FY18	FY19
	Depreciation	Rs. Cr.	1,960	2,237	2,406	2,716
	Interest and finance charges	Rs. Cr.	2,947	3,267	4,046	5,112
	Miscellaneous	Rs Cr.	-	-	-	-
	PBT	Rs. Cr.	50	(3,222)	(4,256)	(4,526)
	Provision for tax	Rs. Cr.	17			
	PAT	Rs. Cr.	33	(3,222)	(4,256)	(4,526)

As evident from P&L statement above, the financial losses of MSEDCL are expected to reduce to Rs. 4,526 Cr. in FY19 as against Rs.5,373 Cr. in base case. The accumulated losses for the four years period ending FY19 are estimated to be Rs. 11,972 Cr. against Rs. 14,487 Cr. in base case. The projected cash flow statement and balance sheet are provided in Annexure 5.5.

The tariff hike required for turnaround under this scenario is assessed at 1.10% vis-à-vis 1.29% under the base case.

Scenario 5: Impact of Power Purchase Portfolio Management

Another key issue that has been observed while preparing the PFA Roadmap, is likelihood of availability of surplus tied up generation capacity, as significant new inter and intra state generation capacities get commissioned. In the medium term the surplus energy available with MSEDCL has been projected to be high, as detailed in Table 96.

Under this scenario it has been considered that MSEDCL will optimize its power purchase portfolio with such a mix of long, medium and short-term power purchase that there is no surplus available. The total power purchase is equal to power required by the utility, thus leaving no surplus power for sale outside the State.

The other key parameters underlying the analysis remains same as in base case, detailed out in Table 80.

As there is no surplus energy being sold at a rate lower than the average power purchase rate, the impact on tariff is expected to decrease to be in range of Rs.0.02/kWh to Rs.0.33/kWh as against Rs. 0.08/kWh to Rs.0.48/kWh in base case. It is interesting to note that the YoY tariff increase required for the turn-around under this scenario is only 0.75% as against 1.29% required under the base case. The impact on tariff has been detailed in Table 96, while the profit and loss statement is presented in Table 97.

Table 96: Energy surplus and Rate of sale and purchase of power

Particulars	Units	FY 16	FY 17	FY 18	FY 19
Energy required (At state periphery)	MU	124,689	136,038	148,144	161,321
Energy available (At State periphery)	MU	136,153	164,524	179,038	187,525
Surplus power - to be sold outside state	MU	11,941	29,673	32,181	27,296
Average power purchase cost (Inc. transmission charges)	Rs/kWh	4.02	4.20	4.25	4.27
Average rate of sale of power outside state	Rs/kWh	3.48	3.48	3.48	3.48

Table 97: Impact on tariff - Scenario 5

Particulars	Derivation	FY 16	FY 17	FY 18	FY 19
Additional recovery due to incremental energy sales (Rs. Cr.)	A	5,914	11,961	18,623	25,962
Incremental power purchase cost (inc. transmission charges and incremental transmission cost due to PFA program (Rs. Cr.)	B	4,705	11,692	17,557	23,398
Add: Cost related to capital expenditure (interest, depreciation and equity return, Rs. Cr.)	B1	774	1,943	2,923	3,670
Add: Incremental O&M Cost and Working capital cost	B2	666	1,382	2,154	3,017
Gap of additional cost and additional recovery	C=(B+B1+B2-A)	232	3,056	4,012	4,124
Energy sales (MU)	D	100,487	110,667	121,896	134,261
Cumulative Impact on tariff (Rs./kWh)		0.02	0.28	0.33	0.31

Table 98: Profit and Loss statement - Scenario 5 (Rs. Cr.)

Profit and Loss statement		Units	Projected			
			FY16	FY17	FY18	FY19
Revenue						
	Revenue from Sale of Power	Rs. Cr.	60,595	66,641	73,304	80,642
	Others	Rs. Cr.	1,809	1,899	1,994	2,094
	Total revenue	Rs. Cr.	62,404	68,540	75,298	82,736
Expenditure						
	Power Purchase cost	Rs. Cr.	50,133	57,119	62,985	68,825
	O&M Cost	Rs. Cr.	6,860	7,505	8,181	8,929
	Employee cost	Rs. Cr.	5,317	5,849	6,434	7,077
	A&G expenses	Rs. Cr.	606	643	681	722
	R&M expenses	Rs. Cr.	937	1,013	1,066	1,130
	EBIDTA	Rs. Cr.	5,411	3,916	4,132	4,982
	Depreciation	Rs. Cr.	1,960	2,237	2,406	2,716
	Interest and finance charges	Rs. Cr.	3,276	3,886	4,510	5,358
	Miscellaneous	Rs. Cr.	-	-	-	-
	PBT	Rs. Cr.	175	(2,207)	(2,784)	(3,092)
	Provision for tax	Rs. Cr.	60			
	PAT	Rs. Cr.	116	(2,207)	(2,784)	(3,092)

As can be seen in the above P&L statement, the financial losses of MSEDCL are expected to reduce to Rs. 3,092 Cr. in FY19 as against losses of Rs.5,373 Cr. in the base case. The accumulated financial losses for the four year period ending FY19 are expected to decrease to Rs. 7,966 Cr. as against the losses of Rs.14,487 Cr. in base case. The detailed

balance sheet and cash flow statement is provide in Annexure 5.6.

Despite backing down of certain generating units as per merit order being followed presently, MSEDCL is already witnessing significant intra-day surplus of available generation. Such surplus is mostly available for only certain periods during a day which is difficult to predict with the available forecasting

tools. Additionally, due to the prevailing conditions in the market for short-term power, MSEDCL is not able to realize its average power purchase cost for sale of such short-term surplus power.

In context of the above, the following options may be evaluated by MSEDCL:

- Introduce data analytics based state-of-the-art load forecasting tool to realistically day-ahead and intra-day forecasts for scheduling and third party sale.
- Establishment of a trading cell within MSEDCL or empower/ strengthen State Trading Company (MSEPTCPL) to handle available surplus generation;
- Alternatively, evaluate the option of outsourcing of surplus sale management to a third party/ trader on a profit sharing basis;
- Assigning all future allocations from IPPs proposed in the state to the State

Government/ MSEPTCPL unless commensurate requirement is evinced from MSEDCL.

- Opportunities for inter-state banking of power.
- Evaluate options for renegotiation of select PPA's based on merit order stacking and demand forecast.

9.6 Sensitivity – Contingent liabilities of MSEDCL

Presently, MSEDCL is faced with significant contingent liabilities related to certain PPAs that may adversely impact its financial position going forward. These are extra-ordinary factors, which are beyond the control of MSEDCL and will have adverse impact on the financial position of the utility.

Table 99 summarizes such liabilities and impending financial implication.

Table 99: Contingent cost elements for MSEDCL

Issue	Status	Impact
Compensatory tariff on account of Change in Indonesian Coal regulations <ul style="list-style-type: none"> - CGPL - JSW 	<ul style="list-style-type: none"> • CERC approved Rs.0.52/kWh as compensation • Matter subjudice with APTEL 	Rs. 861 Cr.
Compensatory Charges on account of New Coal Distribution Policy and Change in law <ul style="list-style-type: none"> - Rattan India Power - Adani Power 	<ul style="list-style-type: none"> • Matter subjudice – Review petition has been filed with MERC 	Rs.1,352 Cr. + Rs.0.10-0.20/kWh
Compensatory Charges on account of cancellation of coal block or on overall cost <ul style="list-style-type: none"> - Krishnapattnam UMPP - Lanco Teesta 	<ul style="list-style-type: none"> • Krishnapattnam - Matter subjudice with Delhi high Court • Lanco – No adverse order so far but likely impact of Rs. 2.17/kWh 	-

In case the utility has to incur the contingent costs listed in Table 99 and in the matters pending adjudication, if unfavorable order is passed, the likely impact on the power purchase cost is expected to the tune of Rs.0.30/kWh. Such increase in power purchase cost may

either have to be passed through in tariff, or there would be an expected additional financial loss to the extent of Rs.4,365 Cr. (YoY). Therefore, it is important that the financial impact of any such contingent and uncontrollable events may be adequately

considered and provisioned in the tariff proceedings.

9.7 Key issues leading to financial difficulties and recommended mitigation measures

As observed from the past and projected analysis of financial position of MSEDCL, there are several financial and commercial issues which must be addressed. The key financial issues identified and possible mitigation measures are outlined in Table 100.

Table 100: Financial issues and loss mitigation measures

Key Issues	Details	Mitigation measures
Recovery of Arrears	<ul style="list-style-type: none"> Presently arrears to the tune of Rs. 23,230 Cr. as on 31st March 2015. The collection efficiency is nearly 97.5%, which needs to be improved for turnaround of MSEDCL. 	<ul style="list-style-type: none"> Disconnecting the consumers having outstanding payments ABC analysis and Age wise analysis of receivables by suitably segregating them into Pvt/Govt sector, litigation/RR cases etc. and priority to be for consumers with higher arrears; The arrears to be recovered from government institutions and local bodies be recovered by the government from their plan funds. Receivables from the Govt. dept./PSUs may be realised by taking up with the Govt. for additional budgetary allocation of funds Cases held up in litigation to be analyzed based on the probability of collection/settlement through negotiation/out of court settlement. Separation of receivables which are completely bad & steps to be taken to write off Devise schemes for collection by giving incentives such as write off of excess surcharge etc.,
Improvement in Revenue Management	<ul style="list-style-type: none"> Delay and irregularities in billing Erratic consumer billing cycle leading to high impact on receivables 	<ul style="list-style-type: none"> Accurate, reliable and timely billing to promote greater billing transparency and lead to lesser consumption disputes. Promoting automatic collection of accurate and reliable meter reading data, can lead to improvement in cash flow with little or no bad debts or arrears. Pre-paid metering may also be promoted specifically for high value consumers so as to get the revenue in advance and no chances of bad debts. The new HHs proposed to be covered under the electrification rollout plan under the PFA Roadmap may be provided with pre-paid meters to avoid payment default related issues. The same may also be extended to other BPL/ APL HHs with a history of payment defaults. Rationalisation of consumer billing cycle across Maharashtra will help increase in billing demand and assessment.

Key Issues	Details	Mitigation measures
Project Management and execution	<ul style="list-style-type: none"> Significant cost and time overrun in capital expenditure schemes. Planning of schemes with detailed cost benefit analysis is not carried out. 	<ul style="list-style-type: none"> Due diligence of all existing capital expenditure schemes may be done and to assess the achievement against the cost benefit analysis projected at the time of preparation of scheme A dedicated project management team may be constituted to achieve the objective of timely completion and zero cost overrun MSEDCL needs to review the timely implementation and completion of Infrastructure plan. Ensure the Quality Control and regular monitoring of the progress of the projects. A comprehensive planning exercise to formulate plans and strategies to achieve the commitments envisaged under capital expenditure scheme
Working capital management	<ul style="list-style-type: none"> Significantly high working capital requirement against the working capital approved by commission, due to higher receivable months. Piling up of current liabilities and disability to discharge such liability on time result in delay payment charges 	<ul style="list-style-type: none"> Due date of payments of bill by the consumers' needs to be brought out in the same month so that sufficient cash is available to meet the current liabilities. Expanding the prepaid consumer base, as elaborated above.
Accumulated losses and Assistance from State Government	<ul style="list-style-type: none"> An accumulated a deficit of ~Rs. 6,000 Cr and difficult financial situation has resulted into increase in working capital requirements due to number of factors like lower tariff, delayed tariff order and revenue gaps of earlier years pending for true up. 	<ul style="list-style-type: none"> Unless there is full recovery of costs and ROE, there will be support required from Government for carrying out the operation. Assistance from State Government to take care of such current liabilities or write off of arrears or to adjust accumulated losses may be given to MSEDCL to overcome the liquidity issues. Improvement in the financial position of MSEDCL as well as rating from the financial institution resulting in lower debt cost. Assistance may be provided in availing the loan at a lower rate of interest so as to reduce the debt servicing cost The State may consider writing off certain liabilities and loss making cash available against current assets indicated in the finalized opening books of MSEDCL.
Regulatory disallowances	<ul style="list-style-type: none"> Significant disallowances on account of power purchase cost 	<ul style="list-style-type: none"> Need to optimize the power purchase portfolio and cost A change in accounting method under AS-9 may be adopted by MSEDCL, whereby DPS can be

Key Issues	Details	Mitigation measures
	<ul style="list-style-type: none"> Consideration of Delayed Payment Surcharge as income by the Commission 	recognized on the basis of certainty of collection of such amount to avoid unnecessary regulatory disallowances against uncollectible Delay Payment Surcharge imposed on defaulting consumers.

In addition to above, a balancing initiative ensuring low cost power procurement and increased revenue management may be considered by MSEDCL, building on the measures envisaged under the Ujjwal Discom Assurance Yojna (UDAY) scheme. The scheme issued by the GoI emphasizes upon the need to reduce the cost of thermal power by way of coal swaps based on efficiencies of plants and fuel price rationalization based on GCV along with grade slippage correction. With the state having an approx. 75% supply from thermal based stations, the GoI initiative could go a long way in addressing the much desired need for reduction in power procurement cost.

The UDAY scheme further envisages a quarterly increase in tariff on a gradual basis to mitigate cost increase burden. This coupled with the operational efficiency programs being undertaken by the state at the generation, transmission and distribution levels would ensure that the primary objectives of sustained revenue inflow are met consistently and the state shall be able to foresee and realize financial loss reduction at a steeper rate than

envisaged. Given the fact that MSEDCL presently operates at efficient levels in terms of managing its YoY losses, implementation of measures envisaged under the UDAY scheme shall ensure that significant tariff increase would not be imminent and residual losses shall be addressed in a near term.

9.8 Support requested from Govt. of India

The Government of India may facilitate the availability of projected fund requirement under various schemes and ensure timely disbursement of fund to avoid any delays.

Further, MSEDCL has planned for significant capital expenditure, part of which is yet to be tied up for funding. MSEDCL would like to seek concessional funding support from the Central Government by means of increased allocations under the ongoing Central Sector Schemes and/ or availability of low cost, long-term funding from multilateral agencies, such as the World Bank and ADB etc.

10. Year-wise Roll Out Plan

The district wise electrification plan for unconnected households of Maharashtra is provided in Table 106.

Table 101: Year wise Generation availability from upcoming central sector projects

Plant Name	FY15	FY16	FY17	FY18	FY19
Existing allocation (MW)	-	4,356	4,998	5,612	5,923
Additional capacity allocation from CGS during the year (MW)	-	149	942	579	250
Cumulative availability (MW)	4,356	4,505	5,447	6,027	6,277

Table 102: Allocation Capacity from Conventional Sources for All Distribution Licensees

Available Capacity (MW)	FY16	FY17	FY18	FY19
MSEDCL (incl CPP)	24,528	26,810	27,389	27,639
TPC	944	944	944	944
R-Infra	1,100	1,100	1,100	1,100
BEST	1,080	1,080	1,080	1,080
Total	27,652	29,934	30,513	30,763
Peak Demand (MW)- whole state	21,616	23,079	24,690	26,432

Table 103: Year wise roll out plan - MSETCL

Parameter	FY 15	FY 16	FY17	FY18	FY19	Total
Substations (Numbers)	24	24	25	21	17	111
Transformation Capacity (MVA)	13,656	10,888	6,900	5,900	5,285	42,629
765 KV	-	3,000	-	-	-	3,000
400 KV	4,815	815	2,070	3,000	3,185	13,885
220 KV	2,600	2,770	2,450	1,150	1,000	9,970
220/33 KV	3,405	2,675	1,350	1,300	600	9,330
132 KV	2,686	2,218	1,030	375	500	6,809
110-100 KV	150	225	-	75	-	450
Lines (Ckt. Kms)	2,053	3,428	3,095	3,730	2,510	14,816
765 KV	-	-	-	-	-	-
400 KV	266	942	291	928	761	3,188
220 KV	767	1,325	1,440	1,359	824	5,715
132 KV	1,016	1,161	1,327	1,343	925	5,772
110-100 KV	4	-	37	100	-	141

Table 104: Year wise roll out plan – TPC -T

Parameter	FY 15	FY 16	FY17	FY18	FY19	Total
Substations (No.)	2	3	2	-	7	14
Transformation Capacity (MVA)	1,235	2,555	2,170	90	4,250	10,300
765 KV	-	-	-	-	-	-
400 KV	-	1,000	-	-	2,500	3,500
220/33 KV	250	1,250	1,310	-	1,000	3,810
132 KV	-	-	-	-	-	-
110-100 KV	985	305	860	90	750	2,990
Lines (Ckt. Kms)	142	54	43	55	662	956
765 KV	-	-	-	-	-	-
400 KV	-	46	-	-	427	473
220 KV	97	8	39	65	181	390
132 KV	-	-	-	-	-	-
110-100 KV	45	-	4	-10	54	93

Table 105: Year wise roll out plan – R-Infra -T

Parameter	FY 15	FY 16	FY17	FY18	FY19	Total
Substations (No.)	-	-	1	-	3	4
Transformation Capacity (MVA)	-	-	250	-	1,000	1,250
220 kV	-	-	250	-	1,000	1,250
Lines (Ckt. Kms)	-	3	54	-	24	81
400 kV	-	-	-	-	3	3
220 kV	-	3	54	-	21	78

Table 106: District wise electrification plan - Urban and Rural

	Electrification of Unconnected Households					Total
	FY15	FY16	FY17	FY18	FY19	Till FY19
Urban						
Ratnagiri	627	-	-	-	-	627
Sidhurdurg	-	-	-	-	-	-
Thane	-	-	-	-	-	-
Raigad	-	-	-	-	-	-
Nashik	4,645	-	-	-	-	4,645
Dhule	2,156	-	-	-	-	2,156
Nandurbar	1,582	-	-	-	-	1,582
Jalgaon	4,071	-	-	-	-	4,071
Ahmednagar	-	-	-	-	-	-
Pune	-	-	-	-	-	-
Nanded	3,389	-	-	-	-	3,389
Hingoli	-	-	-	-	-	-
Amravati	2,765	-	-	-	-	2,765

	Electrification of Unconnected Households					Total
	FY15	FY16	FY17	FY18	FY19	Till FY19
Buldhana	3,287	-	-	-	-	3,287
Akola	1,579	-	-	-	-	1,579
Washim	666	-	-	-	-	666
Nagpur	-	-	-	-	-	-
Wardha	2,249	-	-	-	-	2,249
Bhandara	1,503	-	-	-	-	1,503
Gondia	2,149	-	-	-	-	2,149
Yavatmal	2,500	1,977	-	-	-	4,477
Gadchiroli	491	-	-	-	-	491
Chandrapur	3,103	-	-	-	-	3,103
Satara	3,825	-	-	-	-	3,825
Sangli	475	-	-	-	-	475
Kolhapur	998	-	-	-	-	998
Solapur	2985	0	0	0	0	2985
Aurangabad	6979	0	0	0	0	6979
Jalna	1206	0	0	0	0	1206
Parbhani	2498	0	0	0	0	2498
Beed	2927	0	0	0	0	2927
Osmanabad	1,577	-	-	-	-	1,577
Latur	1,394	-	-	-	-	1,394
Sub- total – Urban Un-electrified HHs	61,626	1,977	-	-	-	63,603
Rural						
Ratnagiri	-	-	-	-	-	-
Sidhudurg	-	-	-	-	-	-
Thane	40,000	2,629	-	-	-	42,629
Raigad	-	-	-	-	-	-
Nashik	30,000	36,000	36,000	36,000	45,240	183,240
Dhule	13,000	13,000	13,000	13,000	14,909	66,909
Nandurbar	13,000	20,000	25,000	27,000	32,126	117,126
Jalgaon	19,500	19,500	19,500	19,500	20,647	98,647
Ahmednagar	17,000	17,000	17,000	17,000	20,346	88,346
Pune	23,596	-	-	-	-	23,596
Nanded	21,000	21,000	21,000	21,000	24,549	108,549
Hingoli	10,000	10,000	10,000	10,000	8,201	48,201
Amravati	13,500	13,500	13,500	13,500	15,415	69,415
Buldhana	12,500	12,500	12,500	12,500	13,924	63,924
Akola	8,000	8,000	8,000	8,000	2,939	34,939
Washim	13,000	10,500	10,500	10,500	1,069	45,569
Nagpur	-	-	-	-	-	-
Wardha	-	-	-	-	-	-

	Electrification of Unconnected Households					Total
	FY15	FY16	FY17	FY18	FY19	Till FY19
Bhandara	6,000	3,385	-	-	-	9,385
Gondia	5,000	5,000	5,000	5,000	3,323	23,323
Yavatmal	25,000	25,000	25,000	25,000	24,092	124,092
Gadchiroli	13,000	14,000	15,000	15,000	11,245	68,245
Chandrapur	11,000	12,000	12,000	12,000	3,283	50,283
Satara	-	-	-	-	-	-
Sangli	13,000	15,386	-	-	-	28,386
Kolhapur	-	-	-	-	-	-
Solapur	13,000	30,000	35,000	40,000	48,999	166,999
Aurangabad	13,000	20,000	18,000	20,000	2,740	73,740
Jalna	13,000	15,000	15,000	8,316	1,000	52,316
Parbhani	10,000	10,000	10,000	10,000	8,415	48,415
Beed	13,000	20,000	25,000	25,000	30,922	113,922
Osmanabad	11,000	11,000	13,000	13,000	15,328	63,328
Latur	13,000	12,000	15,000	15,000	4,563	59,563
Sub- total – Rural Un electrified	393,096	376,400	374,000	376,316	353,275	1,873,087
Total	454,722	378,377	374,000	376,316	353,275	1,936,690



Table 107: Quarterly Electrification plan – Urban and Rural

Particulars	Electrification of Unconnected Households																Total	
	FY15	FY16				FY17				FY18				FY19				Till FY19
	FY15	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Urban																		
Ratnagiri	627	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	627
Sidhudurg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Thane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Raigad	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Nashik	4,645	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4,645
Dhule	2,156	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,156
Nandurbar	1,582	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,582
Jalgaon	4,071	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4,071
Ahmednagar	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Pune	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Nanded	3,389	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3,389
Hingoli	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Amravati	2,765	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,765
Buldhana	3,287	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3,287
Akola	1,579	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,579
Washim	666	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	666
Nagpur	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Wardha	2,249	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,249
Bhandara	1,503	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,503
Gondia	2,149	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,149



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Particulars	Electrification of Unconnected Households																	Total
	FY15	FY16				FY17				FY18				FY19				Till FY19
	FY15	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Yavatmal	2,500	395	395	593	593	-	-	-	-	-	-	-	-	-	-	-	-	4,477
Gadchiroli	491	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	491
Chandrapur	3,103	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3,103
Satara	3,825	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3,825
Sangli	475	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	475
Kolhapur	998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	998
Solapur	2985	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,985
Aurangabad	6979	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6,979
Jalna	1206	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,206
Parbhani	2498	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,498
Beed	2927	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,927
Osmanabad	1,577	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,577
Latur	1,394	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,394
Sub- total – Urban Un-electrified HHs	61,626	395	395	593	593	0	0	0	0	0	0	0	0	0	0	0	0	63,603
Rural																		
Ratnagiri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Sidhudurg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Thane	40,000	526	526	789	789	-	-	-	-	-	-	-	-	-	-	-	-	42,629
Raigad	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Nashik	30,000	7,200	7,200	10,800	10,800	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	11,310	11,310	11,310	11,310	183,240



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Electrification of Unconnected Households																		Total
Particulars	FY15	FY16				FY17				FY18				FY19			Till FY19	
	FY15	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Dhule	13,000	2,600	2,600	3,900	3,900	3,250	3,250	3,250	3,250	3,250	3,250	3,250	3,250	3,727	3,727	3,727	3,727	66,909
Nandurbar	13,000	4,000	4,000	6,000	6,000	6,250	6,250	6,250	6,250	6,750	6,750	6,750	6,750	8,032	8,032	8,032	8,032	117,126
Jalgaon	19,500	3,900	3,900	5,850	5,850	4,875	4,875	4,875	4,875	4,875	4,875	4,875	4,875	5,162	5,162	5,162	5,162	98,647
Ahmednagar	17,000	3,400	3,400	5,100	5,100	4,250	4,250	4,250	4,250	4,250	4,250	4,250	4,250	5,087	5,087	5,087	5,087	88,346
Pune	23,596	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23,596
Nanded	21,000	4,200	4,200	6,300	6,300	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	6,137	6,137	6,137	6,137	108,549
Hingoli	10,000	2,000	2,000	3,000	3,000	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,050	2,050	2,050	2,050	48,201
Amravati	13,500	2,700	2,700	4,050	4,050	3,375	3,375	3,375	3,375	3,375	3,375	3,375	3,375	3,854	3,854	3,854	3,854	69,415
Buldhana	12,500	2,500	2,500	3,750	3,750	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,481	3,481	3,481	3,481	63,924
Akola	8,000	1,600	1,600	2,400	2,400	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	735	735	735	735	34,939
Washim	13,000	2,100	2,100	3,150	3,150	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	267	267	267	267	45,569
Nagpur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wardha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bhandara	6,000	677	677	1,016	1,016	0	0	0	0	0	0	0	0	0	0	0	0	9,385
Gondia	5,000	1,000	1,000	1,500	1,500	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	831	831	831	831	23,323
Yavatmal	25,000	5,000	5,000	7,500	7,500	6,250	6,250	6,250	6,250	6,250	6,250	6,250	6,250	6,023	6,023	6,023	6,023	124,092
Gadchiroli	13,000	2,800	2,800	4,200	4,200	3,750	3,750	3,750	3,750	3,750	3,750	3,750	3,750	2,811	2,811	2,811	2,811	68,245
Chandrapur	11,000	2,400	2,400	3,600	3,600	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	821	821	821	821	50,283
Satara	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sangli	13,000	3,077	3,077	4,616	4,616	0	0	0	0	0	0	0	0	0	0	0	0	28,386
Kolhapur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solapur	13,000	6,000	6,000	9,000	9,000	8,750	8,750	8,750	8,750	10,000	10,000	10,000	10,000	12,250	12,250	12,250	12,250	166,999



Power for All – Maharashtra



Particulars	Electrification of Unconnected Households																Total	
	FY15	FY16				FY17				FY18				FY19				Till FY19
	FY15	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Aurangabad	13,000	4,000	4,000	6,000	6,000	4,500	4,500	4,500	4,500	5,000	5,000	5,000	5,000	685	685	685	685	73,740
Jalna	13,000	3,000	3,000	4,500	4,500	3,750	3,750	3,750	3,750	2,079	2,079	2,079	2,079	250	250	250	250	52,316
Parbhani	10,000	2,000	2,000	3,000	3,000	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,104	2,104	2,104	2,104	48,415
Beed	13,000	4,000	4,000	6,000	6,000	6,250	6,250	6,250	6,250	6,250	6,250	6,250	6,250	7,731	7,731	7,731	7,731	113,922
Osmanabad	11,000	2,200	2,200	3,300	3,300	3,250	3,250	3,250	3,250	3,250	3,250	3,250	3,250	3,832	3,832	3,832	3,832	63,328
Latur	13,000	2,400	2,400	3,600	3,600	3,750	3,750	3,750	3,750	3,750	3,750	3,750	3,750	1,141	1,141	1,141	1,141	59,563
Sub- total – Rural Un electrified	393,096	75,280	75,280	112,920	112,920	93,500	93,500	93,500	93,500	94,079	94,079	94,079	94,079	88,319	88,319	88,319	88,319	1,873,087
Total	454,722	75,675	75,675	113,513	113,513	93,500	93,500	93,500	93,500	94,079	94,079	94,079	94,079	88,319	88,319	88,319	88,319	1,936,690

Table 108 provides district wise electrification plan for unconnected households of Maharashtra:

Table 108: District wise AT&C Loss targets till FY19

Name of Circle	FY16	FY17	FY18	FY19
Ratnagiri	14.81%	14.24%	13.67%	13.10%
Sindhudurg	20.30%	19.52%	18.74%	17.96%
Raigad	4.07%	3.92%	3.76%	3.60%
Thane	12.05%	11.59%	11.13%	10.66%
Pune	9.20%	8.85%	8.50%	8.14%
Nashik	14.55%	13.95%	13.40%	12.80%
Dhule	20.65%	20.00%	19.39%	18.75%
Nandurbar	36.04%	35.10%	34.20%	33.27%
Jalgaon	24.56%	23.93%	23.34%	22.71%
Ahmadnagar	28.27%	27.58%	26.92%	26.22%
Wardha	7.38%	7.09%	6.81%	6.53%
Bhandara	10.25%	9.85%	9.46%	9.07%
Gondia	20.04%	19.27%	18.50%	17.73%
Y'mal	24.05%	23.53%	23.05%	22.52%
Gadchiroli	24.05%	23.53%	23.05%	22.52%
Chandrapur	6.53%	6.28%	6.02%	5.77%
Satara	14.06%	13.47%	12.92%	12.32%
Sangli	17.99%	17.28%	16.60%	15.89%
Kohlapur	9.08%	8.73%	8.38%	8.03%
Solapur	24.42%	23.86%	23.34%	22.78%
A'bad	21.03%	20.34%	19.68%	18.99%
Jalna	18.12%	17.50%	16.92%	16.30%
Parbhani	30.65%	29.92%	29.24%	28.51%
Beed	38.36%	37.61%	36.90%	36.15%
O'bad	31.94%	31.35%	30.80%	30.21%
Latur	31.80%	31.21%	30.66%	30.07%
Nagpur	10.23%	9.83%	9.44%	9.05%
Washim	28.73%	27.99%	27.28%	26.54%
Akola	24.87%	23.95%	23.06%	22.13%
Buldhana	19.30%	18.80%	18.35%	17.85%
Amravati	16.81%	16.16%	15.56%	14.91%
Hingoli	37.27%	36.49%	35.73%	34.95%
Nanded	31.00%	30.28%	29.60%	28.87%

11. List of Abbreviations

Abbreviation	Full Form
ARR	Annual Revenue Requirement
AT&C	Aggregate Technical & Commercial
BPL	Below Poverty Line
CAGR	Compound Annual Growth Rate
CKM	Circuit Kilometers
CoD	Commercial Operation Date
DDG	Decentralized Distributed Generation
DDUGJY	Deendayal Upadhyaya Gram Jyoti Yojana
DPR	Detailed Project Report
DSM	Demand Side Management
DT	Distribution Transformer
EBIDTA	Earnings Before Interest Depreciation Taxes and Amortization
ECBC	Energy Conservation Building Code
EE	Energy Efficiency
EPC	Engineering, Procurement and Construction
EPS	Electric Power Survey
ER	Eastern Region
FY	Financial Year
GoI	Government of India
GoM	Government of Maharashtra
GSS	Grid Substation
GWp	Giga Watt Peak
HH	Household
IPDS	Integrated Power Development Scheme
IPP	Independent Power Producer
ISTS	Inter/Intra State Transmission System
LED	Light-emitting diode
LILO	Loop In Loop Out
LT	Low Tension
MNRE	Ministry of New and Renewable Energy
MoC	Ministry of Coal
MoEF	The Ministry of Environment & Forests
MU	Million Units
MVA	Mega Volt Ampere

Abbreviation	Full Form
MW	Mega Watt
NAD	Need Assessment Document
NESCL	NTPC Electric Supply Company Limited
NHPC	National Hydroelectric Power Corporation
NTPC	National Thermal Power Corporation
O&M	Operation & Maintenance
PAT	Profit After Taxes
PBT	Profit Before Taxes
PFA	Power For All
PFC	Power Finance Corporation
PGCIL	Power Grid Corporation of India Ltd.
PLF	Plant Load Factor
PMA	Project Monitoring Agency
PPA	Power Purchase Agreement
PPP	Public-private partnership
R&M	Renovation & Modernization
RE	Renewable Energy
REC	Rural Electrification Corporation
RGGVY	Rajiv Gandhi Grameen Vidyutikaran Yojana
RoM	Rest of Maharashtra
RoW	Right of Way
RPO	Renewable Energy Purchase Obligation
SCADA	Supervisory Control and Data Acquisition
SHR	Station Heat Rate
SLDC	State Load Dispatch Center
SPV	Special Purpose Vehicle
T&D	Transmission & Distribution
TBCB	Tariff Based Competitive Bidding
ToR	Terms of Reference
TPS	Thermal Power Station
UMPP	Ultra Mega Power Projects
VGf	Viability Gap Funding
YoY	Year on Year

12. Annexure

Annexure 1: Planned Generation Capacity addition

Particulars	Additional Capacity allocation during the year				Total Capacity addition Till FY19
	FY16	FY17	FY18	FY19	
State Sector					
Chandrapur Project U-8	500				500
Chandrapur Project U-9	500				500
Koradi Project U-8	660				660
Koradi Project U-9	660				660
Koradi Project U-10		660			660
Parli Replacement U-8	250				250
Paras U-5				250	250
Sub- total – State sector	2,570	660	0	250	3,480
Central Sector (Allocation to Maharashtra)					
North Karanpura, Jharkhand (660 MW)			33	67	100
NTPC Vindhyanchal V (500 MW)	149				149
Subansiri Hydro Arunachal Pradesh (2000 MW)				183	183
Mauda II Unit 1 &2 (2 x 660 MW)		500			500
NTPC Lara (3 x 800 MW)		114	259		373
NTPC Gadrawara Stage I			232		232
NEEPCO Kameng			55		55
NTPC Sholapur		328			328
Sub- total – Central sector	149	942	579	250	1,920

Annexure 2: District wise cost break up of DDUGJY Scheme

Sl. No	Name of District	Feeder Separation	Connecting the unconnected Rural HHs		System Strengthening	Sansad Adarsh Gram Yojna		Total DPR Cost (In Rs. Crs.)
		Total Cost (Rs. Crs.)	Total no. of Village	Total Cost (Rs. Crs.)	Total Cost (Rs. Crs.)	Total no. of Village	Total Cost (Rs. Crs.)	
1	Ahmadnagar	15	1,454	18	13	2	0	46
2	Akola	37	682	11	20	1	0	69
3	Amravati	54	1,175	5	30	2	1	90
4	Aurangabad	133	1,351	21	66	2	1	220
5	Bhandara	13	567	2	16	1	0	31
6	Bid	47	1,113	9	27	2	2	85
7	Buldana	29	1,156	6	21	1	0	57
8	Chandrapur	51	1,112	12	47	1	0	111
9	Dhule	35	643	6	21	1	0	62
10	Gadchiroli	34	1,424	13	11	2	0	58
11	Gondiya	57	843	10	29	1	0	96
12	Hingoli	32	679	6	20	0	0	57
13	Jalgaon	60	1,144	14	27	2	0	102
14	Jalna	67	829	20	53	1	1	141
15	Kolhapur	22	743	13	10	3	1	45
16	Latur	52	850	9	31	1	0	92
17	Nagpur	105	943	27	100	4	1	234
18	Nanded	64	1,037	16	33	3	1	113
19	Nandurbar	24	563	4	12	1	0	40
20	Nashik	30	1,681	16	9	1	0	54
21	Osmanabad	49	700	8	24	1	0	81
22	Parbhani	41	819	9	32	1	0	82
23	Pune-I(PRC)	66	502	10	42	2	0	118
	Pune -2	9	458	5	6	6	1	21
24	Raigarh -1	0	1,067	25	43	5	1	69
	Raigarh-2	0	132	32	28	1	0	61
25	Ratnagiri	0	749	5	51	3	1	57
26	Sangli	19	349	15	23	1	0	57
27	Satara	18	1,131	7	5	3	0	31
28	Sindhudurg	0	427	31	21	3	1	53
29	Solapur	18	710	7	9	2	1	35
30	Thane -1	0	79	8	51	6	1	61
	Thane -2	0	85	11	10	0	0	21
	Thane -3	0	60	15	2	0	0	17
31	Wardha	19	775	5	5	1	0	30
32	Washim	18	650	8	11	1	0	37
33	Yavatmal	74	1,509	10	29	1	0	113
Total		1,291	30,191	448	988	69	18	2,746

Annexure 3: District wise cost break up of DDUGJY Scheme

Sl. No.	Name of District	DPR Cost (In Lacs)	No. Proposed New Substation	No of Augmentation of Power Transformers	No of Additional power Transformers	Total HT Line km	Total LT Line km	No. of DTC New				Total
								100 KVA	63 KVA	SDT	Others	
1	Ahmednagar	46	2	3	0	450	265	209	12	27	67	315
2	Akola	69	5	4	0	1,013	80	295	0	52	1	348
3	Amravati	90	10	0	0	959	80	823	0	38	0	861
4	Auranagbad	220	20	4	8	2,742	312	1,236	0	166	28	1430
5	Bhandara	31	5	0	0	370	68	137	0	7	0	144
6	Bid	85	5	2	2	1,357	297	210	565	45	0	820
7	Buldana	57	8	0	0	679	36	162	132	31	0	325
8	Chandrapur	111	10	1	4	1,550	165	509	59	0	0	568
9	Dhule	62	9	0	0	591	184	64	0	38	0	102
10	Gadchiroli	58	3	2	0	770	104	407	0	14	0	421
11	Gondiya	96	8	4	0	1,365	258	386	0	35	0	421
12	Hingoli	57	8	1	4	693	187	0	63	62	0	125
13	Jalgaon	102	6	5	3	1,448	532	202	64	1	38	305
14	Jalna	141	16	0	0	1,489	172	443	5	0	84	532
15	Kolhpaur	45	4	0	0	412	285	373	6	21	18	418
16	Latur	92	6	6	3	1,126	461	217	45	83	181	526
17	Nagpur	234	18	3	5	2,490	485	1,527	4	64	115	1,710
18	Nanded	113	12	0	2	1,436	227	561	221	47	136	965
19	Nandurbar	40	4	1	0	490	85	0	9	11	0	20
20	Nasik	54	3	0	0	706	63	7	5	53	2	67
21	Osamanabad	81	9	0	2	804	208	278	122	127	0	527
22	Parbhani	82	11	0	5	1,412	65	309	26	67	5	407
23	Pune-1 (PRC)	118	4	3	0	1,377	489	585	111	86	3	785
	Pune-2 (Baramati)	21	1	2	1	190	70	66	81	2	0	149
24	Raigard-01	69	0	0	0	121	73	37	89	0	15	141
	Raigad-02	61	2	0	0	192	168	30	0	0	71	101
25	Ratnagiri	57	2	3	0	435	73	107	0	0	0	107
26	Sangali	57	4	1	1	693	291	312	43	15	3	373
27	Satara	31	0	0	1	271	163	158	0	62	9	229
28	Sindhudurg	53	1	4	0	486	456	328	30	0	4	362

Sl. No.	Name of District	DPR Cost (In Lacs)	No. Proposed New Substation	No of Augmentation of Power Transformers	No of Additional power Transformers	Total HT Line km	Total LT Line km	100 KVA	No. of DTC New			Total
29	Solapur	35	0	0	0	298	426	167	24	61	0	252
30	Thane-1	61	6	1	0	285	85	0	4	0	59	63
	Thane-2	21	2	0	0	56	56	33	0	0	24	57
	Thane-3	17	0	0	0	42	58	22	0	0	73	95
31	Wardha	30	2	0	0	443	48	280	9	0	2	291
32	Washim	37	3	0	0	392	132	197	13	35	0	245
33	Yavatamal	113	6	2	7	1,317	272	407	144	110	14	675
	Total	2,746	215	52	48	30,949	7,480	11,084	1,886	1,360	952	15,282

Annexure 4 :Details of un-electrified villages to be covered under DDG/RE Plan

Sl. No	District	To be electrified by MSEDCL	To be electrified by MEDA	Electrified by MEDA, but not working (to be electrified by MEDA)	Total
1	Raigad	0	4	0	4
2	Palghar	3	0	0	3
3	Jalgaon	2	0	0	2
4	Nandurbar	12	0	6	18
5	Akola	1	0	0	1
6	Amravati	0	9	0	9
7	Buldhana	0	0	4	4
8	Nagpur	2	0	0	2
9	Gadchiroli	0	19	0	19
Sub-Total		20	32	10	62

Annexure 5.1 : Projected Balance Sheet (Base case)

The projected balance sheet till FY19 under base case is presented below.

Balance Sheet statement (Rs. Cr.)	FY 16	FY 17	FY 18	FY 19
Assets				
Current Assets				
Cash @ Bank	(0)	(0)	(0)	(0)
Other non-current investments	193	193	193	193
Other non- current assets	8,430	8,430	8,430	8,430
Long term loans and advances	-	-	-	-
Stocks – Stores	1,761	1,864	1,954	2,066
Receivables	23,983	25,924	28,024	30,255
Total Current Assets	34,366	36,410	38,600	40,943
Non-current Assets				
Gross Fixed Assets	47,369	51,814	54,081	61,817
Less: Accumulated Depreciation	(16,518)	(18,755)	(21,161)	(23,877)
Other current assets	4,456	4,456	4,456	4,456
Loans and Advances	300	300	300	300
Capital Works in Progress	2,656	2,419	1,831	3,183
Net Fixed Assets	38,263	40,235	39,507	45,879
Total Assets	72,629	76,645	78,107	86,822
Liabilities				
Long Term Debt	21,509	22,001	20,133	22,662
Working Capital Loan/ Short term borrowings	9,753	9,669	10,282	11,294
Cash deficit loan	2,986	8,532	15,216	22,613
Deferred tax liabilities	139	139	139	139
Long term provisions	6,372	6,372	6,372	6,372
Trade payables	14,090	14,090	14,090	14,090
Short term provisions	1,193	1,193	1,193	1,193
Other Current Liabilities	8,631	9,825	10,412	10,736
Total Current Liabilities	23,913	25,108	25,695	26,018
Total	64,672	71,821	77,837	89,099
Equity				
Share Capital	6,438	7,172	7,613	10,440
Grants	3,665	5,774	7,472	8,520
Equity pending allotment	775	775	775	775
Capital Liabilities	-	-	-	-
Reserves and surplus	745	(3,123)	(8,118)	(13,491)
Total	11,623	10,598	7,741	6,244
Total Liabilities	76,294	82,419	85,578	95,343

Annexure 5.2 :Projected Balance Sheet (Scenario 1)

The projected balance sheet till FY19 under Scenario 1 is presented below.

Balance Sheet statement	FY 16	FY 17	FY 18	FY 19
Assets				
Current Assets				
Cash @ Bank	0	(0)	(0)	0
Other non-current investments	193	193	193	193
Other non- current assets	8,430	8,430	8,430	8,430
Long term loans and advances	-	-	-	-
Stocks - Stores	1,761	1,864	1,954	2,066
Receivables	24,143	26,266	28,595	31,108
Total Current Assets	34,526	36,752	39,171	41,796
Non-current Assets				
Gross Fixed Assets	47,369	51,814	54,081	61,817
Less: Accumulated Depreciation	(16,518)	(18,755)	(21,161)	(23,877)
Other current assets	4,456	4,456	4,456	4,456
Loans and Advances	300	300	300	300
Capital Works in Progress	2,656	2,419	1,831	3,183
Net Fixed Assets	38,263	40,235	39,507	45,879
Total Assets	72,789	76,987	78,678	87,675
Liabilities				
Long Term Debt	21,509	22,001	20,133	22,662
Working Capital Loan/ Short term borrowings	9,883	9,957	10,761	12,001
Cash deficit loan	1,879	5,476	8,747	10,820
Deferred tax liabilities	139	139	139	139
Long term provisions	6,372	6,372	6,372	6,372
Trade payables	14,090	14,090	14,090	14,090
Short term provisions	1,193	1,193	1,193	1,193
Other Current Liabilities	8,631	9,825	10,412	10,736
Total Current Liabilities	23,913	25,108	25,695	26,018
Total	63,694	69,053	71,847	78,012
Equity				
Share Capital	6,438	7,172	7,613	10,440
Grants	3,665	5,774	7,472	8,520
Equity pending allotment	775	775	775	775
Capital Liabilities	-	-	-	-
Reserves and surplus	1,882	(13)	(1,556)	(1,552)
Total	12,760	13,708	14,303	18,183
Total Liabilities	76,454	82,761	86,150	96,195

Annexure 5.3 :Projected Balance Sheet (Scenario 2)

The projected balance sheet till FY19 under Scenario 2 is presented below.

Balance Sheet statement	FY 16	FY 17	FY 18	FY 19
Assets				
Current Assets				
Cash @ Bank	(0)	(0)	(0)	(0)
Other non-current investments	193	193	193	193
Other non- current assets	8,430	8,430	8,430	8,430
Long term loans and advances	-	-	-	-
Stocks - Stores	1,765	1,876	1,975	2,094
Receivables	23,983	25,924	28,024	30,255
Total Current Assets	34,370	36,422	38,621	40,972
Non-current Assets				
Gross Fixed Assets	48,170	53,417	56,686	64,890
Less: Accumulated Depreciation	(16,545)	(18,852)	(21,384)	(24,239)
Other current assets	4,456	4,456	4,456	4,456
Loans and Advances	300	300	300	300
Capital Works in Progress	2,656	2,419	1,831	3,183
Net Fixed Assets	39,038	41,741	41,889	48,590
Total Assets	73,408	78,163	80,510	89,561
Liabilities				
Long Term Debt	21,989	22,910	21,596	24,285
Working Capital Loan/ Short term borrowings	9,757	9,681	10,303	11,322
Cash deficit loan	3,075	8,840	15,917	23,852
Deferred tax liabilities	139	139	139	139
Long term provisions	6,372	6,372	6,372	6,372
Trade payables	14,090	14,090	14,090	14,090
Short term provisions	1,193	1,193	1,193	1,193
Other Current Liabilities	8,631	9,825	10,412	10,736
Total Current Liabilities	23,913	25,108	25,695	26,018
Total	65,245	73,049	80,022	91,989
Equity				
Share Capital	6,705	7,706	8,414	11,330
Grants	2,864	4,171	4,867	5,448
Equity pending allotment	775	775	775	775
Capital Liabilities	-	-	-	-
Reserves and surplus	683	(3,367)	(8,701)	(14,533)
Total	11,026	9,286	5,355	3,020

Balance Sheet statement	FY 16	FY 17	FY 18	FY 19
Total Liabilities	76,272	82,335	85,377	95,009

Annexure 5.4 :Projected Balance Sheet (Scenario 3)

The projected balance sheet till FY19 under Scenario 3 is presented below.

Balance Sheet statement	FY 16	FY 17	FY 18	FY 19
Assets				
Current Assets				
Cash @ Bank	0	0	(0)	(0)
Other non-current investments	193	193	193	193
Other non- current assets	8,430	8,430	8,430	8,430
Long term loans and advances	-	-	-	-
Stocks - Stores	1,761	1,864	1,955	2,069
Receivables	23,983	25,924	28,024	30,255
Total Current Assets	34,366	36,410	38,601	40,946
Non-current Assets				
Gross Fixed Assets	47,369	51,814	54,281	62,218
Less: Accumulated Depreciation	(16,518)	(18,755)	(21,171)	(23,905)
Other current assets	4,456	4,456	4,456	4,456
Loans and Advances	300	300	300	300
Capital Works in Progress	2,656	2,419	1,831	3,183
Net Fixed Assets	38,263	40,235	39,697	46,252
Total Assets	72,629	76,645	78,298	87,198
Liabilities				
Long Term Debt	21,509	22,001	20,314	23,003
Working Capital Loan/ Short term borrowings	9,753	9,669	10,285	11,300
Cash deficit loan	3,319	9,772	18,261	28,633
Deferred tax liabilities	139	139	139	139
Long term provisions	6,372	6,372	6,372	6,372
Trade payables	14,090	14,090	14,090	14,090
Short term provisions	1,193	1,193	1,193	1,193
Other Current Liabilities	8,630	9,825	10,410	10,733
Total Current Liabilities	23,913	25,107	25,693	26,015
Total	65,004	73,060	81,063	95,462
Equity				
Share Capital	6,438	7,172	7,613	10,440
Grants	3,665	5,774	7,272	8,119

Balance Sheet statement	FY 16	FY 17	FY 18	FY 19
Equity pending allotment	775	775	775	775
Capital Liabilities	-	-	-	-
Reserves and surplus	413	(4,362)	(11,153)	(19,478)
Total	11,291	9,359	4,506	(144)
Total Liabilities	76,294	82,419	85,570	95,318

Annexure 5.5 :Projected Balance Sheet (Scenario 4)

The projected balance sheet till FY19 under Scenario 4 is presented below.

Balance Sheet statement	FY 16	FY 17	FY 18	FY 19
Assets				
Current Assets				
Cash @ Bank	(0)	0	0	(0)
Other non-current investments	193	193	193	193
Other non- current assets	8,430	8,430	8,430	8,430
Long term loans and advances	-	-	-	-
Stocks - Stores	1,761	1,864	1,954	2,066
Receivables	23,983	25,924	28,024	30,255
Total Current Assets	34,366	36,410	38,600	40,943
Non-current Assets				
Gross Fixed Assets	47,369	51,814	54,081	61,817
Less: Accumulated Depreciation	(16,518)	(18,755)	(21,161)	(23,877)
Other current assets	4,456	4,456	4,456	4,456
Loans and Advances	300	300	300	300
Capital Works in Progress	2,656	2,419	1,831	3,183
Net Fixed Assets	38,263	40,235	39,507	45,879
Total Assets	72,629	76,645	78,107	86,822
Liabilities				
Long Term Debt	15,562	16,054	14,186	16,715
Working Capital Loan/ Short term borrowings	9,753	9,669	10,282	11,294
Cash deficit loan	2,702	7,602	13,547	20,098
Deferred tax liabilities	139	139	139	139
Long term provisions	6,372	6,372	6,372	6,372
Trade payables	14,090	14,090	14,090	14,090
Short term provisions	1,193	1,193	1,193	1,193
Other Current Liabilities	8,631	9,825	10,412	10,736
Total Current Liabilities	23,913	25,108	25,695	26,018
Total	58,441	64,944	70,221	80,636

Balance Sheet statement	FY 16	FY 17	FY 18	FY 19
Equity				
Share Capital	6,438	7,172	7,613	10,440
Grants	3,665	5,774	7,472	8,520
Equity pending allotment	775	775	775	775
Capital Liabilities	-	-	-	-
Reserves and surplus	6,976	3,754	(502)	(5,029)
Total	17,854	17,475	15,357	14,706
Total Liabilities	76,294	82,419	85,578	95,343

The projected cash flow statement under scenario 4 is provided below

Cash flow statement	FY 16	FY 17	FY 18	FY 19
Cash from Operations				
Revenue	65,650	77,934	85,507	91,227
Operating Costs	(61,602)	(76,585)	(84,300)	(88,933)
Miscellaneous expenses	-	-	-	-
Increase in Short term capital requirements	(269)	84	(614)	(1,012)
Tax	(17)	-	-	-
Net Cash from Operations	3,763	1,433	593	1,282
Cash from Investment Activities				
Capex	(8,564)	(6,318)	(3,376)	(10,136)
Net Cash from Investment Activities	(8,564)	(6,318)	(3,376)	(10,136)
Cash from Financing Activities				
Equity Investments	846	734	441	2,827
Debt Drawn	4,326	3,475	1,238	6,261
Loan Repayment	(2,634)	(2,982)	(3,106)	(3,732)
Increase in working capital loan	269	(84)	614	1,012
Payment of past current liabilities	-	-	-	-
Grants	3,392	2,109	1,698	1,048
Interest on cash deficit loan	(260)	(696)	(1,428)	(2,271)
Interest on Loans	(1,802)	(1,698)	(1,662)	(1,748)
Interest on Working Capital Loan	(885)	(874)	(956)	(1,093)
Net Cash from Financing Activities	3,251	(15)	(3,162)	2,304
Net Cash Balances				
Cash BF	(1,152)	(2,702)	(7,602)	(13,547)
Cash Flow during the year	(1,550)	(4,900)	(5,945)	(6,551)
Cash	(2,702)	(7,602)	(13,547)	(20,098)

Annexure 5.6 : Projected Balance Sheet (Scenario 5)

The projected balance sheet till FY19 under Scenario 5 is presented below.

Balance Sheet statement	FY 16	FY 17	FY 18	FY 19
Assets				
Current Assets				
Cash @ Bank	(0)	0	0	(0)
Other non-current investments	193	193	193	193
Other non- current assets	8,430	8,430	8,430	8,430
Long term loans and advances	-	-	-	-
Stocks - Stores	1,761	1,864	1,954	2,066
Receivables	23,983	25,924	28,024	30,255
Total Current Assets	34,366	36,410	38,600	40,943
Non-current Assets				
Gross Fixed Assets	47,369	51,814	54,081	61,817
Less: Accumulated Depreciation	(16,518)	(18,755)	(21,161)	(23,877)
Other current assets	4,456	4,456	4,456	4,456
Loans and Advances	300	300	300	300
Capital Works in Progress	2,656	2,419	1,831	3,183
Net Fixed Assets	38,263	40,235	39,507	45,879
Total Assets	72,629	76,645	78,107	86,822
Liabilities				
Long Term Debt	21,509	22,001	20,133	22,662
Working Capital Loan/ Short term borrowings	10,137	10,665	11,377	12,226
Cash deficit loan	2,620	6,504	10,977	16,093
Deferred tax liabilities	139	139	139	139
Long term provisions	6,372	6,372	6,372	6,372
Trade payables	14,090	14,090	14,090	14,090
Short term provisions	1,193	1,193	1,193	1,193
Other Current Liabilities	8,246	8,829	9,317	9,804
Total Current Liabilities	23,529	24,111	24,600	25,087
Total	64,305	69,793	73,598	82,578
Equity				
Share Capital	6,438	7,172	7,613	10,440
Grants	3,665	5,774	7,472	8,520
Equity pending allotment	775	775	775	775
Capital Liabilities	-	-	-	-
Reserves and surplus	1,112	(1,095)	(3,879)	(6,970)
Total	11,990	12,627	11,981	12,765

Balance Sheet statement	FY 16	FY 17	FY 18	FY 19
Total Liabilities	76,294	82,419	85,578	95,343

The projected cash flow statement under scenario 5 is provided below

Cash flow statement	FY 16	FY 17	FY 18	FY 19
Cash from Operations				
Revenue	61,495	67,607	74,308	81,728
Operating Costs	(56,993)	(64,624)	(71,165)	(77,754)
Miscellaneous expenses	-	-	-	-
Increase in Short term capital requirements	(653)	(528)	(711)	(849)
Tax	(60)	-	-	-
Net Cash from Operations	3,789	2,455	2,431	3,125
Cash from Investment Activities				
Capex	(8,564)	(6,318)	(3,376)	(10,136)
Net Cash from Investment Activities	(8,564)	(6,318)	(3,376)	(10,136)
Cash from Financing Activities				
Equity Investments	846	734	441	2,827
Debt Drawn	4,326	3,475	1,238	6,261
Loan Repayment	(2,634)	(2,982)	(3,106)	(3,732)
Increase in working capital loan	653	528	711	849
Payment of past current liabilities	-	-	-	-
Grants	3,392	2,109	1,698	1,048
Interest on cash deficit loan	(255)	(616)	(1,180)	(1,827)
Interest on Loans	(2,084)	(2,262)	(2,226)	(2,312)
Interest on Working Capital Loan	(937)	(1,008)	(1,104)	(1,219)
Net Cash from Financing Activities	3,307	(21)	(3,528)	1,895
Net Cash Balances				
Cash BF	(1,152)	(2,620)	(6,504)	(10,977)
Cash Flow during the year	(1,468)	(3,884)	(4,473)	(5,116)
Cash	(2,620)	(6,504)	(10,977)	(16,093)



