SOUTHERN POWER DISTRIBUTION COMPANY OF A.P LIMITED

Aggregate Revenue Requirement for Distribution Business for Fourth Control Period (FY2019-20 to FY2023-24)

12th December, 2018

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1 Aggregate Revenue Requirement of Distribution Business for 4th Control Period

APERC Regulation 4 of 2005 states that "*Every Distribution Licensee shall file for each of its licensed business an application for approval of its Aggregate Revenue Requirement (ARR) for each year of the Control Period, not less than 120 days before the commencement of the first year of the Control Period. This filing shall be in such form and in such manner as specified and in accordance with the Guidelines issued by the Commission. The Distribution Licensees may file such applications for ARR of the first Control Period within a period not less than 90 days before the commencement of the Control Period. The ARR filing for the Distribution business shall be for the entire Control Period*"

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"The ARR filings shall contain the following

1. The Operation and Maintenance (O&M) costs which include employee-related costs, repair & maintenance costs and administrative & general costs, estimated for the Base Year and the year prior to the Base Year in complete detail, together with the forecast for each year of the Control Period based on the norms proposed by the Distribution Licensee including indexation and other appropriate mechanisms in terms of the principles enunciated in this Regulation for O&M cost allowance.

2. Regulated Rate Base (RRB) for the Base Year and each year of the Control Period which requires submission of the working capital requirement and a detailed scheme/project-wise Capital Investment Plan with a capitalization schedule covering each year of the Control Period consistent with the Commission's approved ***Resource Plan (Refer Annexure)****.*

3. A proposal for appropriate capital structure and its cost of financing (interest cost and return on equity) for the purpose of computing Weighted Average Cost of Capital.

4. Targets proposed for reduction of distribution losses during the Control Period duly adhering to the Licensees' Standards of Performance Regulation.

5. Details of depreciation, including Advance against depreciation if any required and capitalization schedules for each year of the Control Period.

6. Description of external parameters proposed to be used for indexation;

7. Details of taxes on income;

8. Any other relevant expenditure;
9. Proposals for sharing of gains and losses;
10. Proposals for efficiency parameter targets;
11. Proposals for rewarding efficiency in performance
12. Any other matters considered appropriate"

In accordance with Point no. 2 mentioned above, the Distribution licensee has already filed the Resource Plan with the Hon'ble Commission covering the Sales Forecast, Load Forecast, Power Procurement Plan and Distribution Plan (Capital Investment Plan) consistent with the requirements of the Commission's Guidelines on Load Forecast and Resource Plan. The details of the Resource plan filed with the Hon'ble Commission has been attached in Annexure-A.

1.1 Gross Fixed Assets Projections

1.1.1 Asset additions

The capital investment plan as projected in the Resource plan has been considered for arriving at the Distribution Cost for the next control period. Total capitalization for the Base Year and the Control Period has been projected based on the following assumptions:

1) Capitalization of Base Investment and Capital Work-in-Progress (CWIP): Capitalization of assets for MYT period has been considered based on historical actual capitalization trends and capital expenditure projected for the Control Period.
2) Capitalization of Expenses
   a) Interest during Construction (IDC): Interest during Construction (IDC) has been calculated as a percentage of the average Capital Works-in-Progress for the year.
   b) Operational and Maintenance (O&M) Expenses: Operational and Maintenance (O&M) Expenses capitalized has been projected at 11% of capital expenditure incurred for the year.

Thus, the licensee has projected capital investment undertaken and its capitalisation for the Base Year and Control Period as given below:

Closing Balance of CWIP = Opening Balance of CWIP + Capital Expenditure during the year + Expenses Capitalized – Investment Capitalized

Table 1: Details of the Capital Works in Progress (CWIP)

Particulars	FY19 (RE)	FY20	FY21	FY22	FY23	FY24
Opening Balance of Capital Work in Progress (CWIP)	3,346	4,533	5,397	4,829	3,170	1,431
Capital Expenditure during the year	2,320	2,663	2,462	2,742	2,862	3,206
Expenses Capitalized	255	293	271	302	315	353
Interest During Construction	222	302	385	407	325	190
Total expenses capitalized	477	595	656	709	640	542
Transfer to fixed assets	1,610	2,394	3,686	5,110	5,241	3,576
Closing CWIP	**4,533**	**5,397**	**4,829**	**3,170**	**1,431**	**1,603**

1.2 Depreciation

The depreciation every year for the particular asset class has been calculated as per below formula considering the Depreciation rates for respective asset class of asset base and also Fully Depreciated Assets during the control period.

Depreciation for the year = (Opening balance of the gross fixed assets for the year – Fully Depreciated Assets till previous year) * Rate of depreciation

The total depreciation for the year is calculated by adding the yearly depreciation of each asset class.

During FY2017-18, **Rs. 720.58** Cr. has been incurred towards depreciation (net of additions) which has been detailed below:

Table 2: Depreciation Details

Particulars - Rs. Crs.	2017-18 (Actual)
Opening Balance of assets	12,663
Asset Additions during the Year	1,233
Depreciation During the Year	721

The Depreciation rates as per Ministry of Power guidelines have been assumed to arrive at next 5 years depreciation which is shown below:

Table 3: Depreciation Rates' Details

Asset Class	Rate of Depreciation
Buildings and Other Civil Works	3.02%
Battery Chargers	33.40%
Material Handling Equipment	7.84%
Meters / Meter Equipment	12.77%

Asset Class	Rate of Depreciation
Office Equipment and Air Conditioners	12.77%
Plant & Machinery and Lines, Cables & Network	7.84%
Capacitor Banks	5.27%
Furniture & Fixtures	12.77%
Vehicle – Car / Jeep / Scooter / Motor Cycle/ Lorry / Truck	33.40%
Computers and IT Equipment	12.77%
Intangible assets (Software, Goodwill etc.)	10.00%

The Fully depreciated assets till the year have been deducted from the opening balance of the next year to calculate the depreciation. Depreciation computation after considering the Fully Depreciated Assets (FDA) balances is tabulated below:

Table 4: Depreciated Assets' Details

Particulars (Rs. Cr.)	FY19 (RE)	FY20	FY21	FY22	FY23	FY24
Opening Balance of assets	13,896	15,506	17,900	21,586	26,696	31,936
Asset Additions during the Year	1,610	2,394	3,686	5,110	5,241	3,576
Fully Depreciated assets during the year	92	158	591	908	534	414
Depreciation During the Year	799	922	1,103	1,355	1,699	2,084

1.3 Consumer Contribution & Grants

The consumer contribution additions and Grants has been estimated based on the past trend and new consumer additions in the next 5 years of the control period.

Below table provides the projections of the Consumer Contribution in 4th Control period.

Table 5: Consumer Contribution Details

Particulars	FY19	FY20	FY21	FY22	FY23	FY24
Opening Balance	2,252	2,386	2,509	2,619	2,713	2,788
Additions during the year	490	514	540	567	595	625
Deductions during the year	355	391	430	473	520	572
Closing Balance	**2,386**	**2,509**	**2,619**	**2,713**	**2,788**	**2,841**

Below table provides the projections of the Grants in 4th Control period.

Table 6: Grants Details

Particulars	FY19	FY20	FY21	FY22	FY23	FY24
Opening Balance	551	651	751	851	951	1,051
Additions during the year	100	100	100	100	100	100
Deductions during the year	0	0	0	0	0	0
Closing Balance	**651**	**751**	**851**	**951**	**1,051**	**1,151**

1.4 Working Capital

The licensee has projected the working capital requirement for the year as per below formula:

Working Capital (WC) requirement = 1/12th of the projected gross O&M cost for the year + 12% of the R&M cost towards O&M stores

The year wise projections of the working capital requirement are as follows:

Table 7: Working Capital details

Particulars	FY19 (RE)	FY20	FY21	FY22	FY23	FY24
Working Capital	283	316	355	404	465	533

1.5 Regulated Rate Base (RRB)

The Hon'ble Commission has outlined principles for computation of Regulated Rate Base (RRB) in Regulation 4 of 2005.

Calculation of RRB

The honourable commission has proposed a computation methodology (in the excel spreadsheet) for the RRB calculation for the year, which is as follows:

"RRB = (OCFA – AD – CC) + ΔRAB+WC where,

- **OCFA:** Original Cost of Fixed Assets at the beginning of the Year available for use and necessary for the purpose of the licensed business.
- **AD:** Amounts written off or set aside on account of depreciation of fixed assets pertaining to the regulated business at the beginning of the Year.
- **CC:** Total contributions made by the users towards the cost of construction of distribution/service lines by the Licensee and also include the capital grants/subsidies received for this purpose at the beginning of the year.
- **ΔRAB:** Change in the Rate Base in the year. This component would be the average of the value at the beginning and end of the year as the asset creation is spread across a year and is arrived at as follows:

  $$\Delta RAB = (Inv - D - CC)/2$$

  - Inv: Investments projected to be capitalised during the year of the Control Period and approved.
  - D: Amount set aside or written off on account of Depreciation of fixed assets for the year of the Control Period.
  - CC: User Contributions pertaining to the ΔRAB and capital grants/subsidies received during year of the Control Period for construction of service lines or creation of fixed assets.

Based on the above computation methodology, RRB has been calculated as shown below table. The Original Cost of Fixed Assets (OCFA), Accumulated Depreciation and Total Consumer Contribution calculated for Base Year and 4th Control period i.e., from 2018-19 to 2023-24 are as follows:

Table 8: Regulated Rate Base Details

Particulars	FY19 (RE)	FY20	FY21	FY22	FY23	FY24
Assets	**15,506**	**17,900**	**21,586**	**26,696**	**31,936**	**35,513**
-OCFA Opening Balance	13,896	15,506	17,900	21,586	26,696	31,936
-Additions to OCFA	1,610	2,394	3,686	5,110	5,241	3,576
Acc Depreciation Closing Balance	**7,879**	**8,801**	**9,904**	**11,259**	**12,959**	**15,042**
- Acc Depreciation Opening Balance	7,079	7,879	8,801	9,904	11,259	12,959
- Depreciation for the year	799	922	1,103	1,355	1,699	2,084
Con Contributions closing balance	**3,038**	**3,261**	**3,471**	**3,665**	**3,839**	**3,992**
-Con Contributions Opening Balance	2,803	3,038	3,261	3,471	3,665	3,839
-Additions to Cons Contributions	234	223	210	194	175	153
Working Capital	283	316	355	404	465	533
Change in Rate Base	**288**	**624**	**1,186**	**1,780**	**1,683**	**670**
Regulated Rate Base	**4,585**	**5,530**	**7,379**	**10,395**	**13,920**	**16,341**

1.6 Operation & Maintenance Expense Projections

The Operation & Maintenance (O&M) Expenses consist of the following components:

a. Employee Expenses (EE) including Salaries, wages and other employee costs;
b. Administrative & General costs (A&G) including legal charges, audit fees, rent, rates and taxes;
c. Repairs and Maintenance (R&M) including equipment maintenance, repairs, fault corrections, etc.

Licensee has adopted method recommended by commission in 3rd Control period MYT order. Below is the methodology adopted by the licensee for projection of O&M expenses for 4th Control period:

a. Repair and Maintenance (R&M) Expenses –
   As per MYT order for 3rd Control period, commission has recommended all the licensees to project R&M expenses as 2.05% of the opening balance of the Gross Fixed Assets (GFA) for the year however licensee has considered the average of the actual R&M as a % of the opening GFA for the past 5 years as a proxy for future projections. The methodology used is explained below:

(1) Average of the R&M expenses as a % of opening balance of Gross Fixed Assets (GFA) has been calculated considering 5 years between FY2013-14 to FY2017-18.
(2) This average is expected to remain same for all the years in 4th Control period.
(3) Projections of R&M expenses for 4th Control period has been calculated by multiplying the above average by Gross Fixed Assets of each year.

Below table shows the historical trend of the R&M expenses, opening GFA and the average of the R&M expense as a % of the opening GFA.

Table 9 - R&M expenses and GFA details for FY15, FY16 and FY17

Name of the Parameter	FY14	FY15	FY16	FY17	FY18
R&M expenses	122	179	265	299	319
Opening GFA	6,068	6,565	9,582	11,454	12,663
R&M as % of Opening GFA	2.01%	2.72%	2.77%	2.61%	2.52%
Average R&M as % of Opening GFA			**2.55%**		

Additional Pay due to outsourced employees:
APTransco vide TOO (Addl.Per) Ms No. 197, dt 04-09-2015 issued orders for payment for 15% incremental/revised wages to outsourced workers working through man-power agencies / contractors in APTransco. After further discussions and deliberations, the APSPDCL has issued order for enhancement of revenue to outsourced employees subject to approval from Govt. of AP. The wages of outsourcing employees were enhanced with effect from 01.04.18 as per approval vide S.O.O. CGM (HRD) Ms.No.1764, Dt: 02.11.18.

The salaries of outsourced employees are accounted for under two heads.

- The salaries of outsourced employees working in substations is accounted for under R&M expenses. The total impact of wage revision under this head is Rs. 8.416 Cr. per month.
- The salaries of outsourced employees working in offices (corporate office and field offices) are accounted for under employee expenses. The total impact of wage revision under this head is Rs. 2.166 Cr. per month.

Accordingly the impact of pay revision to outsourced employees is considered under both these heads in the MYT 4th Control Period.

Since, the existing R&M expenses as a % of GFA is 2.55%, licensee has used the same ratio for projecting the R&M expenses. Below table shows the projections summary of the R&M expenses:

Table 10 - R&M expenses projections for 4th Control period

Name of the Parameter	FY19	FY20	FY21	FY22	FY23	FY24
Average R&M as % of Opening GFA	2.55%	2.55%	2.55%	2.55%	2.55%	2.55%
Opening GFA	13,896	15,506	17,900	21,586	26,696	31,936
Enhanced wages to outsourced employees	101	101	101	101	101	101
R&M expenses	**456**	**497**	**558**	**652**	**783**	**917**

b. Employee expenses (EE) and Administrative and General (A&G) expenses
As per MYT order for 3rd Control period, commission has recommended all the licensees to project EE and A&G expense based on the norms linked to Number of Substations (SS), line length (Circuit KM), Number of consumers and Number of DTRs. Licensee has adopted the same methodology for projecting the employee expenses and A&G expenses for 4th Control period. The methodology for projecting employee expenses is explained below. Same methodology has been adopted for projecting A&G expenses:

(1) For each year, actual Employee expenses is allocated to Substations, Line length, DTRs and Consumers in the ratio of 49%:21%:10%:20%. The following ratios are calculated: Employee expense/ Substation, Employee expense/ circuit km of line length, Employee expense/ DTR, Employee expense/ Consumer.

Below table shows the historical data for Employee expenses, A&G expenses and Number of Substations (SS), line length (Circuit KM), Number of consumers and Number of DTRs.

Table 11 - Employee and A&G expenses for 3rd Control period

Parameter	Unit	FY14	FY15	FY16	FY17	FY18
Employee Expenses (EE)	**Rs. Crs.**	854	1813	1508	1347	1662
A&G Expenses	**Rs. Crs.**	52	83	87	97	179
No. of Consumers	Nos.	9,915,158	10,272,545	10,701,263	11,379,916	11,822,731
Number of DTRs	Nos.	313,976	446,468	514,348	544,505	594,863
Line Lengths	Kms	274,896	374,153	384,459	432,220	445,500
Number of SS	Nos.	1,253	1,461	1,982	2,015	2,045

Below table shows the historical norms for the ratios:

Table 12 - Norms for Employee and A&G expenses

Parameter	Unit	FY14	FY15	FY16	FY17	FY18
EE / Consumers	Rs./Nos	172	353	282	237	281
EE / DTR	Rs./Nos	2,720	4,061	2,932	2,473	2,793
EE / Line	Rs./Kms	6,525	10,177	8,236	6,543	7,832
EE /SS	Rs./Nos.	3,340,095	6,081,131	3,727,783	3,274,754	3,981,226

Parameter	Unit	FY14	FY15	FY16	FY17	FY18
A&G Exp/ Consumers	Rs./Nos.	11	16	16	17	30
A&G Exp/DTR	Rs./Nos.	167	186	170	178	302
A&G Exp/line	Rs./Kms	401	465	477	470	846
A&G Exp/SS	Rs./Nos.	205,236	277,896	215,820	235,044	430,002

(2) To arrive at the average of these ratios, the Licensee has considered the data from FY 2013-14 onwards. Average of these ratios for the 5 years between FY2013-14 and FY2017-18 has been considered as the norms for FY2015-16. These norms for FY2015-16 onwards are escalated for by using the escalation rate calculated based on the WPI and CPI index as shown below:

Escalation Rate: For the projections of the expenses, licensee has considered the escalation (inflation) rate as calculated from the WPI and CPI indexes in the 3rd Control period as shown below.

Inflation rate depends on the Consumer Price Index (CPI) for industrial workers and Wholesale Price Index (WPI). The below table lists the CPI (Industrial Worker) and WPI data from FY12 to FY18.

Table 13: CPI, WPI data for FY2013-14 to FY2017-18

Particulars	FY12	FY13	FY14	FY15	FY16	FY17	FY18
WPI	100.0	106.9	112.5	113.9	109.7	111.6	114.9
CPI	194.8	215.2	236.0	250.8	265.0	275.9	284.4

Source: CPI - www.labourbureau.nic.in, WPI - www.eaindustry.nic.in (Office of the Economic Advisor website)

Basis the observed historical CPI and WPI numbers (CPI- Industrial Workers: 40% and WPI: 60%) and calculated the inflation factor based on the illustrative methodology suggested by CERC as shown below:

Table 14 - Calculation for Inflation Rate

Year	WPI	CPI	Composite number	Rt= Yt/Y1	Ln (Rt)	Year - 1	Product
FY12	100	194.8	137.9				
FY13	106.9	215.2	150.2	1.09	0.09	1	0.09
FY14	112.5	236.0	161.9	1.17	0.16	2	0.32
FY15	113.9	250.8	168.7	1.22	0.20	3	0.60
FY16	109.7	265.0	171.8	1.25	0.22	4	0.88
FY17	111.6	275.9	177.3	1.29	0.25	5	1.26
FY18	114.9	284.4	182.7	1.32	0.28	6	1.69
A= Sum of Product column			4.83				
B= 6A			28.98				

Year	WPI	CPI	Composite number	Rt= Yt/Y1	Ln (Rt)	Year - 1	Product
C= n(n-1)(2n-1); n= number of years of data			546.00				
D=B/C			0.05				
g= exp (D)-1			0.05				
Escalation rate= g*100			**5.45**				

The inflation factor is observed to be 5.45% during 3rd Control period. However, for projections of the expenses, licensee has considered 95% of this escalation rate which is 5.16%.

Below are the projected norms for FY2015-16 onwards.

Table 15- Projected norms for Employee and A&G expenses (FY17 to FY18)

Parameter	FY16	FY17	FY18
EE / Consumers	265	279	293
EE / DTR	2,996	3,150	3,313
EE / Line	7,863	8,268	8,695
EE /SS	4,080,998	4,291,577	4,513,023
A&G Exp/Consumers	18	19	20
A&G Exp/DTR	200	211	222
A&G Exp/line	532	559	588
A&G Exp/SS	272,800	286,876	301,679

Table 16 - - Projected norms for Employee and A&G expenses (FY19 to FY24)

Parameter	FY19	FY20	FY21	FY22	FY23	FY24
EE / Consumers	308	324	341	358	377	396
EE / DTR	3,484	3,664	3,853	4,052	4,261	4,481
EE / Line	9,144	9,615	10,112	10,633	11,182	11,759
EE /SS	4,745,895	4,990,783	5,248,307	5,519,120	5,803,906	6,103,388
A&G Exp/Consumers	21	22	23	24	26	27
A&G Exp/DTR	233	245	258	271	285	300
A&G Exp/line	618	650	684	719	756	795
A&G Exp/SS	317,245	333,615	350,830	368,933	387,970	407,989

(3) The projected ratios based on the escalation rates are multiplied by the projected Number of Substations (SS), line length (Circuit KM), Number of consumers and Number of DTRs in order to arrive at the employee expenses and A&G expenses for the respective years of 4th Control period.

(4) As per section 1.6, the additional pay under Employee expenses due to pay revision towards outsourced employees working in offices (corporate office and field offices) w.e.f. FY2018-19 is Rs. 2.166 Cr. per month.

Below table shows the projected Number of Substations (SS), line length (Circuit KM), Number of consumers and Number of DTRs and the projected employee expense and A&G expenses:

Table 17 - Projections for Employee and A&G expenses

Parameter	Unit	FY19 (RE)	FY20	FY21	FY22	FY23	FY24
No. of Consumers	Nos.	11,251,542	11,925,805	12,522,096	13,148,199	13,805,609	14,495,892
Number of DTRs	Nos.	697,461	716,091	734,871	755,981	779,591	806,141
Line Lengths	Kms	462,305	477,812	493,783	511,864	532,219	555,280
Number of SS	Nos.	2,328	2,569	2,814	3,090	3,398	3,746
Enhanced wages to outsourced employees	Rs. Cr.	26	26	26	26	26	26
Employee Expenses	Rs. Cr.	2,143	2,416	2,712	3,053	3,446	3,901
A&G Expenses	Rs. Cr.	142	161	181	203	230	260

O&M projections summary for the Control period and break-up are shown in the table below.

Table 18 - Summary of O&M expense projections

Parameter	Unit	FY19 (RE)	FY20	FY21	FY22	FY23	FY24
Employee Cost	Rs. Crs	2,143	2,416	2,712	3,053	3,446	3,901
A&G Cost	Rs. Crs	142	161	181	203	230	260
R&M Cost	Rs. Crs	456	497	558	652	783	917
Total O&M Expenses	**Rs. Crs**	**2,741**	**3,074**	**3,451**	**3,909**	**4,458**	**5,078**

1.7 Weighted Average Cost of Capital (WACC)

The Regulation prescribes that the licensees will be compensated for the financing costs through Return on Capital Employed (ROCE) principles. This principle is aimed to provide the licensee with the return on debt as well as return on equity at a normative level. The licensee has computed the ROCE as provided in the Clause 15 of the Regulation which specifies that the ROCE be computed by multiplying the Regulated Rate Base (RRB) by the Weighted Average Cost of Capital (WACC).

The Regulation specifies the following methodology for computation of ROCE:

Return on Capital Employed (RoCE) for the RRB for the year 'i' shall be computed in the following manner:

$RoCE_i$ = WACC * RRB_i

Where RRBi is the Regulated Rate Base for the year 1 and WACC is the Weighted Average Cost of Capital. The detailed computation of RRB is explained in Section 2.5 above. With respect to the WACC, the Regulation specifies the formula as follows:

$$WACC_{RRB} = \left[\frac{D/E}{1+D/E}\right] r_d + \left[\frac{1}{1+D/E}\right] r_e$$

Where,

D/E is the Debt to Equity Ratio – Licensee is proposing a normative Debt: Equity ratio of 75:25

- r_d is the Cost of Debt – Licensee has considered the cost of debt as the weighted average of the debt rates for the ongoing loans and projected loans.

Table 19 - Calculation for Debt Rate

Particulars	FY19	FY20	FY21	FY22	FY23	FY24
Ongoing Loans (Opening balance) (Rs. Cr.) (Excl. Working capital loans)	11,001	10,833	9,961	8,692	7,632	6,816
Debt rate of Ongoing Loans (%)	10.3%	10.1%	10.0%	10.1%	10.0%	9.9%
New Loans (Opening balance) (Rs. Cr.)	0	800	2,188	3,671	5,438	7,386
Debt rate of New Loans (%)	11.7%	11.6%	11.7%	11.8%	12.0%	12.0%
Weighted Average of Debt rate (%)	10.4%	10.2%	10.3%	10.6%	10.8%	11.0%

Below are the various funding agencies for the ongoing loans in 4th Control Period.

Table 20 - Funding Agencies for FY18, FY19, FY20

		FY18		FY19		FY20	
Sr. No.	**Funding Agency**	**Closing Balance**	**IR**	**R**	**IR**	**R**	**IR**
1	REC	6371.87	11.00%	675.52	11.00%	324.47	11.00%
2	PFC	2076.62	10.2%-11.5%	28.05	9.00%	-	9.00%
3	WB	-		226.48	9.00%	337.18	9.00%
4	PTC Financial services Ltd	300.00	10.50%				
5	Merger Loans from TSSPDCL	1643.33	11.00%				
6	FRP Bonds	335.05	9.95%				
7	STL from CPDCL	180.92	11.00%				
8	Govt. Loan	9.48	3.00%				
9	JICA	264.86	0.65%				
10	SBI CC Limits	245.33	10.15%				

		FY18		FY19	FY20
11	Andhra Bank CC Limits	275.06	10.00%		
12	Transco ICD	199.82	8.45%		
	Total	**11902.34**		**930.05**	**661.65**

R: Receipts of loans (Rs. Cr.); IR: Annual interest Rate (%)

Table 21 - Funding Agencies for FY21, FY22, FY23, FY24

		FY20		FY22		FY23		FY24	
Sr. No.	**Funding Agency**	**R**	**IR**	**R**	**IR**	**R**	**IR**	**R**	**IR**
1	REC	1.97	11.00%	-	-	-	-	-	-
3	WB	337.18	9.00%	228.17	9.00%	-	-	-	-
	Total	**339.15**		**228.17**		**-**		**-**	

R: Receipts of loans (Rs. Cr.); IR: Annual interest Rate (%)

It is to be noted that currently World Bank loans are being considered as long term loans in books of accounts and not as grants.

- r_e is the Return on Equity – It has been the prevailing regulatory practice to consider 14% as the Return on Equity (ROE) in the ARR of Network business of AP Power Utilities. The APDISCOMs request the Hon'ble APERC to continue the same practice for the 4th Control period also, in view of the prevailing equity market conditions.

Based on the RRB explained earlier, the WACC and the ROCE for the 4th Control Period is as follows:

Table 22: Projected WACC

Particulars	FY19	FY20	FY21	FY22	FY23	FY24
Capital Structure						
Debt Percent	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
Equity percent	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Cost of Funds						
Cost of Debt percent	10.4%	10.2%	10.3%	10.6%	10.8%	11.0%
Return on Equity percent	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%
WACC	**11.3%**	**11.1%**	**11.2%**	**11.4%**	**11.6%**	**11.7%**

1.8 Return on Equity

As per the Hon'ble Commission MYT Tariff order, the Return on Equity considered for arriving at Weighted Average Cost of Capital is taken as 14%.

1.9 Return on Capital Employed

The licensee has arrived at RoCE for all five years of the control period as a product of Regulated Rate Base (RRB) and Weighted Average Cost of Capital (WACC) which is as follows:

Table 23: Projected ROCE (Rs. Cr.)

Particulars	FY19 (RE)	FY20	FY21	FY22	FY23	FY24
Regulated Rate Base	4,585	5,530	7,379	10,395	13,920	16,341
WACC	**11.3%**	**11.1%**	**11.2%**	**11.4%**	**11.6%**	**11.7%**
Return on Capital Employed	**517**	**617**	**830**	**1,191**	**1,618**	**1,919**

1.10 Special Appropriations for safety measures

Licensee has not considered any additional cost towards safety measures for the 4th Control period as the same is covered under O&M expenses.

1.11 Taxes on Income

The licensee projects 20% tax (Minimum Alternate Tax) on Return on Equity during the current fiscal and during ensuing control period. The details are as follows:

Table 24: Projected Taxes on Income

	FY19 (RE)	FY20	FY21	FY22	FY23	FY24
RRB	4,585	5,530	7,379	10,395	13,920	16,341
25% of Regulatory Rate Base	1,146	1,383	1,845	2,599	3,480	4,085
ROE %	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%
Expected Profit @ 14% on 25% of RRB	160	194	258	364	487	572
Tax on Income @ 20%	**40**	**48**	**65**	**91**	**122**	**143**

1.12 Other Expenses

The Licensee expects the other expenses to increase marginally by 3% every year. Below table shows the components of other expenses.

Table 25: Other Expenses Details

Particulars	FY19	FY20	FY21	FY22	FY23	FY24
Misc Other Expenses	36.5	37.6	38.7	39.8	41.0	42.3

1.13 Non- tariff income

Licensee has projected the non-tariff income based on the historical actual non-tariff income. Below is the summary of the non-tariff income for the 4th control period.

Table 26 - Projections of Non-tariff income

Particulars for 33 kV OA Consumers	FY18 (Actual)	FY19	FY20	FY21	FY22	FY23	FY24
Staff Loans & Advances	0.94	0.97	1.00	1.03	1.06	1.09	1.12
Fines & Penalties from Suppliers & Contractors	11.04	11.37	11.71	12.06	12.43	12.80	13.18
Profit on Sale of Scrap	-20.19	-20.80	-21.42	-22.06	-22.72	-23.41	-24.11
Sale of Tender Schedules	1.00	1.03	1.06	1.09	1.13	1.16	1.19
Rental from Contractors	0.06	0.06	0.06	0.07	0.07	0.07	0.07
Supervision Charges	7.37	7.59	7.82	8.05	8.29	8.54	8.80
Miscellaneous Income	70	72	74	76	79	81	83
Withdrawal from Consumer Contribution towards Depreciation on Fixed Assets	323	355	391	430	473	520	572
Total (Rs. Crs.)	**393**	**427**	**465**	**506**	**552**	**601**	**656**

1.14 Revenue Requirement

Following table shows the projected revenue requirement for the distribution licensee during the 4th Control Period.

Table 27: Projected Revenue Requirement for 4th Control Period

Particulars	FY19 (RE)	FY20	FY21	FY22	FY23	FY24
O&M Charges (Net)	2,741	3,074	3,451	3,909	4,458	5,078
Depreciation	799	922	1,103	1,355	1,699	2,084
Advance Against Depreciation	0	0	0	0	0	0
Taxes on Income	40	48	65	91	122	143
Other Expenditure	36	38	39	40	41	42
Special Appropriations	0	0	0	0	0	0
Total Expenditure	**3,617**	**4,082**	**4,657**	**5,395**	**6,320**	**7,347**
Less: IDC and expenses capitalized*	222	302	385	407	325	190
Less: O&M expenses capitalized	0	0	0	0	0	0
Net Expenditure	**3,396**	**3,780**	**4,273**	**4,988**	**5,995**	**7,157**
Add Return on Capital Employed	517	617	830	1,191	1,618	1,919
Total Distribution ARR	**3,913**	**4,398**	**5,103**	**6,179**	**7,614**	**9,076**
Less: Wheeling Revenue from Third Party/Open Access/NTI (if any)	428	466	508	553	603	657
Revenue Requirement, (Net transferred to Retail Supply Business)	**3,485**	**3,932**	**4,595**	**5,626**	**7,011**	**8,419**

2 Wheeling Charges and Losses

The licensee has determined voltage wise wheeling charges and losses to recover ARR and distribution network losses. As per the Regulation, the licensee has determined the ARR for the distribution business and that forms the basis for determination of wheeling charges.

2.1 Determination of voltage wise demand

The Distribution Licensee has captured the historical Contracted Demand of 33 kV and 11 kV. Whereas, Coincident demand of LT category has been considered due to high diversity factor in LT connected load, restricted supply given to agricultural consumers. The coincident demand has been considered as the average of the contracted demand for each year.

Below are the Contracted Demand of 33 kV and 11 kV and Coincident demand of LT for each year of the third Control Period.

Table 28 - Contracted demand and Coincident demand

Parameter	Voltage Level	FY14	FY15	FY16	FY16	FY18
Contracted Load – CD_{33}	33 kV	895	883	884	891	955
Contracted Load – CD_{11}	11 kV	987	1,015	1,038	1,103	1,189
Coincident Demand – CID_{LT}	LT	1,652	1,903	2,308	2,639	2,797

Considering the historical growth of the above, the Licensee has projected the Contracted Demand of 33 kV and 11 kV and Coincident demand of LT for each year of the 4th Control Period as shown in the below table.

Table 29: Voltage-wise Demand

Parameter	Voltage Level	FY19	FY20	FY21	FY22	FY23	FY24
Contracted Load – CD_{33}	33 kV	970	986	1,002	1,018	1,034	1,051
Contracted Load – CD_{11}	11 kV	1,245	1,305	1,367	1,432	1,500	1,572
Coincident Demand – CID_{LT}	LT	3,190	3,639	4,151	4,736	5,402	6,162

The Load at 33 KV contributed from all voltages was computed by adding up the following

- Grossed up 33 kV Contracted Load with 33 kV losses
- Grossed up 11 kV Contracted Load with 11 kV losses and further by 33 kV losses
- Grossed up Coincident Demand of LT with LT losses and further by 11kV and then by 33 kV losses

The Load at 11 kV contributed from all the voltages was computed by adding the following

- Grossed up 11 kV Contracted load with 11 kV losses
- Grossed up Coincident Demand of LT with LT losses and further by 11kV

The Load at LT contributed from all the voltages was computed by adding the following

- Grossed up Coincident Demand of LT with LT losses

Below is the assumptions considered for wheeling losses.

The licensee has taken various steps to reduce the losses like strengthening of the network infrastructure, addition of network elements, and vigorously undertaking the Energy Audit visit to keep a close tab on the losses. The licensee has considered the losses for FY 2018-19 as per approved figures in Retail ARR Tariff Order for FY 2018-19.

Based on the historical performance and the loss reduction measures carried out in the state, licensee has projected the losses for 4th control period as mentioned in the table below.

Table 30 - Loss Trajectory for LICENSEE

Voltage Level	FY 19*	FY20*	FY21	FY22	FY23	FY24
LT	4.40%	4.36%	4.31%	4.27%	4.23%	4.18%
11 kV	3.38%	3.35%	3.31%	3.28%	3.25%	3.21%
33 kV	3.35%	3.32%	3.28%	3.25%	3.22%	3.19%

**Distribution losses are assumed as per the projected losses in the Retail Supply ARR filed with APERC on 24th Nov 2018.*

The losses has been considered as per the Resource Plan filed with APERC for the 4th Control Period.

The below table lists the Demand and Contracted load after adjusting for the losses:

Table 31: Voltage-wise Load after loss adjustment

	FY20	FY21	FY22	FY23	FY24
Load at 33 kV from all voltages	6,488	7,136	7,869	8,695	9,626
Load at 11 kV from all voltages	5,287	5,901	6,595	7,380	8,268
Load at LT from all voltages	3,805	4,339	4,947	5,640	6,431

2.2 Determination of voltage wise Gross Fixed Assets

The Distribution licensee has projected voltage wise asset base (GFA) for each year of the control period based on opening GFA and projected assets addition. The following table summarizes voltage wise assets for each year of the MYT 4th Control Period:

Table 32: Voltage-wise Asset Base

Voltage level	FY20	FY21	FY22	FY23	FY24
33 kV	2,272	2,740	3,388	4,054	4,508
11 kV	11,178	13,480	16,671	19,943	22,177
LT	4,450	5,366	6,636	7,939	8,828
Total	**17,900**	**21,586**	**26,696**	**31,936**	**35,513**

The GFA additions are projected based on physical assets added to the respective voltages. However, voltage wise GFA should be segregated based on exclusive utilization of asset for the respective voltage level i.e. 11 kV assets being used by 11 kV loads and LT loads, 33 kV assets being used by 33 kV, 11 kV and LT loads. Exclusive voltage wise assets have been segregated based on Contracted demand for 33 kV and 11 kV and Coincident demand for LT after adjusting for losses - apportioning of 33 kV asset base towards 33 kV, 11 kV and LT, apportioning of 11 kV asset base towards 11 kV and LT. The LT asset base is considered 100% towards LT. Voltage wise asset base after apportioning is as shown below:

Table 33: 33 kV Voltage Asset Base Apportioning

	FY20	FY21	FY22	FY23	FY24
33 kV	357	398	453	498	508
11 kV	489	561	659	747	785
LT	1,426	1,781	2,276	2,808	3,214
Total	**2,272**	**2,740**	**3,388**	**4,054**	**4,508**

Table 34: 11 kV Voltage Asset Base Apportioning

	FY20	FY21	FY22	FY23	FY24
11 kV	2,854	3,229	3,742	4,190	4,355
LT	8,324	10,251	12,928	15,754	17,822
Total	**11,178**	**13,480**	**16,671**	**19,943**	**22,177**

Table 35: LT level Asset Base Apportioning

	FY20	FY21	FY22	FY23	FY24
LT	4,450	5,366	6,636	7,939	8,828
Total	**4,450**	**5,366**	**6,636**	**7,939**	**8,828**

Table 36: Total Asset Base Apportioning at each voltage level

	FY20	FY21	FY22	FY23	FY24
33 kV	**357**	**398**	**453**	**498**	**508**
11 kV	**3,343**	**3,790**	**4,401**	**4,937**	**5,141**
LT	**14,200**	**17,398**	**21,841**	**26,501**	**29,864**
Total	**17,900**	**21,586**	**26,696**	**31,936**	**35,513**

2.3 Allocation of ARR Cost allocation methodology

Distribution Licensee has proposed allocation of ARR components to the various voltages for determination of wheeling charges as shown below:

2.3.1 O&M Expense allocation

1) Employee Expenses (EE) and Administrative & General Expenses (A&G)

   Employee expenses and A&G expenses have been apportioned as per the distribution of No. of Consumers, Number of DTRs, Length of lines and Number of SS.
   a) Licensee projected the voltage wise No. of Consumers, Number of DTRs, Lengths of lines and Number of SS and then observed voltage-wise percentage of each of these parameters.
   b) As per employee expenses and A&G expenses projections done in section 2.6, licensee allocated these expense into SS, line length, DTR and consumer in the ratio of 49% : 21% : 10% : 20%.
   c) Expense allocation of SS, line length, DTR and consumers are then apportioned to LT, 11kV and 33kV voltage level as per the observed percentages of these parameters.

2) Repairs & Maintenance (R&M) expenses
   The Distribution licensee has observed that the actual R&M expenses are a function of asset base. An increase in the asset base leads to a proportional increase in R&M expenses. Hence, R&M Expenses have been allocated based on the voltage level asset base (net).

2.3.2 Depreciation, Interest/ROCE, Taxes and Other Expenses

Depreciation Interest/ROCE, Taxes and Other Expenses computation is directly linked to the asset base. Hence, they have been allocated based on the apportioned asset base.

ARR

The voltage wise ARR has been arrived with the methodology explained above which is summarized in the below table:

Table 37: ARR for Wheeling Charges

		FY20	FY21	FY22	FY23	FY24
ARR_{33}	33 kV	54	63	77	96	113
ARR_{11}	11 kV	913	987	1,142	1,370	1,493
ARR_{LT}	LT	2,965	3,546	4,407	5,545	6,813
	Total	**3,932**	**4,595**	**5,626**	**7,011**	**8,419**

The voltage wise wheeling charges are computed by dividing the ARR at that voltage level divided by the Demand at that voltage level arrived in section 3.2 as summarized in the below table.

Table 38: Computaiton for Voltage-wise Wheeling Charges

Voltage Level	Voltage-wise wheeling charges
33kV	ARR_{33} / CD_{33}
11kV	ARR_{11} / CD_{11}
LT	ARR_{LT} / CID_{LT}

CD - Contracted demand adjusted for losses
CID - Coincident demand

Based on the methodology explained above, the licensee is proposing the following distribution wheeling charges for each of the control period.

Table 39: Distribution Wheeling Charges for 4th Control Period

Voltage Level	FY20	FY21	FY22	FY23	FY24
33 kV (Rs./kVA/Month)	45	52	63	77	89
11 kV (Rs./kVA/Month)	583	602	664	761	792
LT (Rs./kVA/Month)	679	712	776	855	921

- A consumer drawing energy at the 33 kV level of the Distribution licensee network would have to pay the wheeling charges for 33 kV
- A consumer drawing energy at 11 kV level of the Distribution licensee network would have to pay the wheeling charges of 11 kV
- A consumer drawing energy at LT level of the Distribution licensee network would have to pay the wheeling charges for LT

Annexure A

3 Sales Forecast, Load Forecast, Capital Expenditure

3.1 Sales Projections for Non-scheduled Consumers

Based on projected CAGRs, category-wise sales projections for 4th Control Period has been shown below:

Table 40 - Sales projections for 4th Control Period (MUs)

Consumer Category	FY18 (Actual)	FY19*	FY20*	FY21	FY22	FY23	FY24	CAGR
LT Category								
LT-I Domestic	8,167	8,578	9,119	9,651	10,797	12,098	13,572	**9.61%**
LT-II Non-domestic/Commercial	1,750	1,863	1,993	2,193	2,447	2,735	3,067	**10.48%**
LT-III Industrial	2,038	2,293	2,592	3,001	3,440	3,956	4,563	**14.75%**
LT-IV Cottage Industries	40	45	49	50	54	59	63	**6.96%**
LT-V Agriculture	8,640	9,894	10,293	10,639	10,984	11,330	11,675	**3.37%**
LT-VI Street Lighting & PWS	700	693	725	803	842	882	925	**5.95%**
LT-VII General Purpose	101	107	114	123	133	142	153	**7.41%**
LT-VIII Temporary Supply	1.3	1.2	1.2	1.39	1.44	1.49	1.55	**5.25%**
LT Total	**21,437**	**23,474**	**24,886**	**26,460**	**28,698**	**31,203**	**34,019**	**7.70%**
HT Category								
HT-I Industry	6,455	7,322	7,877	7,731	8,254	8,834	9,480	**5.30%**
HT-I (B) Ferro-Alloys	398			484	517	554	595	
HT-II Others (Commercial)	774	814	862	977	1,080	1,201	1,342	**10.52%**
HT-III Public Infrastructure and Tourism	56	54	57	65	68	72	76	**7.07%**
HT - IV Agriculture	1,079	2,240	2,979	2,742	2,916	3,102	3,302	**8.07%**
HT-V Railway Traction	740	825	849	785	801	817	833	**0.19%**
HT-VI Townships and Residential Colonies	26	27	30	29	30	31	32	**3.46%**
HT-VII Green Power	0	0	0	0	0	0	0	**0.00%**
HT-VII RESCOs	369	475	509	478	521	569	620	**5.47%**
HT-VIII Temporary Supply	0.48	1.6	1.9	0.51	0.52	0.53	0.54	**-19.53%**
HT Total	**9,897**	**11,759**	**13,165**	**13,292**	**14,188**	**15,181**	**16,281**	**6.72%**
LT+HT Total	**31,335**	**35,233**	**38,051**	**39,752**	**42,886**	**46,384**	**50,300**	**7.38%**

**Sales for FY19 and FY 20 has been taken as per revised estimates as per ARR filing for FY2019-20. For Remaining years, sales estimates have been revised based on the FY 2019-20 ARR filings for the 4th control period.*

3.2 Sales forecast for Open Access Consumers

Table 41 - Sales projections for 4th Control Period (MUs) _ Open Access

OA Categories	FY19	FY20	FY21	FY22	FY23	FY24
3rd Party	470	470	470	470	470	470
IEX	1,271	1,398	1,538	1,692	1,861	2,047
Intrastate	299	329	361	398	437	481
EVs (To be met by IEX)	0	7	30	73	129	205
Total (MUs)	**2041**	**2204**	**2400**	**2633**	**2898**	**3204**

3.3 Load Forecast

On the basis of Energy Input at 33 kV level for Discom and circle and assumed load factors for FY2017-18, licensee projected demand in MW for 4th period as per formula mentioned below:

Peak Demand (MW) = Energy required / (24*365/1000)/ load factor

3.3.1 State Level Demand forecast

The peak demand forecasted at the state level has been shown below:

Table 42 - State peak demand for 4th Control Period

Parameters	FY18 (Actuals)	FY19	FY20	FY21	FY22	FY23	FY24	CAGR
Energy Req at state level (MUs)	56,209	64,030	68,606	73,212	79,146	85,776	93,106	**8.8%**
State Peak Demand (MW)	8,983	10,532	11,450	12,219	13,209	14,315	15,539	**9.6%**

3.3.2 Circle/Discom Level Demand forecast

On the basis of non-coincident load factors and energy input at 33 kV level each Discom & circle level, mentioned above, non-coincident peak demands at Discom level & at circle level have also been estimated. Summary of the non-coincident peak demands at LICENSEE is shown below:

Table 43 - LICENSEE Non-coincident peak demand (MW)

Circle/Peaks at 33 kV level	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29
Vijayawada	903	994	1,104	1,228	1,370	1,530	1,711	1,917	2,155	2,430	2,748	3,114
Guntur	692	801	887	985	1,097	1,225	1,371	1,540	1,738	1,970	2,241	2,560
Ongole	595	631	675	724	778	836	900	971	1,051	1,143	1,248	1,367
Nellore	606	666	726	796	877	969	1,075	1,197	1,341	1,511	1,711	1,947
Tirupati	1,064	1,133	1,201	1,275	1,355	1,441	1,534	1,636	1,750	1,879	2,023	2,186

Circle/Peaks at 33 kV level	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29
Kadapa	684	711	747	787	832	883	938	1,001	1,074	1,160	1,260	1,375
Anantapur	978	1,081	1,126	1,177	1,233	1,294	1,361	1,436	1,522	1,621	1,735	1,865
Kurnool	525	541	571	604	642	683	729	780	839	909	991	1,085
SPDCL	**5,094**	**5,545**	**5,968**	**6,447**	**6,986**	**7,591**	**8,271**	**9,041**	**9,934**	**10,971**	**12,173**	**13,564**

3.4 Capital Expenditure Projections for 4th Control Period

Table 44 – Total Forecasted CAPEX for 4th Control period

S. No.	Item	FY19	FY20	FY21	FY22	FY23	FY24
Total Capital Expenditure forecasted (Rs. Cr.)		**2320**	**2664**	**2462**	**2743**	**2862**	**3206**