CHAPTER-5

DATA ANALYSIS AND FINDINGS

5.1 INTRODUCTION

This chapter would focus on the analysis of the data that has been collected through Questionnaire from different Utilities. The data that has been collected as per the research procedure as explained in the preceding chapter would now be subjected to analysis techniques to get valuable results.

The scale reliability was checked before the data analysis part. The following table shows the value:

Table 5.1: Reliability test

Case Processing Summary

		N	%
Cases	Valid	332	94.9
	Excluded[a]	18	5.1
	Total	350	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics	
Cronbach's Alpha	N of Items
.745	81

Apart from the overall reliability the questionnaire contributing to major factors has the following reliability. Summary of the followings is appended below. Details regarding the SPSS analysis is provided in the Annexure-2.

Table 5.2: Cronbach Alpha (α) Score

Sr.No	Questions (variables)	Factors	Cronbach Alpha(α)
1	Q19,Q6,Q12,Q34	Technology Adoption	0.604
2	Q48, Q49,Q50	Asset Optimization	0.619
3	Q29,Q30,Q24,Q28	Capacity Building	0.613
4	Q68,Q69,Q70	Business Prospects	0.609
5	Q15,Q16,Q17,Q18	Customer Satisfaction	0.643
6	Q34,Q33,Q32,Q31	Reforms in Power sector	0.637
7	Q45,Q46,Q47	Competitiveness in Power Sector	0.581
8	Q78,Q80,Q81	Employee Contentment	0.551
9	Q41,Q42,Q44	Political Prepositions	0.567
10	Q53,Q54,Q55	Corporate Social Strategy	0.532

RELIABILITY
/MODEL=ALPHA.

Generally, a value above 0.5 is acceptable. It depicts that the scale used for data collection has an internal consistency and it can be used for the data collection and analysis purpose.

Apart from reliability inter item correlation matrix were checked for the convergent and divergent validity of the questionnaire is verified using SPSS.

Table 5.3: Inter-item correlation matrix proving convergent validity of the instrument

Technology adoption factor

Variable Items	Q29	Q30	Q24	Q28
Q29	1	0.400	0.275	0.234
Q30	0.400	1	0.268	0.284
Q24	0.275	0.268	1	0.274
Q28	0.234	0.284	0.274	1

Asset Optimization factor

Variable Items	Q48	Q49	Q50
Q48	1	0.443	0.347
Q49	0.443	1	0.269
Q50	0.347	0.269	1

Details regarding the SPSS analysis is provided in the Annexure-B.

Table 5.4: Inter-item correlation matrix proving the discriminant validity of the instrument

Items	Q19	Q6	Q12	Q35	Q48	Q49	Q50
Q19	1	0.42	0.456	0.321	0.084	0.037	0.035
Q6	0.42	1	0.474	0.42	0.018	-0.006	-0.105
Q12	0.456	0.474	1	0.389	0.024	-0.049	-0.025
Q35	0.321	0.42	0.389	1	0.059	0.04	0.072
Q48	0.084	0.018	0.024	0.059	1	0.443	0.347
Q49	0.037	-0.006	-0.049	0.04	0.443	1	0.269
Q50	0.035	-0.105	-0.025	0.072	0.347	0.269	1

There is no correlation between the two groups and the inter-correlation matrix of all these 7 items should bring out the dissimilarity between these 2 groups.

Complete correlation matrix is provided in the Annexure-B. Detailed report is appended in Annexure-B

Once the reliability and validity has been found good, Reduction of data was done using SPSS. Before doing the reduction KMO and Bartlett's test was performed on the data.

```
FACTOR
  /VARIABLES Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18
Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 Q27 Q28 Q29 Q30 Q31 Q32 Q33 Q34 Q35 Q36 Q37
Q38 Q39 Q40 Q41 Q42 Q43 Q44 Q45 Q46 Q47 Q48 Q49 Q50 Q51 Q52 Q53 Q54 Q55 Q56
Q57 Q58 Q59 Q60 Q61 Q62 Q63 Q64 Q65 Q66 Q67 Q68 Q69 Q70 Q71 Q72 Q73 Q74 Q75
Q76 Q77 Q78 Q79 Q80 Q81
  /MISSING LISTWISE
  /ANALYSIS Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18
Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 Q27 Q28 Q29 Q30 Q31 Q32 Q33 Q34 Q35 Q36 Q37
Q38 Q39 Q40 Q41 Q42 Q43 Q44 Q45 Q46 Q47 Q48 Q49 Q50 Q51 Q52 Q53 Q54 Q55 Q56
Q57 Q58 Q59 Q60 Q61 Q62 Q63 Q64 Q65 Q66 Q67 Q68 Q69 Q70 Q71 Q72 Q73 Q74 Q75
Q76 Q77 Q78 Q79 Q80 Q81
  /PRINT INITIAL CORRELATION KMO EXTRACTION ROTATION FSCORE
  /FORMAT SORT BLANK(.40)
  /PLOT EIGEN
  /CRITERIA MINEIGEN(1) ITERATE(25)
  /EXTRACTION PC
  /CRITERIA ITERATE(50)
  /ROTATION QUARTIMAX
  /METHOD=CORRELATION.
```

Table 5.5: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.608
Bartlett's Test of Sphericity	Approx. Chi-Square	8.082E3
	df	3240
	Sig.	.000

Table 5.6: Communalities

Communalities

	Initial	Extraction
Q1	1.000	.679
Q2	1.000	.625
Q3	1.000	.683
Q4	1.000	.638
Q5	1.000	.640
Q6	1.000	.663
Q7	1.000	.616
Q8	1.000	.680
Q9	1.000	.652
Q10	1.000	.709
Q11	1.000	.669
Q12	1.000	.675
Q13	1.000	.603
Q14	1.000	.659
Q15	1.000	.647
Q16	1.000	.642
Q17	1.000	.697
Q18	1.000	.644
Q19	1.000	.668
Q20	1.000	.693

Q21	1.000	.658
Q22	1.000	.700
Q23	1.000	.567
Q24	1.000	.636
Q25	1.000	.646
Q26	1.000	.750
Q27	1.000	.516
Q28	1.000	.647
Q29	1.000	.724
Q30	1.000	.640
Q31	1.000	.603
Q32	1.000	.686
Q33	1.000	.678
Q34	1.000	.733
Q35	1.000	.689
Q36	1.000	.684
Q37	1.000	.627
Q38	1.000	.728
Q39	1.000	.719
Q40	1.000	.646
Q41	1.000	.581
Q42	1.000	.686
Q43	1.000	.719

Q44	1.000	.674
Q45	1.000	.670
Q46	1.000	.643
Q47	1.000	.636
Q48	1.000	.683
Q49	1.000	.674
Q50	1.000	.635
Q51	1.000	.664
Q52	1.000	.566
Q53	1.000	.646
Q54	1.000	.693
Q55	1.000	.627
Q56	1.000	.713
Q57	1.000	.652
Q58	1.000	.716
Q59	1.000	.643
Q60	1.000	.683
Q61	1.000	.686
Q62	1.000	.609
Q63	1.000	.654
Q64	1.000	.541
Q65	1.000	.685
Q66	1.000	.635

Q67	1.000	.591
Q68	1.000	.610
Q69	1.000	.622
Q70	1.000	.736
Q71	1.000	.697
Q72	1.000	.605
Q73	1.000	.662
Q74	1.000	.681
Q75	1.000	.653
Q76	1.000	.550
Q77	1.000	.695
Q78	1.000	.594
Q79	1.000	.607
Q80	1.000	.624
Q81	1.000	.652

Extraction Method: Principal Component Analysis.

Generally the KMO value of more than 0.5 is acceptable to consider the data reduction technique to be valid. In our case the KMO value is 0.608 which indicates that we proceed for data reduction and find out considerable factors to carry out statistical analysis. Also Bartlett's test of sphericity suggests that the value is not significant at 95% confidence interval and we can deduce that the correlation matrix formulated for the various factors is not an identity. This implies that there are few variables present amongst all the variables identified for data analysis which have similarity between them and can be reduced to study their impact on the various dependent variables.

5.2 IDENTIFICATION OF FACTORS INFLUENCING POWER DISTRIBUTION UTILITIES USING FACTOR ANALYSIS:

After the KMO test, the data reduction was done through SPSS software. The analysis had shown 27 components with eigenvalues more than 1 showing 65% variation and the Eigen values are plotted through a scree plot. The variances explained are appended below. Complete data is provided in the annexure.

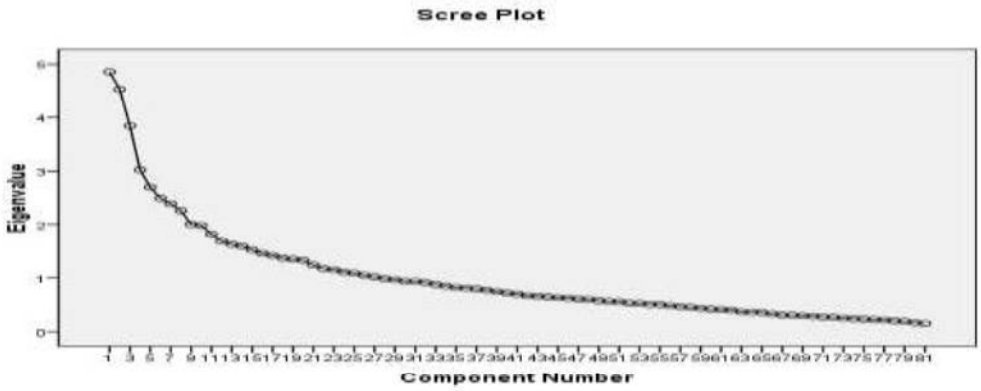


Figure 5.1: Scree Plot

Table 5.7: Total variance explained

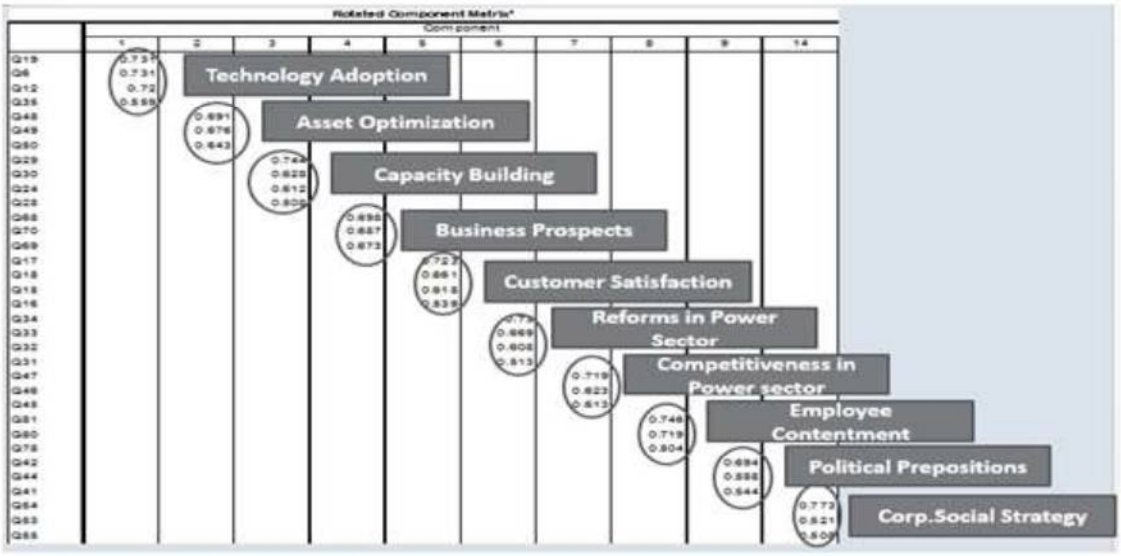
Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.858	5.997	5.997	4.858	5.997	5.997
2	4.529	5.591	11.588	4.529	5.591	11.588
3	3.844	4.745	16.334	3.844	4.745	16.334
4	3.022	3.731	20.065	3.022	3.731	20.065
5	2.697	3.330	23.395	2.697	3.330	23.395
6	2.492	3.077	26.472	2.492	3.077	26.472
7	2.390	2.950	29.422	2.390	2.950	29.422
8	2.263	2.794	32.216	2.263	2.794	32.216
9	2.007	2.477	34.693	2.007	2.477	34.693
10	1.984	2.449	37.142	1.984	2.449	37.142
11	1.818	2.245	39.387	1.818	2.245	39.387
12	1.687	2.083	41.470	1.687	2.083	41.470
13	1.625	2.007	43.476	1.625	2.007	43.476
14	1.591	1.965	45.441	1.591	1.965	45.441
15	1.522	1.879	47.320	1.522	1.879	47.320
16	1.455	1.796	49.116	1.455	1.796	49.116
17	1.417	1.749	50.865	1.417	1.749	50.865
18	1.367	1.688	52.553	1.367	1.688	52.553
19	1.347	1.663	54.216	1.347	1.663	54.216
20	1.329	1.640	55.856	1.329	1.640	55.856
21	1.235	1.525	57.382	1.235	1.525	57.382
22	1.169	1.443	58.825	1.169	1.443	58.825
23	1.149	1.419	60.244	1.149	1.419	60.244
24	1.104	1.364	61.607	1.104	1.364	61.607
25	1.086	1.341	62.948	1.086	1.341	62.948
26	1.047	1.293	64.241	1.047	1.293	64.241
27	1.016	1.254	65.495	1.016	1.254	65.495

Scree plot measures the Eigen value of the various factors derived and plots them against each component number. Generally the factors with Eigen value more than one are considered to be factors contributing good variation in the response.

The factors obtained were further depicted through component matrix. Component matrix is appendix annexure-2. In order to consider only key factors we have considered only the factor loading above 50% for the analysis.

Quantitative analysis-1 highlights 10 no's of key important factors influencing the business sustainability of power utility business which is highlighted below after doing the rotated component matrix. Complete table is appended in annexure-2. The factor identified through the analysis were grouped as per the variables pertaining to the factors.



Extraction Method: Principal Component analysis

Rotation Method: Quartimax with Kaiser Normalization

Rotation converged in 38 iteration

Figure 5.2: Rotated Component Matrix

This factor were then checked for the Normality test so as to decide upon the Parametric and non-parametric which could be applied to the data. For checking the normality of the data, Shapiro-Wilk test was used.

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Technology_Adoption	.157	340	.000	.913	340	.000
Asset_Optimization	.179	340	.000	.892	340	.000
Capacity_Building	.149	340	.000	.921	340	.000
Business_Prospects	.180	340	.000	.881	340	.000
Customer_Satisfaction	.143	340	.000	.918	340	.000
Reforms	.142	340	.000	.923	340	.000
Competitiveness	.181	340	.000	.906	340	.000
Employee_Contentment	.188	340	.000	.880	340	.000
Political_Prepostion	.191	340	.000	.892	340	.000
Corporate_Social_Strategy	.191	340	.000	.907	340	.000

Figure 5.3: Tests of Normality

- For all the data variables, the p-value was found to be lower than the significance level (0.05)
- This signifies that our data is not normally distributed
- Thus parametric tests cannot be applied on the data and we'll use non parametric test corresponding to ANOVA i.e. Kruskal-Wallis Test for Hypothesis testing

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Technology_Adoption is the same across categories of P5.	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.
2	The distribution of Asset_Optimization is the same across categories of P5.	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.
3	The distribution of Capacity_Building is the same across categories of P5.	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.
4	The distribution of Business_Prospects is the same across categories of P5.	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.
5	The distribution of Customer_Satisfaction is the same across categories of P5.	Independent-Samples Kruskal-Wallis Test	.021	Reject the null hypothesis.
6	The distribution of Reforms is the same across categories of P5.	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.
7	The distribution of Competitiveness is the same across categories of P5.	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.
8	The distribution of Employee_Contentment is the same across categories of P5.	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.
9	The distribution of Political_Prepostion is the same across categories of P5.	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.
10	The distribution of Corporate_Social_Strategy is the same across categories of P5.	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Figure 5.4: Summary of Hypothesis Testing- Utility Wise

Based on the Analysis, Kruskal Wallis Test was performed on the factors as the data were non-parametric.

Null Hypothesis: H0: Technology Adoption, Asset Optimization, capacity building, Business prospects, Customer satisfaction, Reforms in Power Sector, Competitiveness in Power sector, Employee contentment, Political participation, Corporate Social strategy do not predict the Strategies for Business Sustenance for Power Utilities in India.

Alternate Hypothesis: H1: Technology Adoption, Asset Optimization, capacity building, Business prospects, Customer satisfaction, Reforms in Power Sector, Competitiveness in Power sector, Employee contentment, Political participation, Corporate Social strategy do not predict the Strategies for Business Sustenance for Power Utilities in India.

- All the Factor has significant level less than 0.05, so we Can Say there is significant difference between the various utilities w.r.t. these factor.
- Null Hypothesis is rejected.

To do further analysis for developing a business strategy, the Mean and Median value were measured for all the factors with respect to all the Utility. Results of the Mean and Median values are appended below.

Table 5.8: Mean &Median value of Factors across Utility wise

Factors	P5					
	PPP		Franchisee		SEB	
	Mean	Median	Mean	Median	Mean	Median
Technology_Adoption	4.12	4.50	3.71	4.00	3.69	4.00
Asset_Optimization	4.56	4.67	4.25	4.33	4.10	4.00
Capacity_Building	4.51	4.50	4.34	4.50	4.13	4.25
Business_Prospects	4.54	4.67	4.18	4.33	4.24	4.33
Customer_Satisfaction	4.33	4.50	4.41	4.50	4.16	4.25
Reforms	4.48	4.75	4.16	4.25	4.05	4.25
Competitiveness	4.49	4.67	4.27	4.33	4.10	4.00
Employee_Contentment	4.53	4.67	4.23	4.33	4.18	4.33
Political_Prepostion	4.59	4.67	4.37	4.33	4.05	4.00
Corporate_Social_Strategy	4.49	4.67	4.31	4.33	4.19	4.33

Significance of Analysis

- Perception of Employees of PPP model was found to be encouraging based on mean and Median values as compared to other models in India with respect to different factors.
- Literature review through various reports also show better prospects with PPP model
- PPP Model has been studied in detail which forms the foundation of objective 2 where more detailed analysis of PPP factors is presented and its sustainability practices are studied through TPDDL operating in PPP model as the reference point**.**

5.3 IDENTIFICATION OF INTERNAL AND EXTERNAL FACTORS FOR PPP MODEL

As the PPP model results are favouring the quantitative analysis were carried out for TPDDL respondents to identify the factors favouring the PPP Model. Before reducing the data of PPP model KMO and Bartlett's test was performed.

Table 5.9: KMO and Bartlett's test

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.565
Bartlett's Test of Sphericity	Approx. Chi-Square	6.375E3
	df	3240
	Sig.	.000

Table 5.10: Communalities

Communalities[a]

	Initial	Extraction
Q1	1.000	.743
Q2	1.000	.747
Q3	1.000	.758

Q4	1.000	.756
Q5	1.000	.745
Q6	1.000	.787
Q7	1.000	.748
Q8	1.000	.738
Q9	1.000	.626
Q10	1.000	.760
Q11	1.000	.688
Q12	1.000	.755
Q13	1.000	.673
Q14	1.000	.715
Q15	1.000	.740
Q16	1.000	.750
Q17	1.000	.747
Q18	1.000	.773
Q19	1.000	.663
Q20	1.000	.739
Q21	1.000	.754
Q22	1.000	.779
Q23	1.000	.751
Q24	1.000	.778
Q25	1.000	.697
Q26	1.000	.771
Q27	1.000	.746
Q28	1.000	.783
Q29	1.000	.791

Q30	1.000	.762
Q31	1.000	.815
Q32	1.000	.828
Q33	1.000	.778
Q34	1.000	.751
Q35	1.000	.802
Q36	1.000	.735
Q37	1.000	.660
Q38	1.000	.784
Q39	1.000	.707
Q40	1.000	.697
Q41	1.000	.684
Q42	1.000	.749
Q43	1.000	.793
Q44	1.000	.727
Q45	1.000	.755
Q46	1.000	.767
Q47	1.000	.717
Q48	1.000	.791
Q49	1.000	.799
Q50	1.000	.783
Q51	1.000	.704
Q52	1.000	.728
Q53	1.000	.758
Q54	1.000	.726
Q55	1.000	.752

Q56	1.000	.784
Q57	1.000	.793
Q58	1.000	.765
Q59	1.000	.714
Q60	1.000	.717
Q61	1.000	.712
Q62	1.000	.756
Q63	1.000	.766
Q64	1.000	.750
Q65	1.000	.711
Q66	1.000	.832
Q67	1.000	.702
Q68	1.000	.781
Q69	1.000	.738
Q70	1.000	.762
Q71	1.000	.777
Q72	1.000	.753
Q73	1.000	.734
Q74	1.000	.733
Q75	1.000	.812
Q76	1.000	.752
Q77	1.000	.694
Q78	1.000	.651
Q79	1.000	.719
Q80	1.000	.739
Q81	1.000	.692

Extraction Method: Principal Component Analysis.[a]

a. Only cases for which P5 = 1 are used in the analysis phase.

Generally the KMO value of more than 0.5 is acceptable to consider the data reduction technique to be valid. In our case the KMO value is 0.565 which indicates that we proceed for data reduction and find out considerable factors to carry out statistical analysis. Also Bartlett's test of sphericity suggests that the value is not significant at 95% confidence interval and we can deduce that the correlation matrix formulated for the various factors is not an identity. This implies that there are few variables present amongst all the variables identified for data analysis which have similarity between them and can be reduced to study their impact on the various dependent variables.

Generally the factors with Eigenvalue more than 1 are considered to be factors contributing good variation in the response. We got 28 factors having Eigenvalue > 1. To identify the key factors influencing PPP model we have considered the loadings above 40% and 10 factors were derived from Rotated component matrix. These factors were further classified into Internal and External factors based on the Strength, Weakness, Opportunities and Threats of PPP model Utility.

Table 5.11: Total variances explained

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.163	6.374	6.374	5.163	6.374	6.374	3.747	4.626	4.626
2	5.053	6.238	12.612	5.053	6.238	12.612	3.050	3.765	8.391
3	4.039	4.986	17.598	4.039	4.986	17.598	2.770	3.420	11.811
4	3.554	4.388	21.986	3.554	4.388	21.986	2.620	3.235	15.046
5	3.321	4.099	26.085	3.321	4.099	26.085	2.607	3.219	18.265
6	2.994	3.696	29.782	2.994	3.696	29.782	2.567	3.169	21.434
7	2.778	3.430	33.212	2.778	3.430	33.212	2.509	3.097	24.531
8	2.706	3.341	36.553	2.706	3.341	36.553	2.466	3.044	27.575
9	2.437	3.009	39.562	2.437	3.009	39.562	2.449	3.023	30.598
10	2.298	2.838	42.400	2.298	2.838	42.400	2.261	2.791	33.390
11	2.171	2.680	45.080	2.171	2.680	45.080	2.240	2.765	36.155
12	2.019	2.492	47.572	2.019	2.492	47.572	2.079	2.566	38.721
13	2.003	2.473	50.046	2.003	2.473	50.046	2.077	2.564	41.285
14	1.955	2.414	52.460	1.955	2.414	52.460	2.066	2.551	43.836
15	1.845	2.278	54.737	1.845	2.278	54.737	2.028	2.503	46.339
16	1.686	2.081	56.818	1.686	2.081	56.818	1.997	2.466	48.805
17	1.639	2.023	58.841	1.639	2.023	58.841	1.952	2.410	51.215
18	1.569	1.937	60.778	1.569	1.937	60.778	1.922	2.373	53.588
19	1.496	1.846	62.625	1.496	1.846	62.625	1.901	2.346	55.935
20	1.419	1.751	64.376	1.419	1.751	64.376	1.883	2.325	58.260
21	1.355	1.673	66.049	1.355	1.673	66.049	1.840	2.271	60.531
22	1.288	1.590	67.639	1.288	1.590	67.639	1.801	2.224	62.755
23	1.230	1.518	69.157	1.230	1.518	69.157	1.759	2.171	64.926
24	1.209	1.493	70.649	1.209	1.493	70.649	1.739	2.147	67.074
25	1.176	1.452	72.101	1.176	1.452	72.101	1.704	2.103	69.177
26	1.132	1.397	73.498	1.132	1.397	73.498	1.690	2.087	71.264
27	1.080	1.333	74.832	1.080	1.333	74.832	1.686	2.082	73.346
28	1.049	1.295	76.127	1.049	1.295	76.127	1.639	2.024	75.370
29	1.010	1.247	77.374	1.010	1.247	77.374	1.624	2.004	77.374
30	.971	1.199	78.573						

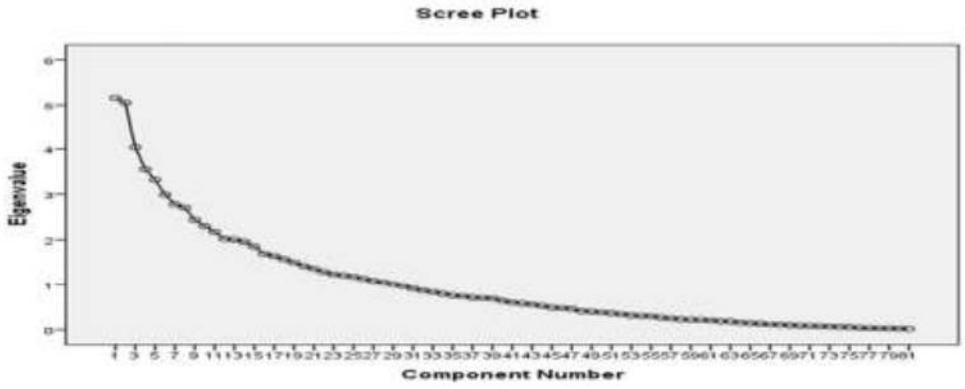
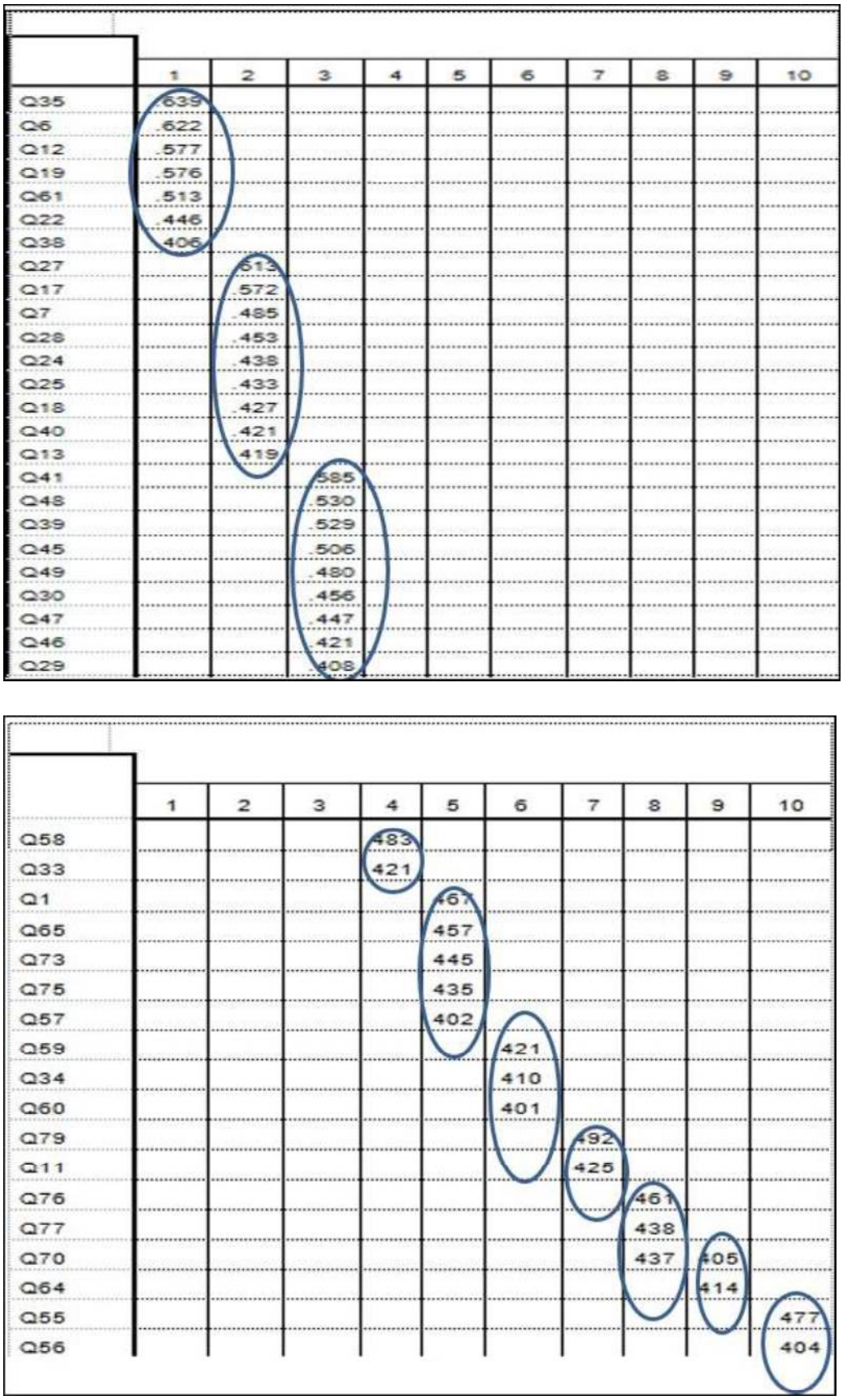


Figure 5.5: Scree plot



	1	2	3	4	5	6	7	8	9	10
Q35	.639									
Q6	.622									
Q12	.577									
Q19	.576									
Q61	.513									
Q22	.446									
Q38	.406									
Q27		.513								
Q17		.572								
Q7		.485								
Q28		.453								
Q24		.438								
Q25		.433								
Q18		.427								
Q40		.421								
Q13		.419								
Q41			.585							
Q48			.530							
Q39			.529							
Q45			.506							
Q49			.480							
Q30			.456							
Q47			.447							
Q46			.421							
Q29			.408							

	1	2	3	4	5	6	7	8	9	10
Q58				.483						
Q33				.421						
Q1					.467					
Q65					.457					
Q73					.445					
Q75					.435					
Q57					.402					
Q59						.421				
Q34						.410				
Q60						.401				
Q79							.492			
Q11							.425			
Q76								.461		
Q77								.438		
Q70								.437	.405	
Q64									.414	
Q55										.477
Q56										.404

Figure 5.6; Rotated component matrix for Quantitative analysis-2

Based on the rotated component matrix the factors were classified as follows:

External Factors:

1. Customer Satisfaction
2. Business Opportunity
3. Policy on renewables
4. Regulatory Environment

Internal factors:

1. Expertise in Distribution and Brand Value
2. Strong Business Process
3. Technology Leader
4. Social Participation
5. Employee Management
6. Performance Management of Power Utility.

5.4 SWOT ANALYIS FOR PPP MODEL

STRENGTH 1) Customer Satisfaction 2) Change Management 3) Technology Leader 4) Good Credit Rating 5) Competitive Advantage 6) Process-centric Organization 7) Quality power	WEAKNESS 1) Amalgamation of culture 2) Attrition of quality manpower 3) Limited Growth in Licensed Business
OPPORTUNITIES 1) Organizational Capabilities 2) Asset Exploitation 3) Scope in existing business through innovation –Mission 9x9 4) Diversification	THREATS 1) Performance Assurance Regulations 2) Possibility of losing High Value Consumers (both existing & future) by way of Captive Power Generation 3) Regulatory Uncertainty 4) Politically sensitive business 5) Dependency on Generation

Figure 5.7: PPP Model SWOT

5.5 IE MATRIX TESTING FOR IDENTIFYING BUSINESS STRATEGY FOR PPP UTILITY MODEL:

5.5.1 IE MATRIX, IFE&EFE

The **Internal-External (IE) matrix** is a strategic management tool used to examine operational circumstances and planned position of a business. The *Internal External Matrix* or short IE matrix is based on the analysis of external and internal business factors which are combined into one suggestive model.
The IE matrix is a continuation of the EFE matrix and IFE matrix models.

IFE Matrix

Internal Factor Evaluation (IFE) matrix is a strategic management tool for examining or assessing major strengths and flaws in functional areas of business. It is tool which is basically used for formulating organizational strategy. The matrix provides a base for gauging relationships among different functional domains in which the firms operate.

Development of the IFE matrix

Following five steps are used to create an IFE matrix:

Key internal factors

In order to improve organizational governance, internal audit was conducted, which further helps in analysing organizational strengths and weaknesses. Despite identification of 10 or 20 internal factors is justifiable, but still the more deeply we understand organizational strengths and weaknesses, the more reliable is organizational strategy. Though the count has little or no effect, but still it helps in undertaking activities that might not contribute to organizational growth and success. First identify organizational strengths to take full advantage of the same and then identify weaknesses to analyse strategies to be implemented. It is advised to be as precise as possible.

1. Weights: After diagnosing strengths and weaknesses, designate a weight that ranges from 0.00 to 1.00 to each factor. The weight assigned highlights

the importance of different factors. Zero signifies irrelevant factor and one signifies the most relevant factor. It is much smooth and simple to assign weights from 0 to 100 scale instead of 0.00 to 1.00, according to the relevancy of each factor if more than 10 factors are involved.

Irrespective of the fact that a particular factor signifies strength or weaknesses for your firm, factors that are of high importance and relevance for your firm, should be allocated highest weights. While allocating weights, make sure that all weights assigned to all factors sums up to 1.00 (or 100 if using the 0 to 100 scale weights). Weights assigned differ in accordance to the industry it belongs to.

2. Rating: The rating scale varies in accordance with opinions of different individuals. Assign a 1 to X rating to each factor. More often, professionals make use of rating scale varying from 1 to 4. The value suggests the relevancy of each factor. For instance, (rating = 1), symbolizes a major weakness, (rating = 2), speaks for minor weakness, (rating = 3), depicts insignificant strength and finally (rating = 4) signifies most important strength. If you use the rating scale 1 to 4, then strengths must receive a 4 or 3 rating and weaknesses must receive a 1 or 2 rating.

Note, Weights are allocated on the basis of industry to which the firm belongs to but rates are assigned on the basis of organizational preference.

3. Multiply: For manipulating the cumulative **weighted score** for each factor, weight assigned to each factor is multiplied with the rate assigned to that particular factor.

4. Sum: And finally for computing the **total weighted score** for your business add the weighted scores computed in the previous step for each factor.

Example of IFE matrix

The subsequent table is an illustration of an **IFE matrix**.

Internal Strengths	Weight	Rating	Weighted Score
1. Largest manufacturer in the market	10 %	4	0.40
2. Supplies major airlines	12 %	4	0.48
3. Good reputation and image	4 %	3	0.12
4. Close proximity to the airport	8 %	4	0.32
5. Strong management team	4 %	3	0.12
6. Increasing cash flow	5 %	3	0.15
7. Loyal employees	4 %	3	0.12
8. Access to cheap and reliable financing	3 %	4	0.12
9. History of minimal service complaints	4 %	3	0.12
10. Financial ratios	5 %	4	0.20
Internal Weaknesses			
1. Saturated market	10 %	1	0.10
2. Sensitive to oil prices	15 %	2	0.30
3. Little diversification	8 %	2	0.16
4. Absence of strategic partner	4 %	1	0.04
5. Limited access to international markets	4 %	1	0.04
major weakness (1), minor weakness (2), minor strength (3), major strength (4)			
TOTAL WEIGHTED SCORE	100 %		**2.79**

Figure 5.8: Example of IE matrix

What values does the IFE matrix take?

Irrespective of the number of factors being identified for being used in IFE matrix, the value for total weighted score varies from 1.0 to 4.0 (assuming you used the 1 to 4 rating scale). The average mark you can perhaps get is 2.5.

Side note: Why the computed average value amounts to 2.5 and not 2.0? The reason behind this is that we have four factors and the sum of these four factors should amount to 1.0. So, the weight assigned to each factor is 0.25. Factors have the following rating: 1, 4, 1, 4. The computed values of weighted scores amounts to 0.25, 1, 0.25, and 1. After summing up, the weighted scores of each factor, the total weighted score of IFE matrix that we receive is 2.5. This average value suggests that if total weighted score amounts to a value less than 2, than the combination of internal factors represents weak factors for sustainable performance of the firm. However a value greater than 2.5 point out strong internal position of the firm.

Benefits of the IFE matrix

First we need to illustrate the disadvantages of IFE matrix before highlighting the positive prospects of this matrix. IFE matrix is based on inner experience

rather than facts. Likewise SWOT analysis; it is also a subjective strategic management tool. Several, amendments are being made in the current IFE matrix to incorporate statistical facts and figures and some objectivity supporting current matrix. Allocation of weights and rates to factors identified is done for confirming the practical nature of the model. For accommodating factors into IFE matrix, Intuitive judgment is required.

External Factor Evaluation (EFE) matrix is yet another strategic-management tool which is been used for evaluating or determining the environment in which the business firm operates in. By analysing the external environment, business firms can anticipate and prioritize profitable prospects available in external environment. The matrix enables the firm to identify threats halting the growth path of the company.

More or same, EFE matrix is similar to IFE matrix. The only difference between the two is that EFE matrix point out the external factors, whereas IFE matrix apprehend the internal factors.

External factors measured in the EFE matrix are subjected to the will of communal, financial, governmental, legal, and other external forces.

Description of Internal-External IE matrix

The Internal-External matrix is affiliated to the strategic portfolio management tool. The matrix places the company in a nine cell matrix just as BCG matrix.

The IE matrix is based on the following two criteria:

1. Score from the **EFE matrix** -- y-axis
2. Score from the **IFE matrix** -- x-axis

The total weighted score computed from EFE matrix is hatched across the horizontal plane on y-axis and the score computed by IFE matrix is conspired across vertical plane on x-axis. The intersection point determines the cause which is important for the firm and the strategy that the company should adopt to deal with the cause.

On the x axis of the IE Matrix, an IFE total weighted score of 1.0 to 1.99 indicates a weak internal position. A score between 2.0 and 2.99 is considered average, while between 3.0 and 4.0 is strong.

On the y axis, an EFE total weighted score of 1.0 to 1.99 is considered as low. A score of 2.0 to 2.99 is medium, while a score between 3.0 and 4.0 is considered as high.

5.5.2 EVALUATION OF IE ANALYSIS

Explanation of IE matrix

In order to explain IE matrix, following illustration is considered. The total weighted score was computed using IFE matrix for an unknown company, which comes out to be 2.79 representing that the company possesses an above-average internal strength.

Also, total weighted score was computed using EFE matrix for an unknown company, which comes out to be 2.46 signifying the less than average potential of the firm to deal with external factors.

The results were plotted on x and y axis of IE matrix:

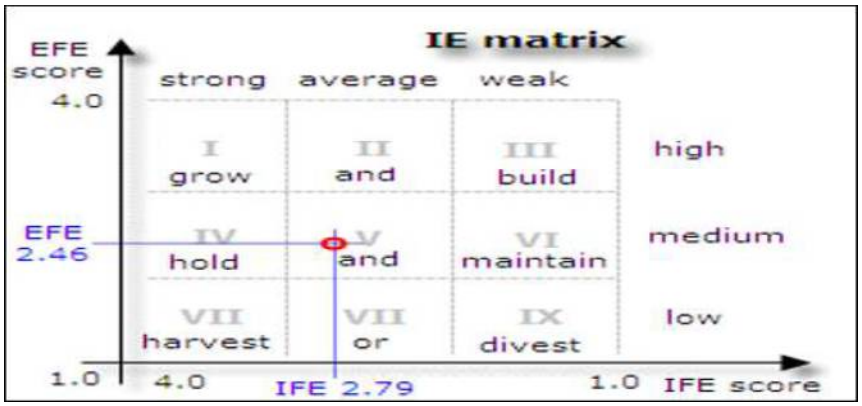


Figure 5.9: Graphical Representation of IE Matrix

The results suggest that company should develop strategies to uphold and maintain its existing position in the market. Strategies should be aligned in a direction to help company maintain its reputational image, while simultaneously penetrating into the existing market with better quality products or services.

The company strategy depends upon the cell in which the intersecting point of horizontal and vertical lines falls in the IE matrix.

The IE matrix can be distributed into **three** main regions representing different strategic inferences:

The results displayed in figure above showcases that first three cells of IE matrix corresponds to grow and build strategy. This involves comprehensive and aggressive planned strategies. The cell highlights the need of the firm to focus on strategies including market penetration, product development and market development. From functional perspective horizontal integration, backward integration and forward integration should be taken into consideration.

The subsequent cells of the matrix recommend that the firm should firm evolve strategies to uphold and maintain its reputational image and financial position. Firm should solely focus on market penetration and product development.

The last three cells of the matrix focuses on harvest or exit strategies. The strategy suggests that firm should constantly innovate its products and offerings, in order to keep pace with the changing demands and sustaining the competitive environment.

5.6 PROPOSAL OF CORE AND NON CORE BUSINESS FOR PPP MODEL

TPDDL is in the Power distribution business for more than a decade and Based on detailed discussion on expansion of Utilities in core and Non-core area were identified based on the Strength, Weakness, Opportunities and Threats of the sector. Most importantly the challenges of the sector with respect to the business prepositions have been considered for the selection of business in core and non-core areas.

Following business prepositions were considered for the IE analysis:

EPC business – Ref: RAPDRP, IPDS schemes by Ministry of Power

ESCO business – Ref: Registered Grade-1 company for ESCO and ESCO Potential as per *WRI Report summary 2008-09*

Open access- Ref: Amendment in EA-2003 with inclusion of Content and Carriage

Asset Sweating- Ref: U-Telco study by TPDDL, Approved rated by Govt for displays of Hoardings in Assets

Electric Vehicle Infra- Ref: NEMMP 2020, FAME subsidy by DHI, Govt.of India

5.6.1 FINDINGS ON CORE BUSINESS

Following core business were considered for IFE and EFE analysis.

EPC business

IE analysis:

Table 5.12: Internal Strengths and weaknesses of EPC businesses

	Internal Strengths	**Weight**	**Rating**	**Weighted Score**
1	TPDDL is having experience of executing capex project of 2200 crores in last 7 Years on 66/33/11 KV network.	15%	4	0.6
2	Rich experience of capex and project management	8%	3	0.24
3	Engineering and procurement expertise with very good vendor development	9%	3	0.27
4	100% timely completion of capitalization of APDRP funds.	18%	3	0.54
5	Availability of best equipment for projects	13%	2	0.26
	Internal Weaknesses	**Weight**	**Rating**	**Weighted Score**
1	TPDDL , has adopted an ethical stand and has avoided cutting corners, thereby prolonging its process of registration with government agencies	13%	2	0.26
2	Need of development of marketing and business development skills	8%	1	0.08
3	More attention need to be given towards core business, as it will be always a foremost priority	9%	2	0.18
4	A separate work system need to be designed for new business proposals	7%	2	0.14
Major weakness (1), Minor weakness (2), Minor Strength (3), Major Strength (4),				
TOTAL WEIGHTED SCORE		100%		2.57

Table 5.13: Opportunities and threats of EPC business

	Opportunities	Weight	Rating	Weighted Score
1	Immense potential of 25,000 crores of EPC business in market	20%	4	0.80
2	Brand TPDDL which is role model for power distribution utilities	10%	4	0.40
3	Lack of credibility of available market players	12%	3	0.36
	Threats	**Weight**	**Rating**	**Weighted Score**
1	Most of the existing clients will be PSU	14%	3	0.42
2	Tendering process of state power utilities treat TPDDL as private player and as per the existing norms, the level playing field is absent among PSUs and Private players	12%	2	0.24
3	Lengthy and delayed process of awarding contracts and payments	12%	3	0.36
4	Work-system and HR resources alignment is a challenge	10%	1	0.10
5	Concept of EPC in distribution is still in introduction phase	10%	2	0.20
Poor (1), Below average (2), Above average (3), Superior (4)				
TOTAL WEIGHTED SCORE		100%		2.88

TPDDL can leverage on its strength of rich knowledge base and skills to start an EPC business for power utilities. Power being a top priority for government of India most of state electricity boards are passing through development stage after electricity act 2003.

TPDDL has been accepted as successful role model by many utilities and Ministry of Power.

Ministry of Power has taken various initiatives to spend Rs. 18,000 crores in distribution sectors like

1 Rajeev Gandhi Gramin Vidutikaran Yojana (RGGVY).

2 R-APDRP schemes

3 State initiatives under WB and ADB

4 Capacity building programs like DRUM

These initiatives has resulted an approximate potential of 25,000 crores in power sector in the field of project execution. If we do the SWOT analysis for EPC business potential following are the point wise clarification.

R -APDRP/RGGVY budget for next three years – Rs 27,500

State budgets for distribution reforms under WB/ADB – Rs 7500

Total market potential	–	Rs 35,000
Target for TPDDL @ 0.5%	–	Rs.180
Profit potential for next 5 years (today's projection)	–	Rs 18

(All figures are in Crores)

TPDDL with help of its sister concern, TATA Projects, can look forward for business opportunity of, at least, 10% of available market potential. Total business opportunity for EPC business in power distribution sector will be Rs 3500 crores.

TATA Project is well established Project/EPC Company working on industrial and bigger power projects can extend support to TPDDL for distribution business from its DATABASE of standardization and HR Support point of view.

TPDDL has awarded many turnkey contracts in last 7 years with a 10% agreed profit margin for a lead contractor. Assuming the same profit potential in the business TPDDL can look forward a profit margin of Rs 70 crores in next 5 years.

APDRP/RGGVY/REC						
Year	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Turnover in Crores	0	0	50	100	150	180
Profit	0	0	5	10	15	18

Figure 5.10: Accelerated Power Development and Reforms Programme / Rajiv Gandhi Grameen Vidyutikaran Yojana/ Rural Electrification Corporation

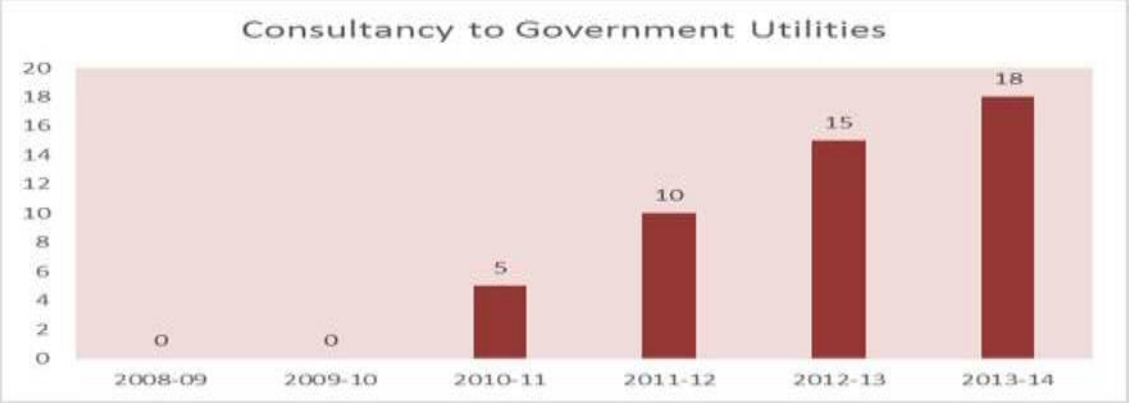


Figure 5.11: Earnings on Consultancy Business

TPDDL already bagged consultancy in Haryana, Orissa, UP and in countries like

IT consultancy Projects: TPDDL already bagged IT consultancy projects for SCADA/SAP implementation for Various SEBs in Punjab, Goa, Jammu, and Orissa.

IT Consultancy Business Proposal						
Year	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Turnover in Crores	2	5	8	10	12	14

Figures in Rs. Crores

Figure 5.12: IT Consultancy Business Proposal

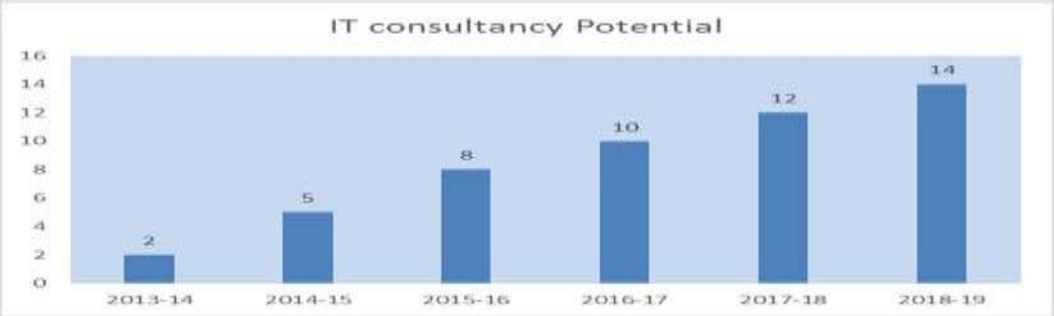


Figure 5.13: Proposed Earnings through IT consultancy

ESCO Business

IFE analysis:

Table 5.14: Internal Strengths and weaknesses of ESCO Business

	Internal Strengths	**Weight**	**Rating**	**Weighted Score**
1	Rich and experience manpower, certified auditors.	15%	4	0.6
2	BEE and MOP Support	8%	3	0.24
3	TATA concern for environment is well acceptable	9%	3	0.27
4	Readiness for Investment	18%	3	0.54
5	Good industrial and commercial consumers interaction	13%	3	0.39
	Internal Weaknesses	**Weight**	**Rating**	**Weighted Score**
1	No prior experience of commercial audits	13%	2	0.26
2	Need to convince industrial consumers	15%	2	0.30
3	Absence of strategic partner	9%	1	0.09
Major weakness (1), Minor weakness (2), Minor Strength (3), Major Strength (4),				
TOTAL WEIGHTED SCORE				2.69

Table 5.15: Opportunities and threats of ESCO Business

	Opportunities	Weight	Rating	Weighted Score
1	Good potential of 450 crores/year in Delhi	22%	4	0.88
2	Scarcity of established players	15%	4	0.6
3	More acceptable choice due to long term association	12%	3	0.36
4	Consumer goodwill	16%	3	0.48
	Threats	**Weight**	**Rating**	**Weighted Score**
1	More NGO's and private companies started activities	9%	2	0.18
2	Other utilities are also started the business	8%	2	0.16
3	Low priority by Business houses	10%	1	0.10
4	Economic Downturn	5%	1	0.05
Poor (1), Below average (2), Above average (3), Superior (4)				
TOTAL WEIGHTED SCORE		100%		2.81

Within the state of Delhi, no other Company in power sector is as related and is in as close proximity as NDPL; not only because of the huge customer base, but also for the enormous goodwill generated among the populace due to the good work done in recent years.

On gauging success and measuring the financial viability and technical feasibility, the greater area approach shall be taken up.

Estimation of the job:

Volume wise;

Investment wise;

Returns gained wise has to be done on a continual basis for looking into the spread under new SWOT analysis after completion of Delhi project.

Benefits:

TPPDL is a Registered ESCO with Grade-1 certification

Total peak demand of Delhi- 7500 MW

Total consumers of Delhi- 2800000

Total Industrial and Commercial Consumers of Delhi- 615000

Total potential of ESCO in India as per WRI (World resource institute) - 183.5 billion units.

Total potential of ESCO in Delhi as per WRI (World resource institute) - 9500 million units.

Total potential of ESCO (in Rupees) for Delhi - **3800 crores**

Total potential for TPDDL Area (in Rupees) **– 1200 crores**

If TPDDL tries its best through good tie-ups and collaborations,

It can always claim for **10%** in TPDDL Area and **2 %** in other Area

Potential for TPDDL-ESCO Business model per year- Rs.150 Crores

(Ref-WRI Report summary 2008-09)

TOTAL Projected potential for TPDDL-ESCO Business will be Rs.150 Crores.

Total earnings projected @8% Profit- Rs. 12 Crores.

ESCO Business Proposal

Year	'13-14	'14-15	'15-16	'16-17	'17-18	'18-19
Turnover in Crores	0	0	50	80	120	150
PROFIT in Crores	0	0	4	7	10	12

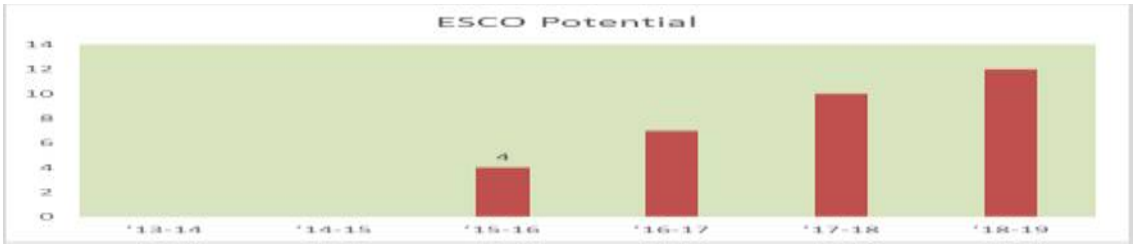


Figure 5.14: Earnings on ESCO Potential

Electric vehicle, Open access and Roof Top solar:

IFE & EFE analysis of Rooftop, EV and Open access:

Table 5.16: Internal Strengths and weaknesses of Electric vehicle, Open access and Roof Top solar

	Internal Strengths	Weight	Rating	Weighted Score
1	Technology leader through implementation of ERP, SCADA, AMR	8%	4	0.32

	and GIS			
2	Established brand name in Market	8%	3	0.24
3	Successful Change Management Experience-Adaptation between PSU and private sector	8%	4	0.32
4	Process Centric Approach with IMS framework of ISO 9001:2000 & TBEM 600+	8%	3	0.24
5	Learning environment established through CENPEID, partnership with Leading	5%	3	0.15
6	consultants etc. also leveraged for capability building	5%	3	0.15
7	Good financial model which provides assured returns provided loss targets are met	8%	3	0.24
8	Community service efforts focused on health & resource conservation initiatives – Sustainability Initiatives	5%	3	0.15
9	Strong credit rating of TPDDL"AA-" enabling financing at a low cost	8%	4	0.32
	Internal Weaknesses	**Weight**	**Rating**	**Weighted Score**
1	Amalgamation of culture (PSU/TATA)	5%	2	0.10
2	Attrition of quality manpower-15% in 2007-08	10%	2	0.20
3	Integration of Business Excellence Pockets	5%	1	0.05
4	Limited Growth in Licensed Business	5%	1	0.05
5	Regulated Business	9%	2	0.18

6	Saturation in business	3%	1	0.03
Major weakness (1), Minor weakness (2), Minor Strength (3), Major Strength (4),				
TOTAL WEIGHTED SCORE		**100%**		**2.74**

Table 5.17: Opportunities and threats for Electric vehicle, Open access and Roof Top solar

	Opportunities	**Weight**	**Rating**	**Weighted Score**
1	Positioned in one of the fastest growing residential & industrial areas of NCT of Delhi	20%	4	0.80
2	Huge investment potential in the power sector ($ 200 bn till 2012)	18%	4	0.72
3	EA'03 has opened new vistas for power distribution companies providing opportunities for forward and backward integration	12%	3	0.36
4	Availability of latest theft proof technologies in developed countries for replication	10%	3	0.3
	Threats	**Weight**	**Rating**	**Weighted Score**
1	Performance Assurance Regulations resulting in penalty on non-compliance	8%	2	0.6
2	Possibility of losing High Value Consumers (both existing & future) by way of Captive Power Generation	4%	1	0.08
3	Non achievement of committed loss level	5%	1	0.12
4	Regulatory Uncertainty	5%	1	0.05
5	Entry into a phase of retail competition (Open Access) & switchover of our existing consumers to other Licensee	5%	2	0.1
6	Limited Availability of Cost Effective Power	8%	2	0.16

7	Politically sensitive business	5%	1	0.05
Poor (1), Below average (2), Above average (3), Superior (4)				
TOTAL WEIGHTED SCORE		**100%**		**3.34**

Roof Top Solar

The Govt. of India has launched 'National solar mission' which inter alia targets 20GW of grid connected solar capacity by 2022. In continuation with this, Delhi government has also outlined a Renewable Purchase Obligation trajectory for the next five years:

Table 5.18: Renewable Purchase Obligation trajectories for the next five years

S. No.	Year	% of Min. Purchase through Solar Power	Total Purchase though Renewable Energy (%)
1	Year I	0.15%	3.40%
2	Year II	0.20%	4.80%
3	Year III	0.25%	6.20%
4	Year IV	0.30%	7.60%
5	Year V	0.35%	9.00%

To promote the use of Renewable Energy Generation for self-consumption of the consumers, DERC has issued DERC (Net Metering for Renewable Energy) Regulations 2014. In addition, Guidelines have been issued subsequently for effective implementation of the Net Metering Regulations, 2014.

Detailed discussions, several rounds of deliberation and rigorous analysis have culminated to identification of following business models:

- **Model I**: TPDDL Owned Net Metering Based Solar PV leased to consumers.
- **Model II**: Consumer Owned Net Metering Based Solar PV.
- **Model III**: Third Party Owned Gross Metering Based Solar PV.

All the above would be purely on voluntary basis and have been formulated with an objective of facilitating the consumers. TPDDL

shall charge a nominal fee for providing these value added services to the interested consumers and ensure safeguarding of their interests.

Objectives & Business Potential

To benefit the customers and bestow clean environment for generations to come, TPDDL's main objectives of the solar roof top scheme are outlined as below:

- To formulate strategies and policies to scale up the solar power generation capacity in TPDDL licensed area.
- To augment grid generation capacity and strengthen the power system network to cater ever increasing load demand.
- To achieve Renewable Purchase Obligation as stipulated by the Central & State Regulatory Authorities.

Identified Business Potential:

Table 5.19: Possible benefits from installation of solar roof top at different places

S. No.	Category	Probable Locations (Nos.) (A)	Avg Available Roof Size (in sqft) (B)	Solar Potential (in MWp) (C) = (A)*(B) / (120*10^3)
1	School*	350	2000	5.8
2	Hospital*	250	1500	3.1
3	Govt. Offices*	1200	1500	15
4	DJB*	200	1000	1.7
5	Delhi University	20	6000	1
6	DMRC	20	4000	0.7
7	Industries	30000	1500	375
GRAND TOTAL		**32040**		**402**

*Installations with Sanctioned Load 5 KW & above

Financial Analysis for 1 Kwp Panel (Indicative)

Model – I: Samarth

Table 5.20: Financial analysis of Samarth model

S. No.	Particulars	Formula	Value (in Rs.)
A	Targeted Cost	-	80,000

B	Capital Subsidy	30% of (A)	24,000
C	Accelerated Depreciation	80% of (A-B)	44,800
D	Tax Benefit	33.99% of (C)	15,228
E	Effective Cost to TPDDL (Indicative)*	(A)-(B)-(D)	40,772
F	Principal Amount to be charged to consumer (incl. IFSD)	Cost - Subsidy + Service Charges	70,000
G	**IRR for TPDDL (5 year)**		**19%**
H	**IRR for Consumer (10 year)**		**16%**

**Interest @11% to be borne by consumer in monthly lease rental.*

Model – II: Sahayak & Model – III: Saksham

Table 5.21: Financial analysis

S. No.	Particulars	Formula	Value (in Rs.)
A	Targeted Cost including installation & 10 Year Maintenance)	-	80,000
B	Service Charges (Designing, Testing & Commissioning)	12.5%	10,000
C	Sale Price	-	90,000
D	**Gross Earnings**	**(C)-(B)**	**10,000**

Table 5.22: Ten Year Plan

Year	Target for Model I (in MWp)	Target for Model II (in MWp)	Target for Model III (in MWp)	Total (in MWp)	Capital Requirement (in Rs. Crs.)	Gross Earnings (in Rs. Crs.)
Year 1	5	4	1	10	28	13
Year 2	10	8	2	20	56	28
Year 3	15	12	3	30	84	49
Year 4	20	16	4	40	112	70
Year 5	25	20	5	50	140	93
Year 6	30	24	6	60	168	115
Year 7	35	28	7	70	196	138
Year 8	40	32	8	80	224	161
Year 9	45	36	9	90	252	183
Year 10	50	40	10	100	280	206
Grand Total	**275**	**220**	**55**	**550**	**1540**	**1055**

EV Charging Stations

Subsidies for hybrid and electric vehicles will have subsidies up to 150,000 for cars and 50,000 on two wheelers. In New Delhi there is exemption of VAT up to 12.5% and refund of road tax and registration charges up to 2%. As per the

National Electric Mobility Mission Plan (NEMMP) India aims to have seven million electric vehicles on the road by 2020 with Delhi having majority of the share.

Currently the numbers of e-vehicles are very few in numbers and primarily used as last mile public transport through E-Rickshaws. Hence we would take this initiative to enhance its numbers multifold by offering adequate power supply and incentive for charging during off-peak hours. At first we would like to start with e-rickshaws which are around 30,000 in our licensed area and around 1, 00,000 in entire NCT of Delhi.

The e-rickshaws are owned, operated and maintained by private vendors on contract with the MCD. The initial idea was to eventually replace the city's 88,000 licensed human-powered bicycle-rickshaws with the battery-powered e-rickshaws. In view of upcoming regulations and notifications to promote e-rickshaws / vehicles, it is expected that these will grow by 10-15 %, on year on year basis, in NCT of Delhi. Currently the number of E-rickshaw plying in Delhi are around 30,000 in our licensed area and around 1,00,000 in entire NCT of Delhi and in next five years their population is expected to be around 5,00,000 (Source – ISGF study). As per National Mobility plan 2020, country will have around 20 % Electrical vehicles.

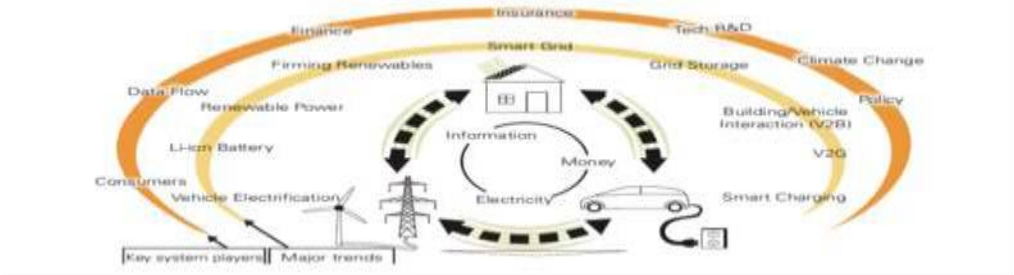


Figure 5.15: The EV Ecosystem (Source: Mahindra Reva)

Objectives and Business Potential

National Electric Mobility Mission Plan (NEMMP) 2020 formulated by the Department of Heavy Industry, Govt. of India which address the issue of E Vehicles in Delhi. Recently, the Ministry of Road Transport & Highways, Govt. of India has issued notification with regard to the movement and

regularization of E Vehicles. The notification has brought E- vehicles under the Motor Vehicle Act. Further, the notification has empowered Municipal Corporation and the Transport department to regulate the E Vehicles and prevent overcrowding.

Electricity being a vital input for driving these E Vehicles needs to be handled in a meticulous manner as this has huge potential risks of power theft, damage to the power distribution network and misuse of electricity in a big way. The primary objective for this project is to identify a suitable business model for promoting E-Charging to enhance the input growth. Simultaneously, we will be also taking up the matter with DERC for the tariff and its category.

The various scope of the project from a Utility's point of view can be as follows:

- To study the growth of E-Vehicles and E-Rickshaws in TPDDL Licensed area
- To advocate for creating regulatory framework promoting electric vehicles.
- Finalization of design for charging stations and their locations.
- Sale of off-peak surplus power at an optimum rate
- To ensure zero theft on account of charging to install sufficient charging stations and space within the licensed area

Details of Working Models and Comparative Financial Analysis

i. Charging Locations

Location	First Year (Pilot)	2nd Year	3rd Year	4th Year	5th Year	6th Year	Total No. of Locations	No. of kiosks / locations	No. of Charging Points (Till FY '20)
Grid Station/ TPDDL Area	2						2	1*	6
Metro (DMRC)	1	3	6	10	20	40	80	3*	720
Franchisee Location	1	2	3	3	6	15	30	10*	900
Malls/ Offices	1	2	4	8	15	30	60	30	1800
Public Parking (Multi Level)	0	1	3	6	10	20	40	30	1200
Total	5	10	15	20	30	50	210	74	4626

*Figure 5.16: Charging Locations (*Each kiosk @3 points)*

ii. Vehicle Projection

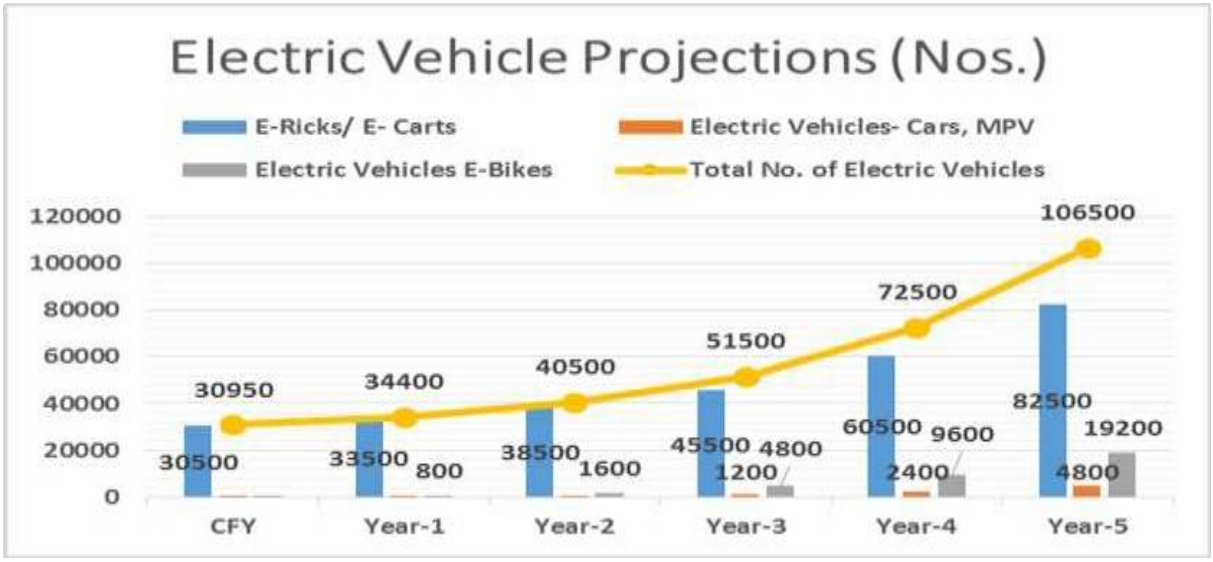


Figure 5.17: EV projections

iii. Load Growth Projections

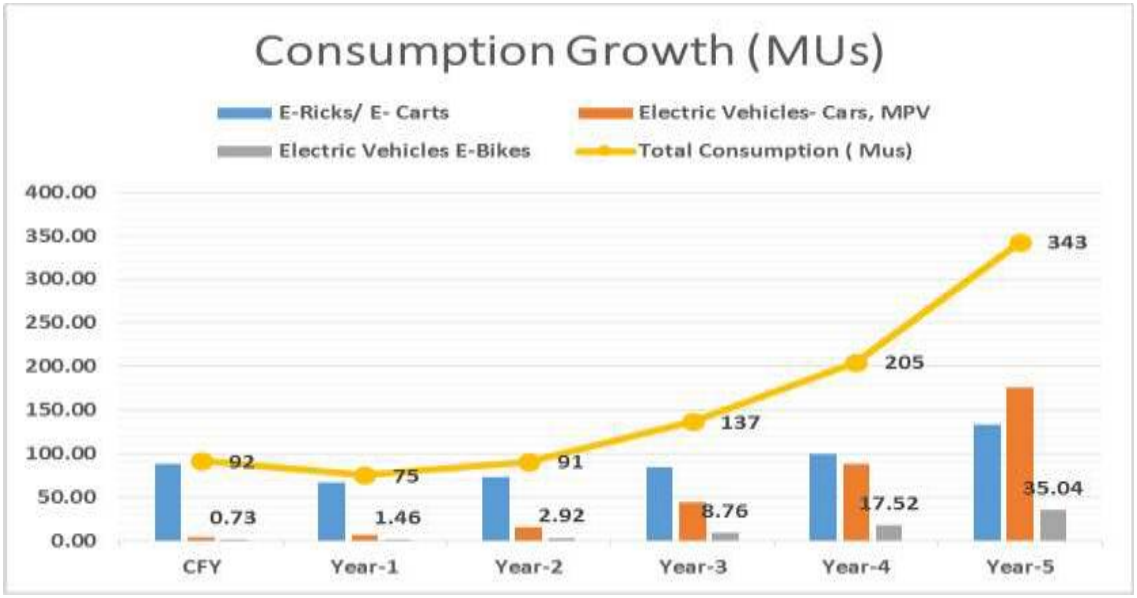


Figure 5.18: Projection of increasing load over the years

iv. Revenue Projections

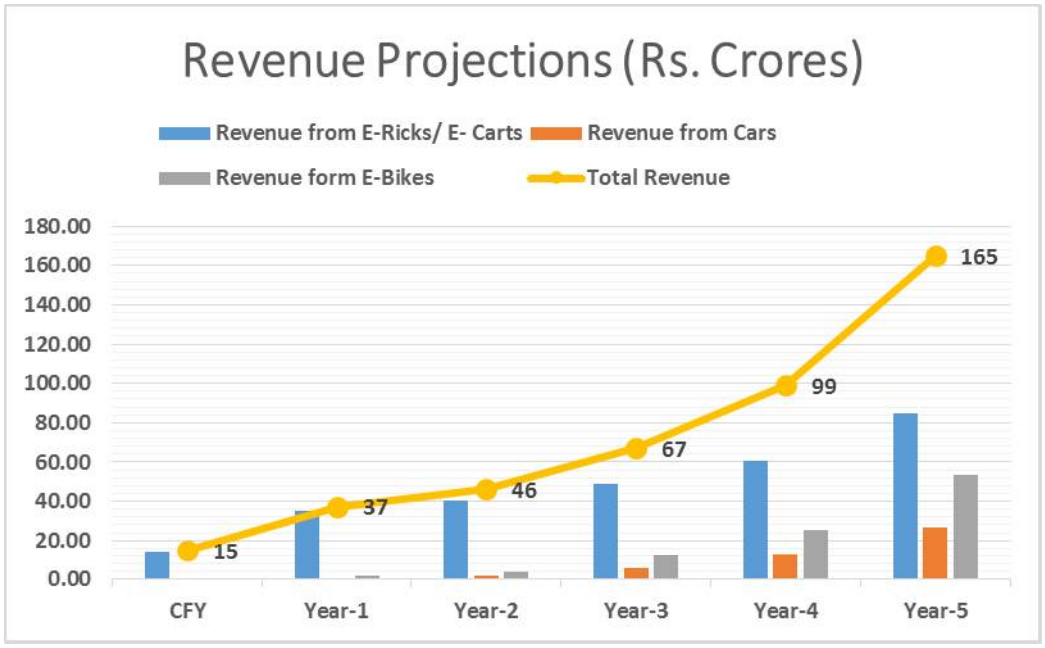


Figure 5.19: Revenue Projections

v. Business Model Proposition

Model	Return	Revenue Sharing	Impact	Risk
I : TPDDL as on only power supplier	CAGR = 50 % ; Initial Revenue = Rs. 16.39 crs	Total by OEM	Low	No risk
II : TPDDL as power supplier + Franchisee	CAGR = 45 % ; Initial Revenue = Rs. 0.24 crs	70% by TPDDL 30% by Franchisee	High	Loss of Capital if growth is not as per projections
III : TPDDL as power supplier + OEM	CAGR = 78% ; Initial Revenue = Rs. 0.24 crs	Charging Infrastructure on Lease for 5 Yrs.	Medium	Loss of Capital on lease basis

Figure 5.20: Various Business Model

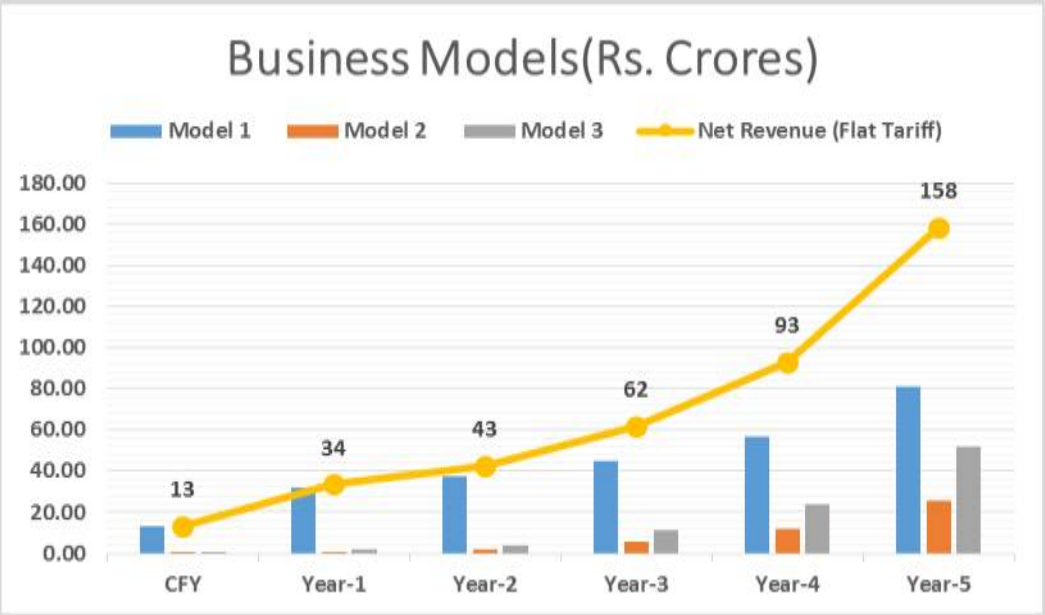


Figure 5.21: Expected Turn over via Business Model

Open access

The main stumbling block for exploiting Open Access Opportunities is the lack of availability of assured/ reliable power over and above TPDDLs own requirement for its Licensed Area.

Based on encouraging results of reliable power supply and consumer satisfaction, enquiries had started coming from NCR (RICO, DLF, and TTSL) for around 75 MW and there is further potential. Given the above, TPDDL should invest in Generation Assets as well as use its status of being a Deemed Trader to procure additional power for supplying to Open Access Consumers.

Table 5.23: Open Access load projections

Year	2015-16	2016-17	2017-18	2018-19	2014-15
Open access load MW	10	20	40	60	75
MU's	86	172	345	518	648
Turnover Crores	35	70	140	207	260

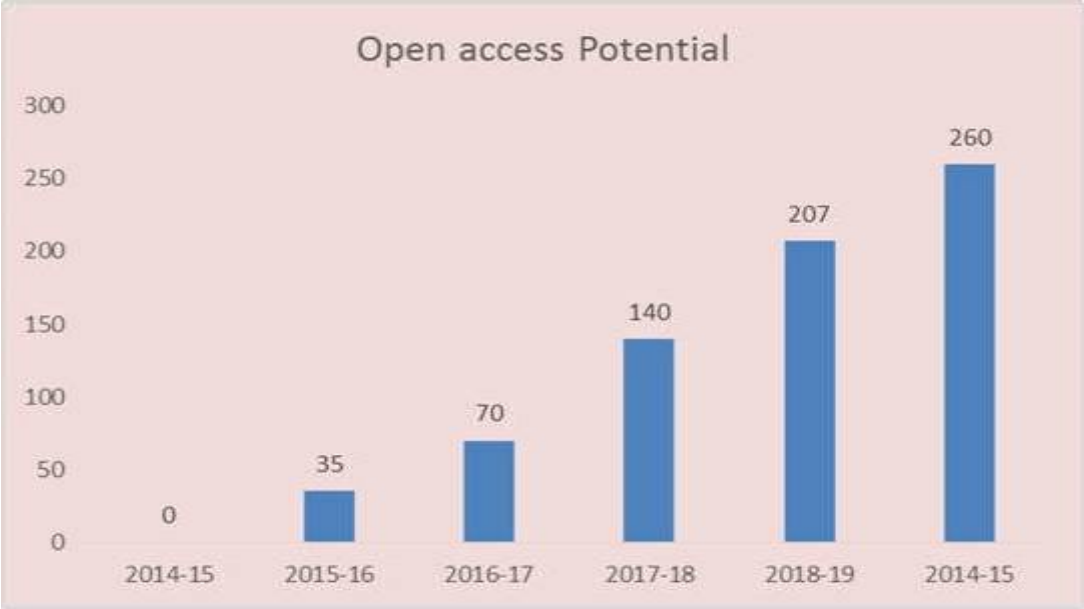


Figure 5.22: Open access potential

5.6.2 IE MATRIX FOR CORE BUSINESS:

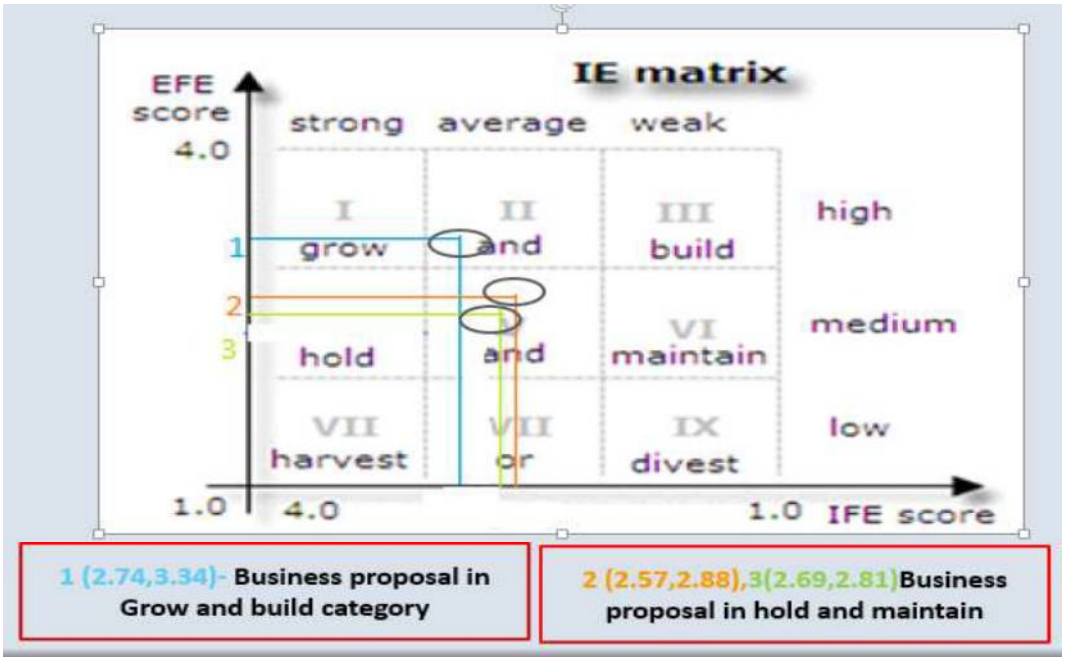


Figure 5.23: IE Matrix for Core Business

Based on IFE and EFE results and SWOT analysis, EPC and ESCO business are categorized in Hold and Maintain category.

Electric vehicles, Open access and Roof Top Solar has been categorized in Grow and Build Category.

5.6.3 NON-CORE BUSINESS

IE analysis for Non-core Business:

Table 5.24: Internal Strengths and weaknesses for Non-Core Business

	Internal Strengths	**Weight in %**	**Rating**	**Weighted Score**
1	Availability of Infrastructure	25%	3	0.75
2	Suitability of Key Locations	25%	4	1.00
	Internal Weaknesses	**Weight**	**Rating**	**Weighted Score**
1	Over commercialization of Assets	16%	2	0.32
2	Not In the line with Business Process	15%	2	0.3
3	No strategic Tie-up	9%	2	0.18
4	Need of Marketing Competency	10%	1	0.1
Major weakness (1), Minor weakness (2), Minor Strength (3), Major Strength (4),				
TOTAL WEIGHTED SCORE		100%		2.7

Table 5.25: Opportunities and threats for Non-Core Business

	Opportunities	**Weight**	**Rating**	**Weighted Score**
1	Immense potential Advertising business in market	22%	4	0.88
2	Commercial Growth of 10-12% in NDPL Area	12%	3	0.36
3	Increased Opportunities due to Privatization of Telecom/Expansion of Cable Network	15%	4	0.6
	Threats	**Weight**	**Rating**	**Weighted Score**
1	Difficult to get Government Nod for New Businesses and Asset Utilization	35%	3	1.05
2	Barrier to entry from established players like DMRC/DTC etc.	16%	1	0.16
Poor (1), Below average (2), Above average (3), Superior (4)				
TOTAL WEIGHTED SCORE		100%		3.05

Potential Business in Non-core area

- U –Telco (Utility and Telecom JV)
    - Regulated Asset base Leasing
    - OFC infra development and leasing
- Asset Sweating for Advertisement agencies.

U-Telco

In simple terms UTelco is a power distribution utility which offer products or service related to Telecom Sector. Over the year, utility sector is gradually upgrading its electrical & communication infrastructure to improve its reliability, productivity, technology adaptability viz. enhances customer satisfaction level. To improve on sustainability and generate new revenue stream and value added product/services for its customer base, utility can maximize utilization of its existing assets through adoption of UTelco (Utility Telecom) business model.

UTelco model adoption has both economic and social benefits through which TPDDL can further enhance customer experiences level viz. creating telecom infra for its internal automation need to further increase operational excellence. Detail need analysis with respect to adoption of Utility Telco business model is described below.

In global context, the concept is catching up and there are successful models like Electric Power Board of Chattanooga, Tennessee (EPB), Opelika Power Services in Opelika, Alabama etc. EPB, Tennessee has set up a (FTTH) network that goes through each and every house and trade area. The Board was able to generate $40 million of revenue, by contributing approximately $12 million in energy saving projects. The company anticipated to earn of profit of approximately $300 million over the forthcoming years. FTTH is a key facilitator in this field. It enabled the transformation of many emerging economies into a Smart City. It constantly endeavours to support and deliver latest technologically efficient inventions. Thus, UTelco is a perfect model because of broadband services, Smart Cities and Smart Grid solutions provided by it. These solutions can be addressed on same Fibre network laid out by utility. In Indian context, PGCIL- (Power Tel), Rail-Tel & MTCIL are UTelco business model adopted. Among them, Power Tel & MTCIL are Transmitter but no distribution utility has adopted this model so far.

Business Proposal-Regulated Asset Base Leasing for Telecom Towers

TPDDL has Grid & distribution substations along with office premises spanning 510sq km in Delhi with number of prime locations. Telecom Infra

developer has two major challenges in terms of land space for Telecom Tower Installation and getting reliable (24X7) power supply source. TPDDL can generate fixed rental/license revenue from these regulated asset base at zero capital investment. Further Telecom Towers will provide requisite and quality signals to extend AMR penetration in remote geography. RAB leasing for Telecom tower will further add to tariff income as each tower consumes approximately 90-100 Units per day. Detail discussion with M/s Indus has been done and commercial agreement need to be signed to move further. DERC approval has been accorded for this proposal.

Location details within TPDDL have been shared. Final location identification will be done during joint survey post finalization of commercial agreement with M/s Indus Tower.

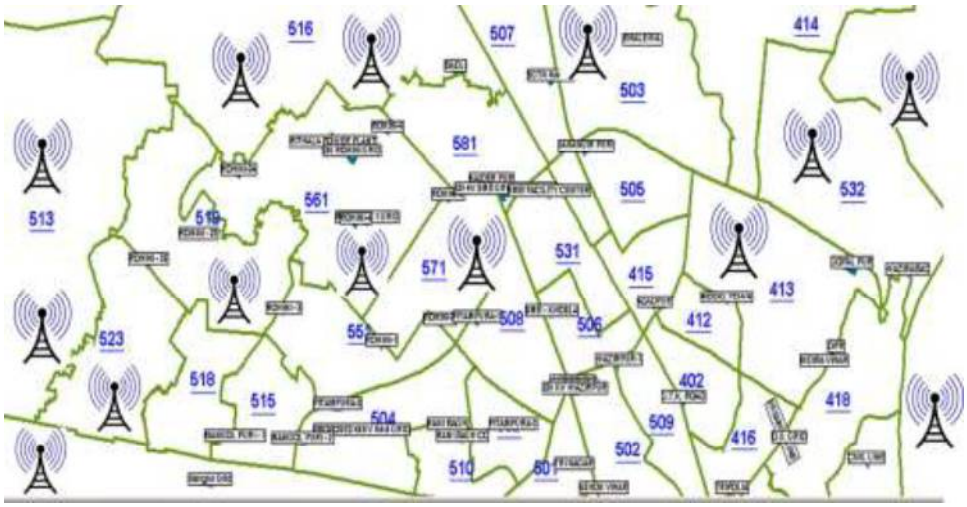


Figure 5.24: Tower locations for installation

RAB Leasing-Financial Report

M/s Indus Tower has sent tentative proposal related to rental value for TPDDL regulated asset. Tentative rental or license value is Rs 55000/Tower/month and total 170 such tower needs to be roll-out in next five years. Average consumption taken for financial projection is 90 Unit/day on installed load of 15 KW/Tower with ABR assumed at Rs 8/unit. Based on above figures financial projection for next five years is tabulated below. Further as per draft commercial agreement interest free deposit of Rs 2 Lakh/tower and rental increment of **10% YoY**.

Table 5.26: Financial projections for the forthcoming years

Sr. No	Time Frame	Site Count	Cumulative Tower Count	Non-Tariff Income Rental Value	Tariff Income
1	Year 1	10	10	66.00	26.28
2	Year 2	25	35	231.00	91.98
3	Year 3	35	70	462.00	183.96
4	Year 4	45	115	759.00	302.22
5	Year 5	55	170	1122.00	446.76
Total		**170**		**2640.00**	**1051.20**

Intangible include expansion of AMR outreach, better illumination through installation of High Mast and enhanced asset safety through wireless CCTV camera on Telecom Tower installed on TPDDL assets. Telecom Tower has mandatory requirement of 4 Hour battery backup. This feature can further be leveraged for Demand response based on detailed study. DERC has accorded requisite approval for this business proposal (attached in annexure).

Business Proposal-Smart Community Solution through OFC Infra

The major sector of customers (population served by TPDDL) belongs to Medium and High class income category (Urban Communities), which contributes to above 60% of the total revenue generated for TPDDL. With rising complex issues in urban cities, it has become essential to manage urban society in a smart manner. The developments should be capable enough to address the changing needs and desires of its consumers. The tools delivered should help in making the lives of people more comfortable and easy. The tools should be such that they make the complex structures of the society a smart and an intelligent community to live in, equipped with latest technological inventions. In simple terms, Smart Community is defined as an intelligent community that discovers sustainable sources contributing to the development of economy.

Smart Community solutions include bundled Value added services like Data, Voice, and Video & Community Microsite. The backbone of all these services is FTH/OFC infra. Robust Fibre to Home Infrastructure can creates immense business opportunity for TPDDL in terms of alternate services like Data,

Voice & Video. With limited exposure in this non-core business function, TPDDL can go for strategic alliance with some ISP/TSP operating in market. Further OFC infrastructure created will enable TPDDL to achieve operation excellence through last mile automation.

Based on our pilot run, we have identified few Apartments / Societies in the area of Rohini and Pitampura, which are big clusters of High Revenue, based consumers.

Details of Working Model and Comparative Analysis

Based on our discussions so far on the subject matter, we have identified two Business Working Models which are illustrated below:

Model 1: TPDDL Owned Infrastructure

Abstract: Under this working model, the entire infrastructure required for having Fibre to Home (FTH) technology shall be Bourne by TPDDL itself. TPDDL is already having a strong robust OFC Network, spread across the entire area of TPDDL. We can use the bandwidth required for FTH Technology through this OFC network, thereby the charges incurred for ISP's would be reduced.

Salient Features

- TPDDL would have dedicated, redundant fibre cable for FTH services, for the areas where bandwidth allocations can be made.
- In parallel, TPDDL has to lay extra fibre cable for the areas wherein the extra bandwidth, over the specified requirement exceeds.
- The design, architecture and solution for FTH services (ranging from Data, Video and Voice services) shall be of best in class to get the optimum output and ensure trouble free operations.
- Installation, testing and commissioning shall be performed under supervision of TPDDL engineers.

Envisaged Benefits

- The entire architecture shall be on the TPDDL Network itself, which shall reduce the rental charges on third party.

- A large segment of consumers residing in the area of Rohini and Pitampura would be benefited with single FTH solution, catering all their daily requirements.
- Most competitive prices shall be offered to our Customers, and further we can use the existing Electricity bill for this service facility also.
- In the long run, this would enable TPDDL to deploy Smart Meters efficiently.

Model 2: Joint Venture Arrangement with a Third Party

Abstract: This is the working model, wherein a Joint Venture agreement shall be made with a Third party for installation of FTH solution for the areas, which are out of reach of TPDDL OFC Network. The third party shall install and lay their own equipment till Consumer premises, where the services are to be provided.

Salient Features

- TPDDL would be the controlling authority of the Third Party.
- All the specifications ranging from architecture to execution shall be designed and framed by TPDDL, in consultation / coordination with the RWA's.

Envisaged Benefits

- The entire architecture shall be under the control of TPDDL.
- A large segment of consumers residing in the area of Rohini and Pitampura would be benefited with single FTH solution, catering all their daily requirements.
- Most competitive prices shall be offered to our Customers, and further we can use the existing Electricity bill for these service facilities also.
- In the long run, this would enable TPDDL to deploy Smart Meters efficiently, and have chances of leasing its own network for these services in future.

Upon successful implementation, the FTH Network layout which shall be developed in Rohini is shown below:

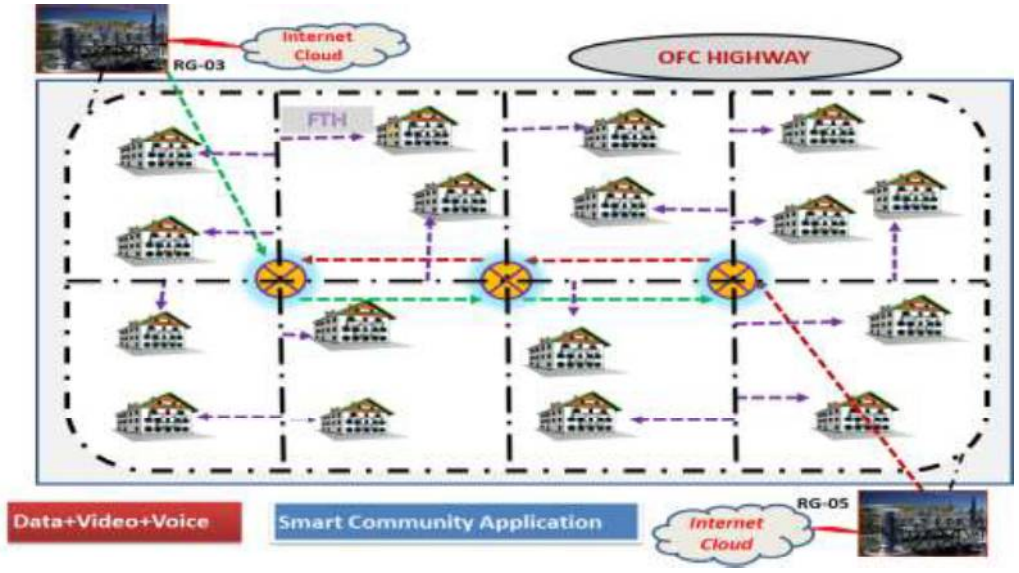


Figure 5.25: SMART community applications

Financial Impact-Smart Community Solution through OFC Infra

Rohini cluster in Sector 13-14 is selected for pilot roll-out of OFC infrastructure. This area mainly consists of multi -story apartments with low loss level and decent spending capacity. M/s Sterlite has conducted detailed survey and found take rate of 40% for its data services with 20% YoY with cost of services as Rs 1200/month.

We have considered more realistic scenario with take rate of 30% & annual growth rate of 10%. Further price of service is pegged at Rs 1000/ month which will be key differentiator viz. other ISP/TSP operating in market. Following table below demonstrates cash flow of Rohini cluster only in five years. Total revenue potential is **Rs 59.54 Crores** with profit close to Rs**23.1 Crores**

		All Figures in Lakhs					
Financial Heads	Sub-Heads	FY 15-16	FY 16-17	FY 17-18	FY 18-19	FY 19-20	Total
Investments & Expenses	OFC(Mat+Inst)@5L/Km	400	20	40	50	50	560
	ISP License Cost	50	5	5	10	10	80
	Internet Link (MTNL/VSNL)		200	400	400	500	1500
	Misc (Equipments, OPEX etc)	200	100	300	400	500	1500
	Total (A)	650	325	745	860	1060	3640
Potential Customers Base		20400	20400	20400	20400	20400	
Active Consumer	Roll out Date : Jan 2016: Take Rate : 30% with YoY : 10 % increase in customer base	6120	6732	7405.2	8145.72	8960.292	
Returns / Revenue generation(B) In Lakhs	A) Data :Rs 1000/month 15 Gb(Guaranted Speed > 20 Mbps B) All Smart Community Solution: Rs 1500/month	734.4	807.84	1332.936	1466.2296	1612.85256	5954.25816
Gross Margin (Profit)	Return-Expenses: (C=B-A)	84.40	482.84	587.94	606.23	552.85	2314.25816

Figure 5.26: Financial Figures

On similar line, there are other 4 High density clusters in Pitampura, Shalimar Bagh, Model Town & Civil Lines where smart community solution can be roll out. Detail financial projection of these clusters requires more analysis but there is clear gross margin of 30-40 % in this business. On similar customer base revenue potential through extrapolation comes to **Rs 198.3 Crores**. Other services like Voice & Video are not included, but could be roll-out once robust OFC Infra is in place.

Asset Sweating for Advertisement agencies

An approved rate of ad-agencies approved by central government indicates rate of 12,000 for hoardings advertisement in Delhi. These rates may vary based on location and size of hoarding. Above rates are for 12x6 feet size of hoarding.

If we assume an average rate of Rs. 9000 per month per hoarding then projected revenue is as follows-**(Refer APPENDIX-C)**

Total potential places for advertisement- 1200

Average rent per month - Rs. 9000

Total rent received per month – Rs.10800000

Total projected revenue per year **– Rs.13 crores**

Table 5.27: Asset Sweating Business Proposal

Asset sweating business Proposal					
Year	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**
Turnover in Crores	**3**	**5**	**8**	**10**	**13**

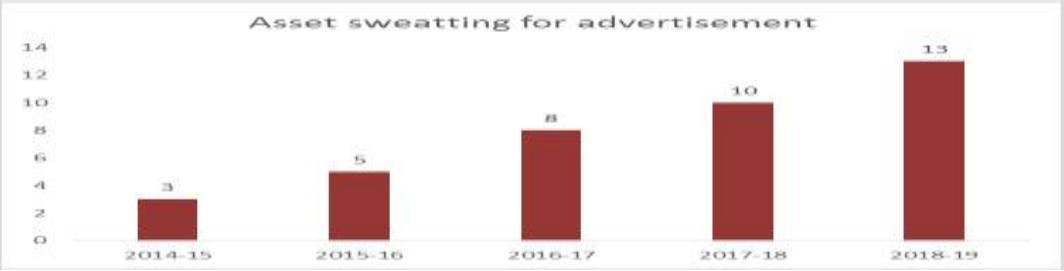


Figure 5.27: Proposed Earnings on Asset sweating business

5.6.4 IE MATRIX FOR NON-CORE BUSINESS:

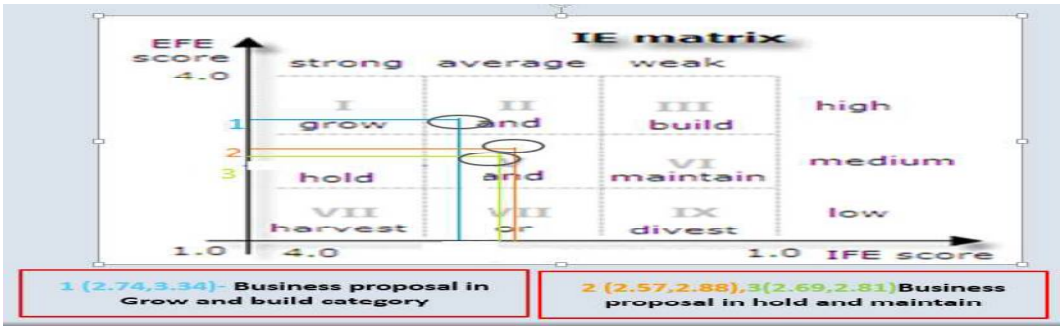


Figure 5.28: IE matrix on Non-core business

Findings on Non-Core Business:

We have considered following Non-core business for IFE and EFE analysis.

Asset sweating:

1. UTELCO
2. Advertisement on Assets

Based on IFE and EFE results and SWOT analysis, UTELCO and Advertisement on Assets has been categorized in Grow and Build Category.

5.7 RECOMMENDATION OF BUSINESS:

Business recommendation Based on IE Matrix analysis.

EPC and ESCO are already an established business with lots of competitors on market. Threat potential is more. They have been categorized on Hold and maintain category based on SWOT analysis and IE analysis.

Roof Top solar, electric vehicles, Open access, UTELCO, Advertisement through assets are new business prepositions with pertaining connection with power business and least competition.

5.8 RECOMMENDATION OF STRATEGIES FOR POWER DISTRIBUTION UTILITY

Exploitation Strategy:

- Exploitation strategy encompasses of stuffs like refinement, effectiveness, construction, choice, assortment, and implementation.

Exploration Strategy

- Exploration comprises of things like exploration, distinction, risk taking, testing, play, elasticity, discovery, modernization.

Strategy Proposed:

On applying the above strategic technique it has been proposed to take forward the following business under following strategy which would help to address the financial issues leading to Business sustenance.

- Rooftop, E-vehicles, UTLECO –Exploration
- Open access, Advertisement through assets- Exploitation.

5.9 CONCLUDING REMARKS

In this chapter data analysis results have been presented. The data was collected and then processed in response to the business problem statement identified in Chapter 1 of the report. Two fundamental goals had driven the

collection of data and the subsequent data analysis. Data was analysed to identify potential factors affecting power distribution business and model. IFE and EFE matrix was used to analyse potential strategies for core business and IE strategic management tool was used to explore potential opportunities in non-core business areas. Lastly, sustainable strategies were recommended to be adopted by TPDDL to cater the financial debt and losses leading to Business Sustenance.