

2018

PROJECT MANAGEMENT CONSULTANCY FOR IMPLEMENTATION OF SMART CITY MISSION PROJECTS FOR MANGALURU CITY





ISSUE AND REVISION RECORD

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ABBREVIATIONS

ABD	Area Based Development
CCMS	Centralized Control and Monitoring System
DPR	Detailed Project Report
EESL	Energy Efficiency Services Ltd.
FTL	Fluorescent Tube Light
GO	Government Order
Gol	Government of India
GPRS	General Package Radio Service
GSM	Global System for Mobile Communication
HPSV	High Pressure Sodium Vapour
HT	High Tension
JV	Joint Venture
kW	Kilowatt
kWh	kilowatt hour
KUIDFC	Karnataka Urban Infrastructure Development & Finance Corporation Limited
LED	Light Emitting Diode
LT	Low Tension
MCC	Mangaluru City Corporation
MESCOM	Mangalore Electric Supply Company Limited
MH Lamp	Metal Halide Lamp
MoUD	Ministry of Urban Development
MSCL	Mangaluru Smart City Limited
0&M	Operation and Maintenance
PPP	Public Private Partnership
SCM	Smart City Mission
SCP	Smart City Proposal
SPV	Special Purpose Vehicle
SoR	Schedule of Rates



1. BACKGROUND

The Ministry of Urban Development (MoUD) and Government of India (GoI) have programmed Smart City Mission (SCM). Karnataka Urban Infrastructure Development & Finance Corporation Limited (KUIDFC) is the State Level Nodal Agency for executing the Smart Cities Mission in Karnataka.

Mangaluru Smart City Limited (MSCL), a special purpose vehicle has been formed for designing, developing, managing and execution of the Smart City Projects. *One of the projects envisioned under the SCP for Mangaluru is to replace conventional street lights by Solar LED street lights in ABD Area and LED Street lights in PAN city area on PPP Basis*. It is desired to achieve reducing energy consumptions as well as to reduce environmental damage.

The subsequent section describes the existing situation analysis of street lights in Mangaluru, Technical Evaluation/feasibility of adopting solar street lighting in Mangaluru, the Government Order (GO) for LED Street Lighting project on PPP Mode, Field Inventory Details for Energy Meters and the Baseline Assessment Report for prepared based on GO.

2. CURRENT SCENARIO

Presently, conventional streetlight fixtures such as metal Halide Lamps (MH), High Pressure Sodium Vapour lamps (HPSV), Fluorescent Tub light (FTL) and LED light fixtures are being used for street illuminations. Summary of the present inventory of the streetlights in Mangaluru is as mentioned below:

40 W FTL	48,600
150 W Sodium Vapour Lamps	6,984
250 W Sodium Vapour Lamps	3,466
250 W Metal Halide Lamps	2,662
400 W Metal Halide Lamps	661
LED Lamps	1,886





Total 64,259 street lights are present in Mangaluru. Based on discussion with MCC and above inventory, it is understood that MCC has undertaken works of replacement of 1866 streetlights into LED. Hence balance 62,373 nos. of conventional lamps will need to be replaced by new equivalent LED light fixtures.

More than 75% street lights are of 40W FTL (Equivalent to 18-24 W LED Street Lights)

The ward wise inventory of the streetlights is enclosed as annexure A to the report

There are 6 subdivisions in Mangalore including:

- Attawara
- Baikampady
- Kavoor
- Kulshekhar
- Managudda
- Suratkal

The wards covered in each subdivision are as mentioned below

S.N.	Subdivision	No. Wards	Ward Nos.	No. Street Lights Energy meters
1	Suratkal	8	1 to 8	357
2	Bikampady	4	9 to 11, 60	251
3	Kavoor	9	12 to 16, 18, 20, 22, 23	373
4	Mannagudda	7	17, 24 to 29	343
5	Attawara	19	30 to 34, 38 to 42, 44 to 47, 55 to 59	686
6	Kulshekhar	13	19, 21, 35 to 37, 43, 48 to 54	550
	Total	60		2,560

A total of 2619 meters are registered under the above 6 sub divisions. Out of 2619 meters, 2560 meters as stated above are in Urban area, rest are in rural area of mangalore

Since all the MESCOM billing records and the meters installed in field are based on subdivisions, all further detailed analysis have been carried out based on each subdivision

3. EVALUATION (TECHNICAL) OF OPTIONS FOR STREET LIGHTING SOLUTIONS FOR MANGALURU

A detailed analysis was case study was carried out on conventional and LED Street lights to determine which option will be practical. Following options were examined –

- LED Street lights without solar panel and without dimming facility
- LED Street lights with solar panel and without dimming facility
- LED Street lights without solar panel and with dimming facility
- LED Street lights with solar panel and with dimming facility



C NI	DESCRIPTION	40 W FTL Lights			150 W HPSV Lights				
5.IN.	DESCRIPTION	24 W LE	24 W LED lights 20 W LED lights		70 W LE	D lights	60 W LED lights		
		BREAK EVEN PERIOD	SAVING PER LAMP PER YEAR IN Rs.	BREAK EVEN PERIOD	SAVING PER LAMP PER YEAR IN Rs.	BREAK EVEN PERIOD	SAVING PER LAMP PER YEAR IN Rs.	BREAK EVEN PERIOD	SAVING PER LAMP PER YEAR IN Rs.
1	Without solar panel and without dimming facility	4.5	613	3.7	736	2.2	3,066	2.0	3,373
2	Without solar panel but with dimming facility	6.0	687	5.2	797	3.1	3,281	2.8	3,557
3	With solar panel and without dimming facility	15.7	3,302	15.1	3,425	9.7	5,755	9.2	6,062
4	With solar panel and with dimming facility	15.4	3,376	14.9	3,486	9.5	5,970	9.0	6,246
S N	DESCRIPTION		250 W HF	SV Lights			400 W N	1H Lights	•
S.N.	DESCRIPTION	140 W L	250 W HF ED lights	SV Lights 120 W L	ED lights	200 W L	400 W N ED lights	1H Lights 180 W L	ED lights
S.N.	DESCRIPTION	140 W L BREAK EVEN PERIOD	250 W HF ED lights SAVING PER LAMP PER YEAR IN Rs.	SV Lights 120 W L BREAK EVEN PERIOD	ED lights SAVING PER LAMP PER YEAR IN Rs.	200 W L BREAK EVEN PERIOD	400 W M ED lights SAVING PER LAMP PER YEAR IN Rs.	1H Lights 180 W L BREAK EVEN PERIOD	ED lights SAVING PER LAMP PER YEAR IN Rs.
S.N. 1	DESCRIPTION Without solar panel and without dimming facility	140 W L BREAK EVEN PERIOD 4.3	250 W HF ED lights SAVING PER LAMP PER YEAR IN Rs. 4,538	PSV Lights 120 W L BREAK EVEN PERIOD 2.8	ED lights SAVING PER LAMP PER YEAR IN Rs. 5,151	200 W L BREAK EVEN PERIOD 2.8	400 W M ED lights SAVING PER LAMP PER YEAR IN Rs. 7,052	1H Lights 180 W L BREAK EVEN PERIOD 2.2	ED lights SAVING PER LAMP PER YEAR IN Rs. 7,665
S.N. 1	DESCRIPTION Without solar panel and without dimming facility Without solar panel but with dimming facility	140 W L BREAK EVEN PERIOD 4.3 3.8	250 W HF ED lights SAVING PER LAMP PER YEAR IN Rs. 4,538 5,611	PSV Lights 120 W L BREAK EVEN PERIOD 2.8 2.0	ED lights SAVING PER LAMP PER YEAR IN Rs. 5,151 6,071	200 W L BREAK EVEN PERIOD 2.8 2.6	400 W M ED lights SAVING PER LAMP PER YEAR IN Rs. 7,052 8,585	1H Lights 180 W LI BREAK EVEN PERIOD 2.2 2.0	ED lights SAVING PER LAMP PER YEAR IN Rs. 7,665 9,045
S.N. 1 2 3	DESCRIPTION Without solar panel and without dimming facility Without solar panel but with dimming facility With solar panel and without dimming facility	140 W L BREAK EVEN PERIOD 4.3 3.8 9.5	250 W HF ED lights SAVING PER LAMP PER YEAR IN Rs. 4,538 5,611 7,840	PSV Lights 120 W L BREAK EVEN PERIOD 2.8 2.0 7.7	ED lights SAVING PER LAMP PER YEAR IN Rs. 5,151 6,071 7,840	200 W L BREAK EVEN PERIOD 2.8 2.6 6.9	400 W M ED lights SAVING PER LAMP PER YEAR IN Rs. 7,052 8,585 10,600	1H Lights 180 W Li BREAK EVEN PERIOD 2.2 2.0 6.2	ED lights SAVING PER LAMP PER YEAR IN Rs. 7,665 9,045 10,600

The summary of results is given in the following Table.





SAVINGS WITH DIMMING FACILITY (Case 1 and 2)

S.N.	DESCRIPTION	24 W LED lights	20 W LED lights	70 W LED lights	60 W LED lights	140W LED lights	120 W LED lights	200 W LED lights	180 W LED lights
1	Without solar panel and without dimming facility	613.2	735.8	3066.0	3372.6	4537.7	5150.9	7051.8	7665.0
2	Without solar panel but with dimming facility	686.8	797.2	3280.6	3556.6	5610.8	6070.7	8584.8	9044.7
3	Difference in annual saving in Rs.	73.6	61.3	214.6	184.0	1073.1	919.8	1533.0	1379.7



The following inferences may be drawn from table and chart above/analysis carried out:

Minimum break even period is for 120W and above is feasible with Option 2 i.e. LED Street Lights without solar panel with dimming facility



- Minimum break even period is for below 120W is feasible with Option 1 i.e. LED Street Lights without solar panel without dimming facility
- The installation of Solar Panel results in doubling of the breakeven point for when compared to installation w/o Solar Panel
- LED Street lights with dimming facility for 120 W and above gives sizable annual savings
- LED Street lights with dimming facility for 24 W and 90 W gives annual savings that is less than 1000/- and hence not recommended

Detailed Calculation are enclosed as Annexure C to the report

A glimpse on the inventory of street lights for Mangaluru reveals that more than 75% street lights are of 40W FTL (equivalent to 18-24 W LED Street light). It may be is inferred that majority of lanes are minor roads and lanes.

In addition to inference/analysis in table above, the following technical limitations were noted while considering installation of solar panel in case of Mangaluru City

- Effectiveness of Installation of solar panels and corresponding output needs open space to eliminate possibility of shadows from trees and tall structures. This may not be feasible on minor roads and lanes and hence may limit the effectiveness of solar panels on street light poles on minor streets and lanes.
- The major roads are typically the one with median and hence the Shadow problem is not envisaged in case of on solar panels installed on street light poles on major streets. However, based on the inventory of Mangaluru and site reconnaissance, the equivalent LED is of 150 W and the manufacturing of solar panels for streetlights is limited to maximum
- Issue of vandalism persists for solar panel on street lights
- Climatic condition of Mangaluru may limit the effectiveness of adoption of solar panel

BASED ON THE ABOVE ANALYSIS AND INFERENCE, IT IS PROPOSED TO GO FOR STREET LIGHTS W/O SOLAR PANEL AND DIMMING FACILITY FOR 120 W AND ABOVE.

4. PROVISIONS LAID UNDER GOVERNMENT ORDER NO UDD 550 PRJ 2017, BENGALURU DATED 15.03.2018 FOR BASELINE ASSESSMENT STUDY

With the objective of providing sustainable and energy efficient smart street lighting in urban areas, it is proposed to implement Energy Efficiency project on PPP model in street lighting by replacement of conventional lamps such as Mercury Vapour/Sodium Vapour lights/Tube Lights/ Metal Halide Lights etc with LED street lights in all city corporations (excluding BBMP) as well as in all other ULB's



The LED street lighting project shall be taken up by the Smart Cities SPV's in case of cities covered under the smart city project and for other City Corporation by itself. In case of other ULB's, district-wise packages will be made by clubbing of ULB's and project will be taken up by the concerned Deputy Commissioners (hereinafter referred as "AUTHORITY")

Initially, "Authority" shall conduct the *baseline study for arriving at the presumptive energy consumption based on the number of existing street lights (non LED and LED) and its rated wattage with below assumptions:*

Street Lighting burning hours: 10 Hours per day during summer months (January to June) and 11 hours during monsoon/winter months (July – December)

- a) At least 99% of LED Lamps are burning (99% uptime)
- b) All energy meters in the project area are in working condition and readings recorded

An analysis of actual ESCOM Energy bills for at least previous 1 year to ascertain the "Fixed Charges" based on sanctioned load and "Energy Charges" based on energy units consumed shall be made to co-relate to presumptive energy consumption arrived based on rates wattage of lamps.

The difference, if any, shall be properly analyzed for (a) non-functional energy meters, (b) non-functional lights & (c) for any other technical reasons and suitably documented/accounted in the baseline study report

5. BASELINE ASSESSMENT STUDY FOR CONVERSION OF ALL LIGHTING INTO LED ON PPP BASIS IN MANGALURU, UNDER MANGALURU SMART CITY

5.1. Preamble

Based on the provision laid under the GO UDD 550 PRJ 2017, BENGALURU DATED 15.03.2018 as described in section 4 above, the following steps are to be carried out as part of baseline assessment:

 Presumptive Energy Consumption based on the number of street lights in the city non LED and LED) and its rated wattage with assumptions for Street Lighting burning hours as 10 Hours per day during summer months (January to June) and 11 hours during monsoon/winter months (July – December)



- 2) An analysis of actual ESCOM Energy bills for at least previous 1 year to ascertain the "Fixed Charges" based on sanctioned load and "Energy Charges" based on energy units consumed shall be made
- 3) The analysis of 1 Year MESCOM Bills shall be co-related to presumptive energy consumption arrived based on rates wattage of lamps
- 4) The difference, if any, shall be properly analyzed for (a) non-functional energy meters, (b) non- functional lights & (c) for any other technical reasons and suitably documented/accounted in the baseline study report

The above aspects are covered in the subsequent sections of the report

5.2. Step 1: Presumptive Energy Consumption based on the existing street Light Inventory of the City

5.2.1. Overall approach

The latest existing street light inventory was collected from MCC officials and analysis was carried out with respect to type of fixtures and its wattage and is presented below

5.2.2. Findings

Presently, conventional streetlight fixtures such as metal Halide Lamps (MH), High Pressure Sodium Vapour lamps (HPSV), Fluorescent Tub light (FTL) and LED light fixtures are being used for street illuminations. Summary of the present subdivision wise inventory of the streetlights in Mangaluru is as mentioned below:

S.N.	Division	No.	40 W	150	250 W	250	400	72	Total	No. Energy
		Wards	Tube	W SV	SV	W	W	W	fixtures	meter
						MH	MH	LED		
1	Suratkal	8	7,663	724	305	262	42	99	9,103	357
2	Bikampady	4	4,294	393	185	111	41		5,028	251
3	Kavoor	9	9,994	927	615	346	67	80	12,038	373
4	Mannagudda	7	3,651	741	311	379	74	32	5,195	343
5	Attawara	19	9,950	2,325	1,257	970	339	111	14,971	686
6	Kulshekhar	13	15,448	1,874	793	594	168	17	18,907	550
	Total	60	51,000	6,984	3,466	2,662	731	339	65,242	2,560

PRESENT INVENTORY OF LIGHTING FIXTURES SUBDIVISIONWISE

Based on MCC records, total 64,259 street lights are present in Mangaluru. Based on discussion with MCC and above inventory, it is understood that MCC has undertaken works of replacement of 1866 streetlights into LED. Hence balance 62,373 nos. of conventional lamps will need to be replaced by new equivalent LED light fixtures.

More than 75% street lights are of 40W FTL (Equivalent to 18-24 W LED Street Lights)



The ward wise inventory of the streetlights is enclosed as annexure A to the report. The subdivision wise summary of energy consumption based on MCC inventory is mentioned below:

S.N.	Subdivision	Yearly energy consumption for 2017 as per Inventory (kWh)	S.N.	Subdivision	Yearly energy consumption for 2017 as per Inventory (kWh)
1	Attawara	9304595.013	4	Kulshekhar	1891580.58
2	Baikampady	834163.38	5	Managudda	1901295.936
3	Kavoor	1645441.614	6	Suratkal	1314134.172
Total	- 16 901 7	011			

Total = **16,891,211**

Detailed subdivision wise- meter wise yearly energy consumption based on inventory is enclosed as Annexure C to the report

5.3. Step 2: Analysis of last 1 year (2017) Energy Bills of MESCOM

5.3.1. Overall approach

As per the GO instructions, an analysis of actual ESCOM Energy bills for at least previous 1 year to ascertain the "Fixed Charges" based on sanctioned load and "Energy Charges" based on energy units consumed shall be made

Accordingly, Monthly bills for complete 1 year 2017 (Jan 2017-Dec 2017) were collected from respective sub division for each meter including Revenue Registered Number (RR Number), Sanctioned Load, Fixed Charges and Energy Charges for each registered meter

The table below shows the format/details available from MESCOM bills for further analysis





5.3.2. Findings

The subdivision wise summary of energy consumption based on MESCOM bills is mentioned below:

S.N.	Subdivision	Yearly energy consumption for 2017 as per MESCOM Bills (kWh)	S.N.	Subdivision	Yearly energy consumption for 2017 as per MESCOM Bills (kWh)
1	Attawara	9596778.646	4	Kulshekhar	2685916.6
2	Baikampady	1107847.07	5	Managudda	2203379.72
3	Kavoor	2694265	6	Suratkal	1445425.8
Total	= 19,733,6	13			

Detailed subdivision wise, meter wise yearly energy consumption based on MESCOM Bills is enclosed as Annexure C to the report

The Sub-division wise, meter wise MESCOM bills (2017) collected are enclosed as Annexure D to the report

5.4. Step 3: Correlation of Presumptive Energy Consumption and Energy Consumption based on MESCOM bills

5.4.1. Overall Approach

As required, the analysis of 1 Year MESCOM Bills (2017) were co-related to presumptive energy consumption arrived based on rates wattage of lamps

5.4.2. Findings

The subdivision wise summary of energy consumption based on Presumptive Consumption and MESCOM bills is mentioned below:

S.N.	Subdivision	Yearly energy consumption for 2017 as	Yearly energy consumption for 2017 as per MESCOM
		per inventory (kwn)	Bills (KVVN)
1	Attawara	9596778.646	9596778.646
2	Baikampady	1107847.07	1107847.07
3	Kavoor	2694265	2694265
4	Kulshekhar	2685916.6	2685916.6
5	Managudda	2203379.72	2203379.72
6	Suratkal	1445425.8	1445425.8
	Total	16,891,211	19,733,613

Detailed subdivision wise, meter wise yearly energy consumption based on MESCOM Bills is enclosed as Annexure C to the report



As is evident from table above, the Yearly Energy Consumption as per MESCOM Bills is more than that derived from the actual presumptive consumption

5.5. Step 4: Analysis of Difference in Presumptive Approach and MESCOM billing

5.5.1. Overall Approach

Since there is variation in yearly energy consumption based on inventory and yearly energy consumption based on MESCOM bills, *a detailed field survey/Inventory was carried out along with MESCOM officials/lineman for taking energy readings on each meter*

The overall intent of the Field survey was to identify:

- 1) Identify the non-functional meter, if any
- 2) Any other possible technical issue

5.5.2. Field Inventory/ Survey for Street Light meters

A detailed 2 months field survey/ inventory was carried out along with MESCOM officials/lineman was carried out for taking energy readings on each meter

The methodology adopted for the field survey for each is as listed below

Switch on the Energy meters

Record/Note the following:

- RR Number
- Latitude and Longitude for asset mapping
- Whether meter is working condition or non-working condition
- Initial Meter Reading
- Voltage
- Current
- Whether the meter is 1 Phase meter or 3 Phase meter

Take Final Reading for each meter after 1 hour



The overall format in which the data was compiled is as mentioned below

RR No.	Initial Reading (kWh)	Final Reading (kWh)	Diff. (kWh)	Start Time	End Time	Time Hr.	Yearly cons. (kWh)	Voltage (V)	Current (A)	1 ph/ 3 ph	Yearly cons. (kWh)	Latitude	Longitude

The Photographs shown below are the documentation of the field inventory process. The complete set of Photographs will be submitted to MSCL in CD



APPOINTMENT OF PROJECT MANAGEMENT CONSULTANTS FOR IMPLEMENTATION OF SMART CITY MISSION PROJECTS IN MANGALURU CITY



BASELINE ASSESSMENT REPORT FOR LED STREET LIGHTING ON PPP MODE IN MANGALURU



The KMZ file created for asset mapping of each meter is as shown below. The editable copy of the same will be handed over to MSCL/MCC/MESCOM



5.5.3. Findings and Inferences

The sub division wise findings and yearly energy consumption are as mentioned in table below

S.N.	Subdivision	Meters surveyed	Meters working	Meters not working	% meters not working	As per Field Survey
1	Attawara	704	638	66	10.34	4412683.227
2	Baikampady	237	189	48	25.40	1384495.389
3	Kavoor	399	378	21	5.56	2820517.67
4	Kulshekhar	580	532	48	9.02	3209305.62
5	Managudda	360	307	53	17.26	2107941.803
6	Suratkal	339	302	37	12.25	1434854.066
	Total	2619	2346	273	10.42	15,369,798

A total 273 meters were recorded as in nonworking condition which is 10.42% of total 2619 meters

As it evident from graph, Baikampady has registered highest % percentage of meters not working (25.40%),



followed by Managudda (17.26%) and Suratkal (12.25%)

In addition to the non-working meters, the following additional technical reasons may be noted as reason accounting for difference in yearly consumption based on MCC records and that of MESCOM bills:

- Street lights are being operated manually and hence time durations are different
- In event of meters becoming defective or non-working, MESCOM bills are generated using average of three consecutive energy readings prior to meter known to be defective.
- Accuracy of meters may vary



6. ESTIMATED ENERGY SAVINGS

Based on the proceedings of Committee Meeting on "Approval of Presumptive Consumption arrived after Baseline Study and to clear the RFP under Implementation of Energy Efficiency Project for streetlights by replacement of existing conventional lamps with LED along with Centralized Control and Monitoring System (CCMS) in all Smart cities/ Urban local bodies of Karnataka – reg, held on 20.3.2018 at DMA office", the energy savings calculation shall be re-verified as per the assumed burning hours and other considerations for both Pre-LED and post LED Scenario, considering only the presumptive energy consumption of conventional light fixtures and LED Fixtures respectively

Accordingly, the estimated energy savings and the % energy savings have been derived based on presumptive energy consumption for both Pre-LED and post LED Scenario

6.1. Assumptions

- New LED lighting fixtures will be installed on the existing lighting poles and on the same location.
- LED wattage shall be determined for existing system lumens and lux levels.
- Burning hours of Street lights is considered 10 hours for Jan-June and 11 Hours for July 0 Dec
- Dimming LED fixtures with 120 W or higher wattage every day for calculation of energy saving.
- Procurement of LED fixtures shall conform to the technical specifications.
- Prevailing energy tariff to MCC is considered as Rs. 5.85/- per kWh with 5% escalation every year.
- Discounted Tariff for LED Replacement as applied by MESCOM i.e. 4.85/- per kWh with 5% escalation every year will be considered for post LED scenario
- While Calculating the energy Consumption (units) for various wattages of existing streetlights like FTL, Sodium Vapour, Mercury Halide, and induction lamps, an addition of 15% has been done to compensate for Choke losses (as per 2nd DMA Committee meeting proceedings)

6.2. Proposed Equivalent Inventory for Conversion to LED

Based on the same system lumen output, the proposed equivalent inventory of LED street lights shall be –

24 W LED Street Lights 48,600 90 W LED Street Lights 10,450 180 W LED Street Lights 3,319 LED Lamps 1,886 Total 64,259



The ward wise inventory of the equivalent LED streetlights inventory is enclosed as annexure B to the report

S.N.	Existing Fixtures	Wattage	LED Fixture	Wattage	Saving in W
1	400 W MH	430	200 W LED	200	230
			180 W LED	180	250
2	250 W MH	280	120 W LED	120	160
3	250 W SV	280	120 W LED	140	140
				120	160
4	150 W SV	170	70 W LED	70	100
			60 W LED	60	110
5	40 W FTL	44	24 W LED	24	20
			20 W LED	20	24
			18 W LED	18	26

The estimated saving in wattage, for same system lumens, is as demonstrated below

Note:

- 1) The LED wattage shall differ from manufacturer to manufacturer.
- Present illumination may be less or more giving number of dark spots or over illuminations. To correct the illumination as per norms given in the Table below, Developer shall consider +/- 10% change in the total wattage of the new inventory considered above.

Illumination for Streets – Is 1944

S.N.	Group	Ave. Lux Level	E _{min} /E _{ave}	E _{min} / Emax
				TIIAA
1	Gr. A1 – Fast Traffic	30	0.4	0.33
2	Gr. A2 – Mixed Traffic	15	0.4	0.33
3	Gr. B1 – Secondary Roads with shops	8	0.3	0.2
4	Gr. B2 – Secondary Roads with light	4	0.3	0.2
	Traffic			

6.3. Estimated Energy Savings for Proposed Street Lighting Solutions for Mangaluru

Based on the existing inventory with MCC, a total of 62373 existing fixtures (excluding already replaced LED fixture) are to be replaced with LED. The total load of these fixtures based on current fixtures installed is calculated as 5324 kW (Refer Annexure A for details)



Based on the proposed replacement Fixtures as stated in section 6.2, the total load of new LED fixtures is estimated as 2876 kW (Refer Annexure B for details)

The summary of estimated energy savings under Mangaluru Smart City, is as stated below

A) Pre-LED Scenario (Existing Scenario)

Sr. No	Existing Fixtures	Wattage including 15% choke losses)	Energy Consumption in kWh	Energy Consumption in kWh	Total Energy Consumption in kWh
		kw	(Burning Hours @ 10	Burning Hours @ 10	
			Hrs/ day during Jan to	Hrs/ day during Jan to	
			Julie	Julie	
1	40W Tube	2236	4046436	4524854	8571290
2	150W S.V.	1205	2181412	2439325	4620737
3	250W S.V.	997	1804660.5	2018029	3822690
4	250W M.H.	766	1386279	1550182	2936461
5	400W M.H.	304	549516	614486	1164002
	Total	5507	9968304	11146876	21115180
	7	21115180			

B) Post- LED Scenario (Proposed Scenario) and Estimated Energy Savings

Sr. No	Existing Fixtures	Wattage	Energy Consumption in kWh	Energy Consumption in kWh	Total Energy Consumption in kWh	Energy Savings due to LED replacement in kwh
		kw	(Burning Hours @ 10 Hrs/ day during Jan to	Burning Hours @ 10 Hrs/ day during Jan to		
1	24W LED	1166	2110460	2359984	4470444	4100846.4
2	70W LED	629	1138490	1273096	2411586	2209150.8
3	120W LED	520	941200	1052480	1993680	1829009.7
4	120 W LED	399	541190	605176	1146366	1790094.6
5	150 W LED	162	293220	327888	621108	542894.4
	Total	2876	5024560	5618624	10643184	10471995.9
	Add 10% additio	onal energ	y savings on acco	unt of CCMS insta	allation	1047199.59
				Total Energ	yy Savings	11519195.49

Based on A) and B) above, Total estimated savings in % = (11519195.49/21115180)*100 = 55% APPOINTMENT OF PROJECT MANAGEMENT CONSULTANTS FOR IMPLEMENTATION OF SMART CITY MISSION PROJECTS IN MANGALURU CITY



BASELINE ASSESSMENT REPORT FOR LED STREET LIGHTING ON PPP MODE IN MANGALURU

6.4. Discussions with MCC regarding the current Expenses incurred

Based on discussion with MCC it is understood that

- Current bills paid by MCC for street lights is INR 11.5 Cr/Yr
- O&M expenditure borne by MCC is INR 5.2 Cr/Yr
- The works undertaken for replacement of 1866 streetlights to LED are of Havells brand. The replaced LED are of 72 W, 90 W and 110 W having approximate cost of INR 8000-9000/Unit

6.5. Estimation of the Salvage Value

Following Table gives the salvage value of the lighting fixtures which will be removed for installing LED Street Lights –

S.N.	Type of Lighting	Quantity	Unit salvage rate in	Total salvage cost in
	Fixtures		Rs.	Rs.
1	40 W FTL	48,600	150	72,90,000
2	150 W HPSV	6,984	300	20,95,200
3	250 W HPSV	3,466	400	13,86,400
4	250 W MH	2,662	400	10,64,800
5	400 W MH	661	400	2,64,400
	Total salvage value			1,12,00,800

The total estimated salvage value is INR 1.12 Cr

6.6. Details of Electricity Charges paid, O& M expenditure Energy Consumption of street lights during 2015-16, 2016-17, 2017-18

Year	Expenditure incurred/ Energy consumption charges paid to MESCOM (Cr)	Expenditure incurred for O&M Bill (Cr)	Energy Consumption
2015-16	11.34	4.12	1.79
2016-17	12.16	4.47	1.86
2017-18	12.47	4.76	1.74

Signed copy (AEE, Electrical; MCC) is enclosed to the report

6.7. Details of SFC Grants for 2015-16, 2016-17, 2017-18

Year	Released	Expenditure
2015-16	508250000.00	334455387.00
2016-17	203103000.00	375707453.00
2017-18	415172000.00	345173708.00



Annexure A: Existing	Street	Light F	Fixtures
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14/ord	40W	Tube	150W	/ S.V.	250W	S.V.	250W	М.Н.	400W I	И.Н.	7014/150	0014/155	110W
ward	Quantity	kW	Quantity	kW	Quantity	kW	Quantity	kW	Quantity	kW	72W LED	90W LED	LED
1	998	40	98	15	28	7	29	7	2	1	-	-	142
2	927	37	77	12	36	9	30	8	2	1	-	-	-
3	955	38	85	13	43	11	35	9	5	2	-	41	-
4	944	38	103	15	37	9	38	10	16	6	-	50	-
5	965	39	96	14	45	11	35	9	3	1	99	-	-
6	813	33	83	12	31	8	26	7	2	1	-	-	-
7	897	36	81	12	43	11	32	8	2	1	-	-	-
8	964	39	101	15	42	11	37	9	8	3	-	-	64
9	807	32	76	11	42	11	32	8	2	1	-	-	-
10	1,075	43	135	20	65	16	31	8	14	6	-	-	-
11	1,020	41	89	13	35	9	19	5	4	2	-	-	217
12	1,145	46	97	15	30	8	16	4	0	0	80	-	-
13	1,096	44	81	12	210	53	10	3	0	0	-	-	-
14	739	30	75	11	90	23	33	8	10	4	-	-	-
15	1,239	50	93	14	36	9	17	4	0	0	-	-	-
16	1,065	43	102	15	26	7	18	5	0	0	-	-	46
17	870	35	85	13	42	11	12	3	6	2	28	-	-
18	1,196	48	96	14	31	8	30	8	6	2	-	-	-
19	776	31	170	26	88	22	33	8	6	2	-	90	-
20	1,268	51	135	20	96	24	41	10	12	5	-	-	-



Ward	40W	Tube	150W	/ S.V.	250W	S.V.	250W	М.Н.	400W M	и.н.	7214/150	0014/150	110W
ward	Quantity	kW	Quantity	kW	Quantity	kW	Quantity	kW	Quantity	kW	72W LED	90W LED	LED
21	1,151	46	151	23	42	11	55	14	10	4	-	-	-
22	1,103	44	142	21	46	12	156	39	24	10	-	-	-
23	843	34	106	16	50	13	25	6	6	2	-	-	-
24	665	27	181	27	46	12	45	11	10	4	-	-	74
25	584	23	90	14	42	11	11	3	0	0	-	-	-
26	531	21	103	15	49	12	115	29	6	2	226	-	-
27	452	18	97	15	45	11	25	6	12	5	-	-	-
28	263	11	93	14	46	12	142	36	31	12	-	-	-
29	286	11	92	14	41	10	29	7	9	4	-	-	-
30	351	14	86	13	79	20	102	26	12	5	50	-	-
31	639	26	79	12	106	27	32	8	22	9	-	-	-
32	757	30	132	20	97	24	18	5	12	5	-	-	-
33	522	21	141	21	97	24	22	6	6	2	-	126	-
34	718	29	124	19	94	24	20	5	18	7	10	-	-
35	1,426	57	165	25	53	13	30	8	10	4	-	-	-
36	1,019	41	146	22	73	18	58	15	12	5	-	60	-
37	1,058	42	96	14	78	20	26	7	0	0	-	-	52
38	889	36	180	27	92	23	124	31	18	7	70	-	-
39	851	34	96	14	73	18	16	4	0	0		65	-
40	239	10	160	24	63	16	83	21	27	11	149	-	-
41	255	10	169	25	64	16	67	17	19	8	-	-	-



Mand.	40W Tube		150W S.V.		250W S.V.		250W M.H.		400W I	И.Н.	7214/150	0014/150	110W
ward	Quantity	kW	Quantity	kW	Quantity	kW	Quantity	kW	Quantity	kW	72W LED	90W LED	LED
42	158	6	87	13	25	6	51	13	29	12	-	-	-
43	245	10	197	30	72	18	155	39	20	8	-	-	-
44	117	5	126	19	63	16	71	18	25	10	-	-	-
45	333	13	108	16	38	10	75	19	15	6	-	-	-
46	243	10	98	15	112	28	47	12	29	12	-	-	-
47	987	39	179	27	39	10	55	14	20	8	-	-	-
48	661	26	107	16	89	22	26	7	32	13	40	-	-
49	1,133	45	128	19	33	8	38	10	2	1	50	-	-
50	988	40	134	20	33	8	42	11	2	1	-	-	-
51	1,209	48	146	22	80	20	38	10	14	6	-	-	-
52	1,404	56	138	21	90	23	22	6	18	7	-	-	32
53	1,689	68	169	25	33	8	34	9	22	9	-	-	-
54	1,679	67	127	19	29	7	37	9	2	1	-	-	-
55	517	21	113	17	36	9	52	13	21	8	-	-	-
56	390	16	127	19	74	19	41	10	8	3	25	-	-
57	255	10	82	12	31	8	54	14	18	7	-	-	-
58	305	12	79	12	56	14	22	6	6	2	-	-	-
59	834	33	159	24	18	5	18	5	2	1	-	-	-
60	1,092	44	93	14	43	11	29	7	12	5	-	-	-
Total	48,600	1,944	6,984	1,048	3,466	867	2,662	666	661	264	827	432	627
Grand													



Ward	40W Tube		150W S.V.		250W S.V.		250W M.H.		400W M.H.			90W/ LED	110W
	Quantity	kW	Quantity	kW	Quantity	kW	Quantity	kW	Quantity	kW	72W LED	90W LED	LED
total													
1) Fixtures	62,373	E selveline											
2) kW	4788 (excludin g choke losses)	existing LED Fixtures											



Ward	24 W	LED	70 W LED		120 V	V LED.	120 V	V LED.	200 W LED	
	Quantity	kW	Quantity	kW	Quantity	kW	Quantity	kW	Quantity	kW
1	998	24	98	9	28	4	29	4	2	0.5
2	927	22	77	7	36	5	30	5	2	0.5
3	955	23	85	8	43	6	35	5	5	1.2
4	944	23	103	9	37	6	38	6	16	3.9
5	965	23	96	9	45	7	35	5	3	0.7
6	813	20	83	7	31	5	26	4	2	0.5
7	897	22	81	7	43	6	32	5	2	0.5
8	964	23	101	9	42	6	37	6	8	2.0
9	807	19	76	7	42	6	32	5	2	0.5
10	1,075	26	135	12	65	10	31	5	14	3.4
11	1,020	24	89	8	35	5	19	3	4	1.0
12	1,145	27	97	9	30	5	16	2	0	0.0
13	1,096	26	81	7	210	32	10	2	0	0.0
14	739	18	75	7	90	14	33	5	10	2.5
15	1,239	30	93	8	36	5	17	3	0	0.0
16	1,065	26	102	9	26	4	18	3	0	0.0
17	870	21	85	8	42	6	12	2	6	1.5
18	1,196	29	96	9	31	5	30	5	6	1.5
19	776	19	170	15	88	13	33	5	6	1.5

Annexure B: Proposed LED Street Light Fixtures



Ward	24 W LED		70 W LED		120 V	V LED.	120 W LED.		200 W LED	
	Quantity	kW	Quantity	kW	Quantity	kW	Quantity	kW	Quantity	kW
20	1,268	30	135	12	96	14	41	6	12	2.9
21	1,151	28	151	14	42	6	55	8	10	2.5
22	1,103	26	142	13	46	7	156	23	24	5.9
23	843	20	106	10	50	8	25	4	6	1.5
24	665	16	181	16	46	7	45	7	10	2.5
25	584	14	90	8	42	6	11	2	0	0.0
26	531	13	103	9	49	7	115	17	6	1.5
27	452	11	97	9	45	7	25	4	12	2.9
28	263	6	93	8	46	7	142	21	31	7.6
29	286	7	92	8	41	6	29	4	9	2.2
30	351	8	86	8	79	12	102	15	12	2.9
31	639	15	79	7	106	16	32	5	22	5.4
32	757	18	132	12	97	15	18	3	12	2.9
33	522	13	141	13	97	15	22	3	6	1.5
34	718	17	124	11	94	14	20	3	18	4.4
35	1,426	34	165	15	53	8	30	5	10	2.5
36	1,019	24	146	13	73	11	58	9	12	2.9
37	1,058	25	96	9	78	12	26	4	0	0.0
38	889	21	180	16	92	14	124	19	18	4.4
39	851	20	96	9	73	11	16	2	0	0.0
40	239	6	160	14	63	9	83	12	27	6.6



Ward	24 W LED		70 W LED		120 V	V LED.	120 W LED.		200 W LED	
	Quantity	kW	Quantity	kW	Quantity	kW	Quantity	kW	Quantity	kW
41	255	6	169	15	64	10	67	10	19	4.7
42	158	4	87	8	25	4	51	8	29	7.1
43	245	6	197	18	72	11	155	23	20	4.9
44	117	3	126	11	63	9	71	11	25	6.1
45	333	8	108	10	38	6	75	11	15	3.7
46	243	6	98	9	112	17	47	7	29	7.1
47	987	24	179	16	39	6	55	8	20	4.9
48	661	16	107	10	89	13	26	4	32	7.8
49	1,133	27	128	12	33	5	38	6	2	0.5
50	988	24	134	12	33	5	42	6	2	0.5
51	1,209	29	146	13	80	12	38	6	14	3.4
52	1,404	34	138	12	90	14	22	3	18	4.4
53	1,689	41	169	15	33	5	34	5	22	5.4
54	1,679	40	127	11	29	4	37	6	2	0.5
55	517	12	113	10	36	5	52	8	21	5.1
56	390	9	127	11	74	11	41	6	8	2.0
57	255	6	82	7	31	5	54	8	18	4.4
58	305	7	79	7	56	8	22	3	6	1.5
59	834	20	159	14	18	3	18	3	2	0.5
60	1,092	26	93	8	43	6	29	4	12	2.9
Total	48,600	1,166	6,984	629	3,466	520	2,662	399	661	162



Ward	24 W LED		70 W LED		120 V	V LED.	120 W LED.		200 W LED	
	Quantity	kW	Quantity	kW	Quantity	kW	Quantity	kW	Quantity	kW
Grand total					6,128					
1) Fixtures	62,373	Excluding								
2) kW	2,876	existing LED Fixtures								



Annexure C: Detailed subdivision wise- meter wise energy consumption based on inventory SUMMARY OF ENERGY METERS

S.N.	Subdivision	Meters surveyed	Meters working	Meters not working	% meters not working	As per MESCOM Bill	As per Inventory	As per Field Survey
1	Attawara	704	638	66	10.34	9596778.646	9304595.013	4412683.227
2	Baikampady	237	189	48	25.40	1107847.07	834163.38	1384495.389
3	Kavoor	399	378	21	5.56	2694265	1645441.614	2820517.67
4	Kulshekhar	580	532	48	9.02	2685916.6	1891580.58	3209305.62
5	Managudda	360	307	53	17.26	2203379.72	1901295.936	2107941.803
6	Suratkal	339	302	37	12.25	1445425.8	1314134.172	1434854.066
	Total	2619	2346	273	10.42	19,733,613	16,891,211	15,369,798



Data from MESCOM is not available

MNR and Data from survey not available

data from MESCOM and Survey not available

Note: For MNR data, we have considered as per MESCOM's yearly unit.

WTE Louis Berger Tisto

BASELINE ASSESSMENT REPORT FOR LED STREET LIGHTING ON PPP MODE IN MANGALURU

Annexure D: Sub-division wise, meter wise MESCOM bills (2017)