Terms and conditions for Bidder for Implementation of 20000 Energy efficient street lighting performance contract, technical details, Sepcifications

PART- 3

Reference No.: NIT 3

Date: 14/05/2016

Bhopal Smart City Development Co. Ltd, Bhopal
Madhya Pradesh

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Letter of Invitation

Invitation No:

The BSCDCL is implementing the Smart street lighting project of 20000 lights as per the attached list on CONCESSIONAIRE Model.

Background

The overall objective of the BSCDCL IS TO REPLACE TREDITIONAL LIGHTS WITH THE SMART ENERGY EFFICIANT STREET LIGHTING project is as follows:

1. To improve the illumination level on the roads and improve compliance with commonly accepted standards for street lighting;
2. Reduction of energy consumption and greenhouse gas emissions through energy efficient retrofits;
3. Modernization/augmentation of metering, monitoring and control system to ensure successful design and implementation of large scale municipal street lighting energy efficiency;and
4. Creation of the foundation of a smarter Bhopal (Smart City) by implementing a smart city platform through 'networked' LED street light installation and an advanced multi-application Control and Monitoring System (CMS);
5. Ensure efficient operation and maintenance of street lighting services using the smart city plateform.

Annexure – A: Instructions to Bidders

Submission of bid as per the RFP document volume-1 and 2

Annexure – B: Project Structure and Scope of Work

The overall operational mechanism of an CONCESSIONAIRE model for a shared savings prototype is as shown below.

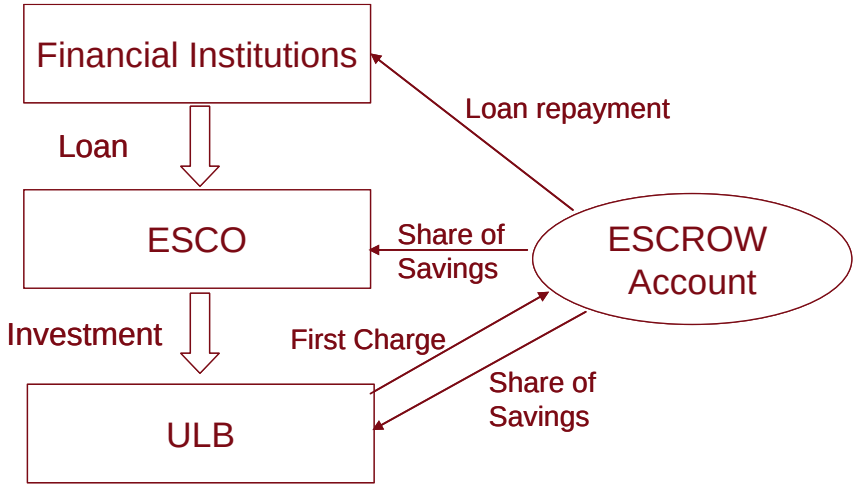


Figure 1: ESCO Model based on Shared Saving Concept

The bidding parameter in shared savings contract is usually the ***"percentage savings of energy"***, measured against the baseline, which the CONCESSIONAIRE offers to share with BhopalMunicipal Corporation. A minimum guarantee on project savings, based on the investment grade energy audit report and project specifications is enforced as a part of the bidding. The transaction structure for the CONCESSIONAIRE project will be as follows:

Table 1: CONCESSIONAIRE Project Structure

Particular	Structure for CONCESSIONAIRE Project
Model	Shared Saving – Design, Finance,Build, Own, Operate & Transfer (BOOT) Model
Parameters for Evaluation of Financial bids	• Overall Quoted Guaranteed Energy Savings (%) from retrofitting of street light fixtures on each feeder panel selected under CONCESSIONAIRE project • Percentage share of overall savings offered to BSCDCL from the guaranteed savings proposed by CONCESSIONAIRE;
Sharing of Savings	Minimum 10% of overall savings has to be offered toBSCDCL;
Tariff Consideration	As per the present prevailing electrical tarrif of MPMKVVCL and shall be revised by the DISCOM in future.

Particular	Structure for CONCESSIONAIRE Project
Project Coverage	Retrofitting and O&M of identified switching points and respective street light fixtures that are installed on Street light Infrastructure provided by DISCOMand BSCDCL. • Successful bidder will deploy an LED streetlight smart networking solution consisting of (i) individual controller at every LED streetlight (ii) a sub-Ghz (free band 865Mhz - 867Mhz) rf mesh network solution and (iii) a multi-application Control and Monitoring System. Feeder controllers will be connected to the rf mesh network • Successful bidder will replace existing brackets along with energy efficient street lights(to improve the lighting levels) as per the new specifications and designs, • They will also replace all the terminal box, junction box, flexible wires from Fixture to terminal box/Junction box wherever required; • O&M of street light conductors and underground cables will be in the scope of CONCESSIONAIRE.
Energy Conservation Measures (ECMs)	Technical Specifications for LED street lights and LED streetlight smart networking solution is a part of Tender document;
Project Duration	15 Years, excluding construction period
Savings	Minimum/ Reserve value of Guaranteed monthly Energy Savings at 35% of monthly baseline energy consumption at each switching point covered under CONCESSIONAIRE project for next 15 years;
Monitoring of energy savings post implementation; whether an independent agency / engineer is contemplated	Yes. An independent agency will be appointed by BSCDCL for implementation monitoring and subsequent O&M monitoring, supervision for energy saving achieved and inspection of optimized use of the Smart City Platform. The monitoring and verification process is detailed out in Energy Performance Contract (Volume II)
Minimum standards of Operation and Maintenance	The minimum standards for maintenance of the lux level on roads and operation and maintenance of street light system should be adhered as per BSCDCL rules and guidelines and National Lighting codes
Penalties & Liabilities	• Penalties levied for non-achievement of savings shall be equivalent to at least the difference between actual and quoted guaranteed savings; • Penalties levied for non-compliance of lux level standard

Particular	Structure for CONCESSIONAIRE Project
	• Penalty for Non-Compliance to Minimum Up-Time • Penalty for non-compliance with electrical safety related matters • Penalties levied for non-implementation or non-operation of the streetlight networking solution
Payment security	Trust and Retention Account (TRA) or ESCROW Mechanism to enhance bankability of the project;
Provisions relating to escrow account, if any	Appointment BSCDCLand the Contractor/CONCESSIONAIRE shall appoint the a reputable Bank to serve as the escrow agent for the purposes of this Agreement and subject to the terms of this Agreement and the Escrow Agent hereby accepts this appointment. Escrow Account Within five (5) Business Days of the date hereof, BSCDCLand the Escrow Agent shall establish an escrow bank account denominated in Indian Rupees for the benefit of the CONCESSIONAIRE (the " CONCESSIONAIRE PROJECT ACCOUNT "). Deposit and Replenishment Request Within fifteen (15) days of signing of this Agreement ("CONCESSIONAIRE Project Account Agreement"), BSCDCL shall deposit an amount equal to One (1) months of energy bills. In the event that the amount in CONCESSIONAIRE Project Account falls below 30% of the previous deposited amount or on payment of monthly energy saving fee for subsequent two months, whichever is earlier, the Escrow Agent shall send a written request ("Replenishment Request") to BSCDCLto replenish the CONCESSIONAIRE Project Account and with a copy to the CONCESSIONAIRE for the same. Identification and Separation The Escrow Agent shall clearly identify in its records the Escrow Account as an escrow account and shall keep the funds standing to the credit of the Escrow Account segregated from and not commingled with the Escrow Agent's own funds or the funds of any of its other customers or third parties. Fees Fees to be paid to the Escrow Agent for the establishment and management of the Escrow Account shall be borne equally by BSCDCLand the CONCESSIONAIRE.

Table 2:Proposed responsibility of CONCESSIONAIRE under the project

Area	Responsibility Assigned to CONCESSIONAIRE under this project
Meet Desired Outcomes	• Achieving agreed/ quoted monthly Energy Savings (%);

Area	Responsibility Assigned to CONCESSIONAIRE under this project
	• Design and Installation of smart streetlight network and plateform based on individual streetlights and feeder panels control with Remote Measurement, monitoring& Switching Capability; • Meeting timelines specified in contract for replacements/ repair of non-functional Street light fixtures and feeder panel;
Key responsibilities	• Capital investments required for retrofitting of street light fixtures; • Design and Installation of Feeder Panels with Remote Measurement, monitoring& Switching Capability; • O&M (only for Street light fixtures and and smart streetlight control system (CMS, Network, Individual controller and feeder controller) which have been installed by the CONCESSIONAIRE) including replacement requirements during tenure of project;
Citizen Service	• Setting up of call center for citizens to record and address complaints in Bhopal city;
Reporting/ Monitoring & verification (M&V)	• Remote metering and monitoring from centralized location; • Measure of daily/billing period consumption; • Setting up of call center for citizens to report complaints; • Daily reporting of fused/ non-functional fittings/ fixtures etc. as well as citizen complaint resolution status;

Detailed Scope of Work of CONCESSIONAIRE

The scope of work is divided in two phases.

1. **Phase I** of the CONCESSIONAIRE project cover validation of status of street light systems, physical installations of Led street lights and light fixtures, existing street light cables or conductors, meters in street light infrastructure maintained by BSCDCL, prepare the asset register (Numbering the poles and respective fixtures on poles) and liaison with respective government departments for necessary approvals related to implementation of the project. The technical specifications and quantities required is provided as part of Contract Document**. The Phase I of the CONCESSIONAIRE project has to be completed within three months from the award of work.**

2. **Phase II** of the CONCESSIONAIRE project includes design, procurement, installation, testing, Commissioning, operation and transfer of smart city platform (CMS and networking solution) and LED streetlight as per the road-wise specifications provided in the Contract Document. **The Phase II of the CONCESSIONAIRE project has to be completed within 9 months from the award of work.**

3. **Phase III** of the CONCESSIONAIRE project is operation and maintenance of street light system and Smart City Platform for 15 years from the date of issue of Commencement Certificate.

The project will broadly cover following activities:

The phase I of the project will cover following activities

1. Bidders are expected to carry out necessary field surveys to verify the status of switching points, physical installations, geographic area covered and scope of the CONCESSIONAIRE project defined so as to fully satisfy themselves on the existing field conditions and their scope. They will also be responsible forreviewing the baselines established pursuant to Energy Audits completed recently and satisfy themselves on the scope and feasibility of the project implementation for smart Feeder panel and LED light fixtures. The details on existing street lighting system and feeder panel is provided in Information memorandum enclosed as Annexure F;
2. CONCESSIONAIRE shall be responsible for conducting GIS/GPS mapping of street lighting switching points and rationalise the coverage area under the switching points.
3. CONCESSIONAIRE shall be responsible for identifying existing street light cables or conductors or existing damaged poles in street light infrastructure maintained by BSCDCL. In such instances, CONCESSIONAIRE will provide the reasons and related investment costs for replacement with suitable justification wherever required. The replacement of such infrastructure will be done at the cost of CONCESSIONAIRE with the assistance of BSCDCL or DISCOM as the case may be. The CONCESSIONAIRE will be allowed to merge the total load of two nearby switching points/feeder panels into one feeder panel provided they satisfy following conditions:
    a. The total load on any feeder panel should not exceed 15 kW in such case.
    b. Approval from BSCDCL for such modifications has to be taken
    c. Each feeder panel has a consumer number as per the electricity bills. The two consumer numbers, if has to be merged together then all the load on second consumer number has to be shifted to the first consumer number. The sanctioned demand and contract demand for first consumer number should be revised by laisioning with DISCOM and responsibility for de-functioning of second consumer number and non-issue of electricity bills to BSCDCL lies with CONCESSIONAIRE.
    d. All the poles and street light fixtures should be integrated and linked to the new feeder panel; Part load transfer is not acceptable
    e. The cost of such modifications will be borne by the CONCESSIONAIRE;
    f. The baseline energy consumption will be computed as the addition of baselines fixed earlier for feeder panels which have been merged; The third party energy auditor will approve the revised baseline for the single feeder after merging.
4. The CONCESSIONAIRE will ensure pole numbering with linkage to the respective switching points/feeder panels which caters to these poles (for e.g. SW No./Pole no.). The Feeder panels and switching points from which the street lights on poles are

operated and billed will also be numbered using suitable indelible method in consultation with BSCDCL. Pole marking done by Energy Auditors in recent months may be made use of to the extent possible. The count of street light fixture on each pole numbered should be verified by BSCDCL. Numbering of all poles and feeders should be completed within six weeks from award of work to the CONCESSIONAIRE and CONCESSIONAIRE will ensure that these numbers are not erased during project time period. Similarly, any modifications done in the current system has to be appropriately fed to the GPS data and it should be updated on regular basis by CONCESSIONAIRE;

5. CONCESSIONAIRE shall be responsible for providing necessary arrangements to protect their equipment and installations from damage or theft. Suitable protection devices to address fault in conductors or cables, voltage spikes or surges, faulty earthing, phase imbalances, current leakage etc. must be in-built in the design stage itself. If any equipment or installations belonging to the CONCESSIONAIRE are damaged on account of the above mentioned reasons or defective design, installation or operation by the CONCESSIONAIRE, the same has to be replaced within 48 hrs. by CONCESSIONAIRE at its own cost;
6. CONCESSIONAIRE will liaison with DISCOMS during pre and post implementation periods of CONCESSIONAIRE project for addressing all the electricity billing issues such asaverage billing, metering, replacement of defective meters, reduction or increase in contract demand as per the actual loads, power factor incentives etc. BSCDCL will support CONCESSIONAIRE in this initiative;
7. CONCESSIONAIRE will facilitateand coordinate the factory inspection to be conducted by BSCDCL for the verification of the feeder panels and lighting fixtures at the manufacturer's site. This inspection and verification shall be carried out in agreed lot size before despatch of every lot for installation at site;
8. CONCESSIONAIRE will obtain all necessary approvals, sanctions, licences in the name of CONCESSIONAIRE for installation of proposed equipment pertaining to the project from the concerned competent authorities and maintain validity of the same at all times during the project duration. CONCESSIONAIRE will bear the charges or pay deposits or any other amount for such approvals/licences/sanctions as may be necessary. BSCDCL shall issue the NOCs wherever necessary;
9. The baselines for energy consumption for existing street lighting connections at all switching points will be established using the existing energy meters of the Discoms and verified by the third party energy auditors along with the CONCESSIONAIRE. For this purpose, BSCDCL will ensure that all meters are in proper working condition in coordination with DISCOM. Where meters are not in proper working condition, CONCESSIONAIRE shall install a check meter duly tested and certified in accordance with the existing regulations and such check meter will be used for the purpose of energy consumption baselines of CONCESSIONAIRE project. Where CONCESSIONAIRE has doubts regarding the accuracy of any meter, it can contest the same on the basis of records obtained using ACCUCHECK meter and seek replacement of such meters. BSCDCL shall assist the CONCESSIONAIRE for replacement of such meters in coordination with DISCOM;

10. CONCESSIONAIRE willobtain the approval from BSCDCL on the schedule of work for installation of lighting equipment and smart feeder panels and BSCDCL will accord such approvals with adherence to the overall time table of the project implementation as specified in this Bid document. The commencement Certificate will be given by BSCDCL to CONCESSIONAIRE. On acceptance of the commencement certificate, The CONCESSIONAIRE will initiate the work.

Phase II – Installation of LED Street light Fixtures and Smart Streetlight Plateform & Network

1. The CONCESSIONAIRE will first install LED street lights fixturesswitching pointwise or feeder panel wise. After installation of LED street light fixtures at individual switching point/feeder panel, the responsibility of operation and maintenance of the respective feeder panel and street lights will be transferred to the CONCESSIONAIRE for the project time period. Smart individual light controller will be implemented in the same when the street lights are changed by LED street light and once the LED street light implementation is completed the activity of installation of smart feeder panels as per the new load will commence. The smart feeder panels should be designed for at least 20% excess load than the existing load of LED street lights
2. CONCESSIONAIRE will submit the schedule for installation of brackets and LED fixtures equipped with individual light controller as per the design and specifications for different category of roads to BSCDCL for approval.
3. The implementation process will be prioritized by first considering A1 roads, followed by A2 roads, then B1 category of roads and lastly B2 category of roads. All the roads with current installations of 250 W HPSV/Metal halide lamps fixtures will be replaced first under the CONCESSIONAIRE project with desired LED Fixtures. This program shall be decided in consultation with BSCDCL
4. The implementation/installations of brackets on poles and LED light fixtures shall be closely monitored by BSCDCL. The existing old light fitting removed from each pole will be given number of the pole from which it was removed and handed over to BSCDCL store in working condition without any damage to the light fixture. BSCDCL will maintain the daily stock record of the old fittings, cables, brackets and feeder panels replaced and handed over by the contractor to BSCDCL (store department). The store keeper will issue a challan or copy of receipt to Contractor listing the material handed over with quantities.
5. Post satisfactory completion of installations, independent energy auditor will establish the savings on the feeder panel and submit a report to BSCDCL. BSCDCL shall issue "Commissioning Certificate" for switching point/meters only if the energy savings are found to be equal or more than the guaranteed savings proposed by CONCESSIONAIRE. Generally Commissioning certificates shall be issued in lots of 25 feeder panel/switching points/meters. Commissioning Certificate date shall be the basis to decide the start date of CONCESSIONAIRE's share of savings for the particular feeder panel/switching point;

6. On completion of implementation, CONCESSIONAIRE will take photographs of new streetlight system that covers all feeder panels/switching points and includes street light fixtures, record of new lux levels on roads and photographs of street light poles, conductors and cables, feeder panels etc. All the information must be updated in the GPS street light data of BSCDCL post installation of new system;
7. CONCESSIONAIRE willbe required to submit the monthly reports/daily reportsusing the data collected from the centralised system in formats as agreed with the BSCDCL.

Integration of Customer Complaints system

8. The CONCESSIONAIRE shall provide all necessary assistance for reporting the status of complaints received and addressed to BSCDCL in appropriate reporting formats and in periodicity as may be specified so as to integrate this information with the Grievance Redressal System at BSCDCL level or the State Level as the case may be
9. CONCESSIONAIRE will ensure compliance with all safety standards and fulfil all the statutory obligations in respect of the deputed staff at its own cost, for the full project duration;
   TheCONCESSIONAIRE will obtain feeder/Switching point and road-wise "Commissioning Certificate" from Engineer incharge /authorized official of BSCDCL for CONCESSIONAIRE project in the lot of 25 feeder panels after satisfactory installation of feeder panels;

Phase III

Operation of Maintenance of the project for the remaining time period.

1. CONCESSIONAIRE will depute qualified and experience Team Leader to oversee the installation, operation and maintenance of smart feeder panels and LED street lights for the full project duration. The team leader will be point of contact for all interaction with MC and should be full time available in Bhopal. On commencement of the project appropriate number of personnel with required qualifications will be recruited by CONCESSIONAIRE to ensure timely completion of installation and efficient operation and maintenance of street light system.
2. CONCESSIONAIRE will procure or take on rent (as appropriate) at least five hydraulic ladder/Tower wagon for installation and maintenance of street light fixtures.
3. CONCESSIONAIRE willbe required to submit the monthly reports/daily reportsusing the data collected from the centralised system in formats as agreed with the BSCDCL.
4. CONCESSIONAIRE will follow all the electrical safety guidelines and regulations and efficiently carryout the operation and maintenance of the street lights post commissioning of project.

Payments to CONCESSIONAIRE

1. Monthly reports for the energy savings, taken from the data generated from all the meters in pre-agreed formats will be submitted by CONCESSIONAIRE to BSCDCLevery month. The first report shall be prepared on completion of one month from the receipt of Commissioning Certificate for every feeder panel. This report shall form the basis of payments to CONCESSIONAIRE. 75% of payment against the claimed savings will be immediately made to the CONCESSIONAIRE by BSCDCL on receipt of this report and the balance will be paid on approval by BSCDCL based on evaluation done by Third Party Auditor as described in para 9 of Phase II of this bid document.
2. A third party monitoring and verification exercise will evaluate and establish the actual savings derived from CONCESSIONAIRE project against the baseline energy consumption established earlier. If the percentage actual savings on energy consumption for the overall CONCESSIONAIRE project are found to be below guaranteed savings (in percentage) on the established connected load, BSCDCL shall deduct the amount equal to the difference between the proposed and actual savings from the amount of agreed level of payments with CONCESSIONAIRE for that month; Based on this report and approval of BSCDCL, remaining payment will be made to CONCESSIONAIRE within 10 days of submission of report by third party energy auditor.
3. The reports submitted by CONCESSIONAIRE and verified by BSCDCL shall be the basis of establishment of monthly savings and approval of the monthly savingsthereafter. The third party energy auditor will inspect the actual equipment installed and conduct field measurement on sample basis every six months for lux levels and present the findings to BSCDCL and CONCESSIONAIRE;If the report received from third party energy auditor indicates deficient lux levels than indicated in the monthly reports generated and submitted by CONCESSIONAIRE, thenappropriate adjustments will be done in subsequent months in CONCESSIONAIRE's paymentsto be made by BSCDCLfor the subsequent period.
4. The monthly report shall be submitted by the CONCESSIONAIRE within 5 days of the last calendar date of the previous month (For example, to work out the share of savings for the month of October, the monthly report for October should be submitted to BSCDCLlatest by 5th October);
5. If CONCESSIONAIRE fails to submit the requisite reports to BSCDCL in any month within seven days of the last billing cycle date of the previous month, BSCDCL will not release the payment of the shared savings to the CONCESSIONAIRE for such month;
6. Throughout the contract period of seven years, the Energy Efficient technologies, brackets, terminal boxes, junction boxes etc. and distribution network provided should remain in perfect working order physically and functionally. CONCESSIONAIRE will undertake preventive maintenance regularly during the contract period;
7. CONCESSIONAIRE shall rectify and corrector compensate for any damages caused directly or indirectly to the street lighting network during the operational phase of the project;

8. CONCESSIONAIRE shall make changes in the reports, as required from time to time by BSCDCL and Third Party energy auditor. The decision taken by BSCDCL in consultation with third party energy auditor cannot be challenged by CONCESSIONAIRE at any point of time and is binding on the CONCESSIONAIRE;
9. CONCESSIONAIRE will handover the energy efficient street lighting system in satisfactory and working condition to BSCDCL at the end of agreement period.
10. The CONCESSIONAIRE will provide the manuals and training to BSCDCLelectrical and maintenance staff for operation and maintenance of new Energy Efficient technologies installed and submit the copies of warranties on equipment/energy efficient technologies to BSCDCL;
11. Before handing over the EE technologies to BSCDCL, the CONCESSIONAIRE has to seek "Handing over Certificate and No dues certificate" from BSCDCL.

Formula for making commercial payments to CONCESSIONAIRE against Savings from CONCESSIONAIRE Project

- CONCESSIONAIRE is required to quote the guaranteed energy savings that they are willing to offer for the Project (the "Quoted Guaranteed Energy Savings"). The Quoted Guaranteed Energy Savings cannot be less than 35%.
- CONCESSIONAIRE must ensure that they share at least10 % of the Quoted Guaranteed Energy Savings with BSCDCL each year.
- As per the Energy Savings achieved with respect to the energy baseline consumption norm, BSCDCL shall pay the CONCESSIONAIRE a fee for the energy savings (the "Energy Savings Fee") which is computed as follows:

Energy Savings Fee for a given month *= (100-XX%)*energy saved in the given month (kWh)* Tariff (₹/kWh) assumed for making payments to CONCESSIONAIRE.*

Notes :

(a) XX represents the level of savings offered by CONCESSIONAIRE to BSCDCL.
(b) Energy Savings in a given month should not be less than the minimum guaranteed savings to BSCDCL
(c) Tariff for making payments to CONCESSIONAIRE shall be assumed to be Rs 5/kWh over the life of the project

Timeline and Deliverables of CONCESSIONAIRE Project in Bhopal

The work of CONCESSIONAIRE project implementation is expected to get implemented in one year from the date of signing of contract.

Phase III – Operation and Maintenance – 15 years excluding construction period.

Annexure – C: Technical Proposal Submission Forms

Submission of bid as per the RFP document volume-1 and 2

Annexure – D: Financial Proposal Submission Form

To the attention of the CEO, BSCDCL[Place + Date]

From:*[Name and address of the Bidding Company/ Lead Member]*
Tel:
Fax:
Email:

Re: 'Citywide Implementation of Energy Efficient 20000 NOS of Street Lighting LED in the MC of Bhopal'

Dear Sir,

Please find below our Financial Bid for 'Citywide Implementation of Energy Efficient Street Lighting in the City of Bhopal' (the Project) in response to the Request for Proposal ("RFP") issued by BSCDCL on (date).

We hereby confirm the following:

(a) This Financial Bid is being submitted by [name of bidder] in accordance with the conditions stipulated in the RFP.
(b) We have examined in detail and understand and agree to abide by all terms and conditions stipulated in the RFP Documents issued by BSCDCL, as amended, and in any subsequent communication sent by BSCDCL. Our Financial Bid is consistent with all requirements of submission stated in the RFP and in any subsequent communication sent by BSCDCL.
(c) Our Financial Bid is as follows:
Our Quoted Guaranteed Energy Savings in Bhopalcity for the duration of the CONCESSIONAIRE Project is [xx] percent [(…)%]. The percentage savings will be always be computed as a difference of baseline kWh and actual kWh consumed.
(d) We also agree to share [XX] percent (…%) of the Quoted Guaranteed Energy Savings with BSCDCL/BMC.
(e) We are solely responsible for any errors or omissions in our Financial Bid.

Duly authorized to sign the bid for and on behalf of

[Signature]

Name:
Title: Date:
Place:
[Name, signature and title of the Authorized Person in whose name a power of attorney was issued.]

Annexure – E: Energy Service Performance Contract

Standard Energy Performance Contract is provided in separate document as PART II. Kindly refer this document.

Annexure – F: Information Memorandum for Bhopal City

The third party energy audit company has done a comprehensive investment grade energy audit. The energy audit report is summarize below. It captures the actual switching point-wise roads of the city and relevant data on number of street lights by types of street light fixture, poles, types of poles, pole arrangement, distance between two poles, lamp mounting height, existing power consumption, lux levels etc. We have included the similar data for new Kolar area proposed to be covered into CONCESSIONAIRE project. Present scenario is as under :-

Table 3: Bhopal City – List of Major Luminaires Installed

Sr. No.	Luminaire Type	Wattage of Luminaire (W)	Number of Fixtures in BSCDCL	
1	Sodium Vapour	250	9734	2433500
2	Sodium Vapour	150	5735	860250
3	Fluorescent Tube Light	40	9465	378600
4	Sodium Vapour	70	3526	246820
5	Metal Halide	400	401	160400
6	Fluorescent Tube Light	96	2082	199872
7	Metal Halide	250	334	83500
8	LED	30-150	5800	522000
9	PL 2x36,36,24 watt	24	845	20280
10	CFL	85	3500	297500
	Total		**41422**	**5202722**

*The total number of street lighting fixtures in Bhopal is 41422 and total load is = 5.2 MW

Notes:

1. In Bhopal city approximately 5800 LED lights already installed which is to be replaced by the concessioner. As for as energy saving calculation is concern these 5800 lights shall be considered as per respective sodium vapour lights and as decided by the third party energy auditor. which shall be binding to accept for both the parties.
2. This is Total Installed KW obtained by physical survey of each of the fixtures.
3. This is total measured KW. It was possible to measure the load on most of the Switching Points. (Actually measured 5220 KW for 571 Switching Points, 94.44% of Metering Points could be measured).
4. This is total load as per Bill (Sanctioned Demand).Corresponding electricity bills for respective switching points has identified for about 99.99% of the Switching points. Then it is extrapolated for 100%. (Actually 5220 KW for 571 Switching Points).
5. These are total likely units based on installed load. If present fixtures are operating (with correction for working lamps in present scenario) then it indicates likely unit consumption (5220 KW x 12 hrs/day x 365 days/year).

Definitions and Interpretation

Definitions

In this Contract (including the recitals and schedules), the following words and expressions have the following meanings:

"Commencement Date" has the meaning given in Article **Error! Reference source not found.**.

"**Consent"** means any permit, consent, approval, authorization, agreement, no objection certificate, waiver or licence which must be obtained by the CONCESSIONAIRE in order to perform the Services and for any goods to be transported, imported and exported.

"Contract" means this energy performance contract entered into between BSCDCL and the CONCESSIONAIRE on the date hereof, including the recitals and schedules, as may be amended from time to time by the Parties.

"CONCESSIONAIRE" means *[name of Winning Bidder]*

"CONCESSIONAIRE Event of Default" has the meaning given in Article**Error! Reference source not found.**.

"CONCESSIONAIRE Representative" means the person appointed by the CONCESSIONAIRE to represent the CONCESSIONAIRE and communicate with BSCDCL.

"Contract Year" means successive periods of twelve (12) calendar months commencing on the Commencement Date.

"Corrupt Act" means the act of promising, giving, receiving, or agreeing to receive money or some other item of value with a corrupt aim, or perceived aim, of influencing a public official in the discharge of his official duties; and acts giving rise to criminal liability under Indian Laws.

"DISCOM" mean the electricity distribution companies supplying electricity to the city of Bhopal.

"**Delay Liquidated Damages"** means an amount per week of delay calculated in accordance with Article 0 in the event the Services are not completed in accordance with the Timeline.

"Effective Date" means the date on which this Contract and all of its schedules are signed by the duly empowered representatives of both Parties.

"Energy Baseline" has the meaning given in Article 0.

"Energy Conservation Measures (ECMs)" means the installation of new equipment, modification or alteration of the Existing Lighting Facilities by the CONCESSIONAIRE and at the CONCESSIONAIRE's cost, in the city of Bhopal, or revised operation and maintenance procedures to reduce energy costs by improving efficiency of use.

"Energy Savings" means a reduction of energy consumption resulting from the CONCESSIONAIRE's ECMs taking into consideration quality of power supply. Energy Savings are determined by comparing the Energy Baseline with the energy consumed (or electrical demand) after ECMs are implemented.

"Energy Savings Fee" has the meaning given in Article 0.

"Existing Lighting Facilities" means all BSCDCL (or DISCOMwherever relevant) owned street lighting equipment and apparatuses, including, but not limited to, poles, cables, wires, lighting fixtures, fittings, ballasts, lamps, tubes, switching devices and timers within the Project Area.

"**Force Majeure Event"** has the meaning given in Article 0.

"Financial Year" means (i) the period commencing on the Commencement Date and ending at midnight on the following March 31; and (ii) thereafter, each period commencing on April 1 and ending on the following March 31, unless this Contract is terminated or expires, in which case the period will end at the end of the Term.

"**Independent Energy Auditor"** means the third party energy auditor appointed by BSCDCL for undertaking the scope of work described under Schedule 4.

"Laws" means all current or future (during the Term of the Project) applicable Indian laws, administrative regulations, local regulations, regulations on the exercise of autonomy, special regulations, rules, judicial interpretations and other regulatory documents with legal binding force or any compulsory requirement.

"**Lender"** means a person providing financing to the CONCESSIONAIRE in relation to this Project.

“Lighting Fixtures”means street lights fitting containing luminaire, choke, lens, driver, capacitor, arm length/bracket, flexible wire and junction box or termination box (wherever used).

" **Material Adverse Effect"** means any material adverse effect on (i) the ability of the CONCESSIONAIRE to observe and perform any of its rights and obligations under this Contract under normal circumstances, and/or (ii) the legality, validity, binding nature or enforceability of this Contract.

"**Material Adverse Government Action"** has the meaning given in Article 0.

"BSCDCL" means the Municipal Corporation of Bhopal city.

"BSCDCL Event of Default" has the meaning given in Article **Error! Reference source not found.**.

"**BSCDCL Representative"** means the person appointed by CEO to represent BSCDCL and communicate with the CONCESSIONAIRE.

"Non-Standard Roads" means the roads where street light fixtures are mounted on DISCOM poles and nine point method for the measurement of lux and uniformity is not applicable.

"**Operation and Maintenance (O&M)"** means all the activities required for operation and maintenance of the street lighting system handed over to the CONCESSIONAIRE within the Project Area including, but not limited to smart feeder panels, cables/conductors, connectors, fuses, poles, pole earthing, junction box, fixtures, wires etc.

"**Project Area"** means the switching points and respective street lights identified and surveyed under street lighting investment grade energy audit which are operated and managed by BSCDCL as PER ANNEXURE.

"Quoted Guaranteed Energy Savings" means the percentage of guaranteed energy savings that the CONCESSIONAIRE offered in its bid for the Term of the Project.

"Required Action" has the meaning given in Article **Error! Reference source not found.**.

"Standards for roads" means the roads where street light infrastructure is designed as per the lux level and uniformity requirements and nine point method of measurement is applicable

"Services" means the services to be performed by the CONCESSIONAIRE pursuant to this Contract and described in Schedule 1.

"SubCONCESSIONAIRE" means any person to whom execution of any part of the Services is subcontracted by the CONCESSIONAIRE, directly or indirectly, and includes such person's legal successors or permitted assignees.

"**Third Party Energy Audit (TPEA)"** means the process of determining the energy baseline consumption norm for each switching point (as per the methodology provided in Schedule 4) and joint verification of the street lighting asset inventory for such switching

points by deployment of necessary devices and equipment by the Independent Energy Auditor in the presence of BSCDCL and the CONCESSIONAIRE.

"Value of Guaranteed Energy Savings" means the product of the Energy Baseline consumption (kWh) for street lighting fixtures taken over by the CONCESSIONAIRE under the Project and the applicable tariff rates defined for Quoted Guaranteed Energy Savings.

BSCDCL's Responsibilities

Access

BSCDCL shall be responsible for providing the CONCESSIONAIRE with, free of charge, on and from the Commencement Date, access to all information and data, the existing lighting facilities and the premises for the in-house control room. The access to the Project Area is to be given to CONCESSIONAIRE for the performance of the Services and in respect of which BSCDCL has control. Access to the Existing Lighting Facilities and the land within the Project Area shall confer on the CONCESSIONAIRE a right to only use the existing lighting facilities and the land necessary to enable the CONCESSIONAIRE to carry out the Services. If BSCDCL removes any particular pole or fixture after the commissioning phase of the Project, the CONCESSIONAIRE shall be entitled to the Energy Savings Fees that would have arisen out of the Energy Savings pertaining to such fixture for the remaining life of the Project, based on the average savings realised on a per fixture basis in the six (6) months prior tosuch removal or the period after the commencement date of the project up to the date of such removal, whichever is less. If access to any particular pole or fixture is not provided by BSCDCLto the CONCESSIONAIRE during Phase 3, the CONCESSIONAIRE shall be entitled to the Energy Savings Fee for the fixtures that would have arisen out of the Energy Savings pertaining to such fixtures for the amount of time when access was not provided.

In the event BSCDCL fails to provide the CONCESSIONAIRE with free of charge access to all the Existing Lighting Facilities for any three (3) months during the Term, this shall constitute a BSCDCL Event of Default in accordance with Article **Error! Reference source not found.**.

Assistance to the CONCESSIONAIRE

If requested by the CONCESSIONAIRE, BSCDCL shall use its best endeavours to assist the CONCESSIONAIRE in a timely and expeditious manner with the following:

(a) Obtaining all Consents necessary for the Services (excluding any qualifications that the CONCESSIONAIRE should already possess) such as construction permits, permits for temporary use of land and temporary suspension of water, power or traffic, etc.;

(b) Protecting underground pipelines, buildings and structures (including historic relics) and trees located on or close to the Project Area;

(c) Consulting with the CONCESSIONAIRE if any construction or installation project implemented by BSCDCL or other local public entity in the city which may have direct or indirect impact on the CONCESSIONAIRE; and

(d) Obtaining DISCOM's full cooperation during the Term of the Contract.

The benefit of warranties and guarantees in force for the existing energy efficient street light infrastructure and fixtures will be made available to the CONCESSIONAIRE by BSCDCL to the extent possible.

Payment of Fees

In consideration for the Services performed by the CONCESSIONAIRE under this Contract, BSCDCL shall pay to the CONCESSIONAIRE the Energy Savings Fee in a timely manner in accordance with Article 0.

The CONCESSIONAIRE shall issue invoices to BSCDCL in accordance with Article 0. In the event BSCDCL fails to pay the complete amount set on the invoice issued by the CONCESSIONAIRE within thirty (30) days of issuance of such invoice, BSCDCL shall be required to pay the outstanding amounts plus interest for late payment for every day of delay to be calculated at one point twenty-five per cent (1.25%) per month.

BSCDCL shall pay the fees for services of Independent Energy Auditor within the maximum amount agreed upon between the Parties and the payment terms of the contract to be entered into between BSCDCL and the Independent Energy Auditor for the TPEA (as mentioned in Article 2.2.1 **Error! Reference source not found.**).

Lux Level Measurements

Upon commencement of Phase 3, BSCDCL shall conduct, with the assistance of the Independent Energy Auditor, lux level measurements on five per cent (5%) of the street lighting fixtures, randomly selected by BSCDCL, on a rotational basis . Such lux level measurements will be carried out twice in a year. The

CONCESSIONAIRE shall participate in the lux level measurements along with BSCDCL and the Independent Energy Auditor. If the lux levels are found to be below the applicable standards specified in Schedule 2, the CONCESSIONAIRE shall make payments to BSCDCL for the amounts as determined under Article 0.

Such semi-annual measurements must be completed by 30th June and 31st December of each Financial Year for the Term of the Project.

Operation and Maintenance

BSCDCL shall be responsible for the operation, maintenance and invoicing of all the identified feeder panels/switching points and street lighting fixtures until the same are handed over to the CONCESSIONAIRE at the end of Phase 1. After handing over of the street light fixtures by BSCDCL to CONCESSIONAIRE for the project, the CONCESSIONAIREshall be responsible for maintenance of street light poles, cables or conductors carrying main electricity supply to each pole and respective feeder panels in the city.

The CONCESSIONAIRE's Responsibilities

Energy Baseline Determination

With immediate effect from the Commencement Date, the CONCESSIONAIRE shall undertake field surveys of the street lighting fixtures covered in the Project Area to accomplish the following (together, the "Energy Baseline"):

(a) Understand the physical layout and single line diagram of various circuits, switching points and validate the type and quality of fixtures installed thereon;

(b) Assess the feasibility of clubbing independent circuits for optimising the number of switching points where feeder panels, including meters, are to be installed. The CONCESSIONAIRE must cover all the streetlight fixtures under one switching point/feeder panel and should not neglect/leave any of the pole while clubbing two switching points/feeder panels. The total connected load post implementation of all ECMs should not exceed 15 kW on one feeder panel when clubbing two feeder panel together;

(c) Avail buy-in from BSCDCL on the proposed switching points metering plan. BSCDCL shall respond in writing to the CONCESSIONAIRE's plans to be submitted within one (1) week of such submission. If BSCDCL fails to respond within one (1) week of such submission, the provisions of Articles **Error! Reference source not found.** and **Error! Reference source not found.** shall apply.

(d) The CONCESSIONAIRE shall from time to time revise the asset database and the marking of poles in accordance with the nomenclature agreed with respective

BSCDCL. The GPS survey data base needs to be prepared by CONCESSIONAIRE will be updated regularly by CONCESSIONAIRE for the Feeder panels and street light fixtures installed under CONCESSIONAIRE project;

(e) Furthermore, upon BSCDCL's approval of the metering plan for a particular switching point, the CONCESSIONAIRE shall undertake the implementation of the proposed metering arrangement by installing the feeder panel comprising the metering equipment housed in a separately openable and sealable compartment. For switching points where the meters to be installed by the CONCESSIONAIRE are to be considered as energy billing meter by DISCOM, the CONCESSIONAIRE shall ensure that such meters adhere to the specifications notified by DISCOM and are tested in DISCOM's meter testing labs or their approved testing lab and are installed and sealed in accordance with DISCOM's procedures. BSCDCL shall assist the CONCESSIONAIRE in coordinating with DISCOM to finalise the technical specifications for such meters, have such meters tested in DISCOM's labs, and install and seal such meters on the respective switching points.

(f) Upon installing the feeder panels and meters on the switching points, the CONCESSIONAIRE shall coordinate the TPEA as elaborated in Schedule 3 along with the Independent Energy Auditor and BSCDCL.

In instances of changes in lighting infrastructure where utility billing as baseline may not be appropriate,the independent energy auditor will revise the baseline as per the initial connected load and post implementation connected load and receipt of first month's bill post revised load. The energy savings shall be established by understanding the incremental energy consumption and providing the adjustment factor to the future bills for rest of the monthly billing cycles.

Services

Once the survey report prepared following the field surveys has been accepted by BSCDCL, the CONCESSIONAIRE shall begin carrying out the Services in accordance with Schedule 1.

The CONCESSIONAIRE shall be responsible for installation and O&M of street light fixture and its components, cables, flexible cable from street light fixture to junction box or main conductor, earthing at each pole, junction box and its components such as MCB, fuse etc. and smart feeder panels.

BSCDCL gives the exclusivity to the CONCESSIONAIRE to carry out the Services described in Schedule 1 in relation to all the Existing Lighting Facilities located within the Project Area throughout the Term and in accordance with this Contract.

Subject to the provisions of this Contract, the CONCESSIONAIRE is solely responsible for the manner in which the Services are performed and ensure

adherence to all the applicable Rules, Regulations, Laws etc. for electrical safety and other aspects. The CONCESSIONAIRE shall be required to conduct Electrical Safety Audits once in a year and submit the reports to BSCDCL.

Environmental and Social Requirements

The CONCESSIONAIRE shall carry out the Services in accordance with all relevant procedures and practices adopted or defined by BSCDCL to replace, collect, transport and store old appliances, fixtures etc..

The CONCESSIONAIRE shall ensure that the practices employed to dispose lamps, cut trees or branches of trees etc. are in accordance with applicable municipal or other relevant Laws or Regulations or Rules.

Billing to BSCDCL

The CONCESSIONAIRE will raise monthly invoices in three copies against the energy savings achieved during the month. These invoices should be submitted within eight days of receipt of electricity bills from DISCOM.

The invoices should be sent to Executive Engineer - Electrical Department of BSCDCL, Chief Engineer Technical –UDEDand Team Leader of TPEA.

Asset Ownership

Existing Lighting Facilities

BSCDCL (and/or other relevant government authorities, as applicable) shall at all times during the Term remain the owner of the land and the Existing Lighting Facilities, with the exception of certain poles which are owned by DISCOM.

The CONCESSIONAIRE shall take due care while removing the old street light fixtures/cables and other street light equipment. The CONCESSIONAIRE shall own BSCDCL street lighting fixtures/ fittings and any other equipment that have been replaced for implementing the ECMs.. In addition, the CONCESSIONAIRE shall adhere to the requirements specified under Article 0.

The CONCESSIONAIRE will not be liable for any liability in relation to the Existing Lighting Facilities existing prior to the Commencement Date or arising from any event or circumstance that occurred prior to the Commencement Date.

Newly Installed Equipment and Systems

The CONCESSIONAIRE shall remain the owner of the equipment and systems installed by the CONCESSIONAIRE during the Term of the Contract. The CONCESSIONAIRE shall undertake all the procurement of equipment and services necessary for the Project. The CONCESSIONAIRE shall hand over any replaced equipment, fittings or other items to BSCDCL with proper documentation for BSCDCL's verification. The replaced equipment shall be free of any lien. At the end of the Term, the CONCESSIONAIRE shall submit to BSCDCL a list of all the equipment, fittings or other items that were replaced during the Terms of project.

The essence of this contract is to keep all the street lights 'ON' & as such any non-functioning of street light fixtures/poles will be adversely reflected on the performance of the CONCESSIONAIRE. Hence it will be in the interest of the CONCESSIONAIRE to identify & attend to the faults & keep the lights 'ON' in a safe manner. He should employ only qualified & experienced personnel & use proper instruments, take adequate precautions, use good quality prescribed material, exercise proper supervision & maintain proper report back system & public relations.

The CONCESSIONAIRE should monitor the electrical load on each phase & each circuit in the panel & also maintain load balance equally on all the phases. He should never allow any circuit to be overloaded.

The material used for the work shall be new & of best quality available and work should be carried out with best workmanship. Material used and works carried out shall conform to the relevant Electricity Act & rule of Bureau of Indian standard. Also the work should meet the requirement of BSCDCL and DISCOM.

The poles owned by BSCDCL and smart feeder panels should be colored once in every two years as per the colour codes and paints defined by BSCDCL.

At the expiry of the Term, all rights and titles to, and interests in, all improvements and equipment constructed or systems installed are vested in BSCDCL, subject to any payments made by BSCDCL to the CONCESSIONAIRE in accordance with Article **Error! Reference source not found.**if

applicable, free and clear of all and any liens and encumbrances created or caused by the CONCESSIONAIRE. The CONCESSIONAIRE shall surrender possession of the said equipment and systems to BSCDCL in good repair and condition, reasonable wear and tear accepted.

Delay Liquidated Damages

Where the CONCESSIONAIRE fails to complete the Services within the Timeline provided under Article **Error! Reference source not found.**, BSCDCL shall be entitled to receive Delay Liquidated Damages as follows:

(a) In the event the CONCESSIONAIRE fails to finalise the activities of Phase 1within the Timeline stipulated in Article**Error! Reference source not found.**, the CONCESSIONAIRE shall be liable to pay BSCDCL Delay Liquidated Damages of an amount equal to one lakh Indian Rupees (Rs. 1 lakh) for each week of delay, subject to a maximum delay of eight (8) weeks. In the event the activities in Phase 1are not finalized by the CONCESSIONAIRE within the maximum delay of eight (8) weeks after the Timeline stipulated in Article 6, this breach shall constitute a CONCESSIONAIRE Event of Default and BSCDCL shall be entitled to terminate this Contract in accordance with Article**Error! Reference source not found.**.

(b) In the event the CONCESSIONAIRE fails to finalize the activities in Phase 2 within the Timeline stipulated in Article 6, the CONCESSIONAIRE shall be liable to pay on a weekly basis to BSCDCL Delay Liquidated Damages of an amount equal to the savings that would have been achieved if the remaining street lighting fixtures had been commissioned. The Quoted Guaranteed Energy Savings shall be used to estimate the amount of savings. If the activities in Phase 3 are not finalized by the CONCESSIONAIRE within the maximum delay of eight (8) weeks after the Timeline stipulated in Article 6, this breach shall constitute a CONCESSIONAIRE Event of Default and BSCDCL shall be entitled to terminate this Contract in accordance with Article**Error! Reference source not found.**.

Independent Energy Auditor

BSCDCL shall appoint an independent energy auditor (the "Independent Energy Auditor") selected following a transparent and competitive tender procedure launched by BSCDCL. All the Independent Energy Auditor's expenses shall be borne by the BSCDCLin accordance to provision under Article0.

The scope of work of the Independent Energy Auditor is described in detail in Schedule 4.

Reporting

During the Term, the CONCESSIONAIRE shall provide monthly reports to BSCDCL about the following matters:

(a) Update on the assets;

(b) Operation and maintenance services;

(c) Energy saving report;

(d) Lamp failure report; and

(e) Monitoring and verification report.

The CONCESSIONAIRE shall also submit Annual Electrical Safety report as per the Article0.

In addition to the reports mentioned in Article 0, the CONCESSIONAIRE shall provide daily reports on non-functional points and individual feeder panelsduring the entire Phase 3.

If the CONCESSIONAIRE does not issue monthly reports within ten (10) days of the end of the relevant month for any three (3) months or there is major false information in more than three (3) reports during the Term of the Contract, this breach shall constitute a CONCESSIONAIRE Event of Default.

If the CONCESSIONAIRE does not issue daily reports in Phase 3 for three (3) consecutive days or for more than ten (10) days in a Financial Year, this breach shall constitute a CONCESSIONAIRE Event of Default.

If the CONCESSIONAIRE does not issue annual electrical safety audit report, this shall constitute CONCESSIONAIREs event of default and the CONCESSIONAIRE will be penalised in accordance with provision of Article 0.

Remuneration

Energy Savings Fee

As consideration for the Energy Savings achieved with respect to the energy baseline consumption norm, the BSCDCL shall pay the CONCESSIONAIRE a fee for the energy savings (the "Energy Savings Fee") which is computed as follows:

*Energy Savings Fee for a given month = (100-XX%)*energy saved in the given month (kWh)* Tariff (₹/kWh) assumed for making payments to CONCESSIONAIRE*

Where,

(d) XX represents the level of savings offered by CONCESSIONAIRE to BSCDCL.
(e) Energy Savings in a given month should not be less than the minimum guaranteed savings to BSCDCL
(f) Tariff for making payments to CONCESSIONAIRE shall be assumed to be Rs. 5/kWh over theTerm.

BSCDCL shall retain XX per cent (XX%) of the Energy Savings realised each month during the Term of the Project. The payment of the Energy Savings Fee by BSCDCL to the CONCESSIONAIRE shall be governed by the following provisions:

(a) The Energy Savings Fee shall be provided by BSCDCL to the CONCESSIONAIRE as and when the handed over street lighting fixtures covered under a particular switching point are commissioned in Phase 2. All the switching points will be considered together on a cumulative basis, provided that during Phase 2, the CONCESSIONAIRE is eligible for payments from BSCDCL only if savings achieved for all the handed over switching points considered together on a cumulative basis are equivalent to or greater than *[Insert Quoted Guaranteed Energy Savings]* of the EnergyBaseline.
(b) If the realised monthly savings are less than *[Insert Quoted Guaranteed Energy Savings*] of the Energy Baseline, the CONCESSIONAIRE shall pay the penalty as follows:
    a. Payments to BSCDCL corresponding to the difference between the amounts of energy calculated at Energy Savings at *[Insert Quoted Guaranteed Energy Savings]* of the Energy Baseline and the realised percentage of Energy Savings.
    b. Penalty of 10% of the total energy savings expected at *[Insert Quoted Guaranteed Energy Savings]* of the Energy Baseline.
    c. The above payment amount shall be determined based on the energy tariff of Rs. 5/kWh with escalations for the entire Term. Vice a Versa, if savings realised are more than 50% then the share promised by CONCESSIONAIRE to BSCDCL will be computed on the actual savings realised and will be passed on to the BSCDCL as its share of savings

To determine BSCDCL's payments as specified in Article 0, the CONCESSIONAIRE shall issue to BSCDCL monthly invoices for each switching point using the same starting and closing meter reading dates each month. The invoices must be accompanied by the tables attached in Schedule 3 for each switching point, including calculations of the actual Energy Savings achieved based on the Energy Baseline for each point determined as per the provisions of Article 0. The invoices should clearly highlight the actual energy consumption, total outage hours, and adjustments of non-functional fixtures for their respective durations for each switching point. The CONCESSIONAIRE shall ensure that the invoice issued is for the same

billing period as that followed by DISCOM. The process of billing to the BSCDCL shall be as per the Article 0.

Penalty for Non-Compliance with Lux Standards

If the CONCESSIONAIRE fails to achieve the required lux levels based on the standards specified for the identified street lighting fixtures, as determined under Article 0, the CONCESSIONAIRE shall make payments to BSCDCL of an amount equal to the amount determined in accordance with the following formula for each Financial Year of the Term. Such amounts may be directly set off by BSCDCL against the Energy Savings Fee in accordance with Article 0.

Lux non-compliance penalty *= [(number of non-compliant street lighting fixtures identified)/ number of street lighting fixtures surveyed)] x (Value of Guaranteed Energy Savings for the time period between the two subsequent energy energy audit-in this case 6 months)Where,*
Annual Value of Guaranteed Savings *= % Guaranteed savings x Baseline energy consumption (kWh) x Tariff (₹/kWh) assumed for making payments to CONCESSIONAIRE*

Tariff for making payments to CONCESSIONAIRE shall be assumed to be Rs. 5/kWh over the Term.

In the above formula, the Value of Guaranteed Energy Savings (in Indian Rupees) shall be considered for the entire Project.

The CONCESSIONAIRE shall stagger its payment to BSCDCL into six (6) equal monthly instalments during six (6) months following the end of the respective Financial Year for which the semi-annual field measurements have been taken by the Independent Energy Auditor.

Penalty for Non-Compliance to Minimum Up-Time

The CONCESSIONAIRE shall be responsible for maintaining the handed over street lighting fixtures under each switching point in good working condition and shall ensure that the non-working lamp hours on each switching point are maintained within acceptable limits at all times during the Term.

All street lighting faults arising out of failures or malfunctioning of equipment installed by the CONCESSIONAIRE shall be cured within a period of forty-eight (48) hours after the failure or malfunctioning is reported to BSCDCL. Failure of the same shall result in a penalty of hundred Indian Rupees (Rs. 100 only) per street lighting fixture per day. If the CONCESSIONAIRE does not rectify the same within seven (7) days, BSCDCL may proceed with such

rectification and deduct the cost of such work from the CONCESSIONAIRE's payment.

The CONCESSIONAIRE shall be liable to pay penalties for any loss of functional lamp hours on each switching point if such non-functional lamp hours exceed two per cent (2%), with the percentage determined at the end of each Financial Year in accordance with the following formula:

% of non–functional lamp hours for a switching point *= [(non-functional lamp hours)/(total on hours * no. of fixtures)]*

For every slippage of one per cent (1%) in non-functional lamp hours beyond the acceptable limit of two per cent (2%), the CONCESSIONAIRE shall pay BSCDCL an amount equivalent to three per cent (3%) of the Value of Guaranteed Energy Savings for such switching point, in accordance with the following:

Penalty for non-compliance of minimum up-time *= 3 * (% slippage)* (annual value of Guaranteed Energy Savings)*

In the above formula, the annual Value of Guaranteed Energy Savings(in Indian Rupees) is for each respective switching point.

Penalty for non-compliance with electrical safety related matters

In case the CONCESSIONAIRE is found to be negligent in matters pertaining to electrical safety as per the requirement specified in Article 0, he shall be penalised by BSCDCL to the extent of twice the value of actual damage caused to the street lighting infrastructure/other assets which will be ascertained by proper investigation to be undertaken by BSCDCL.

In case the CONCESSIONAIRE does not undertake electrical safety audit as per the requirement specified in Article 0, he shall be penalised by BSCDCL to the extent of twice the cost of undertaking electrical safety audit as determined by BSCDCL.

Clean Development Mechanism

The CONCESSIONAIRE is eligible to claim clean development mechanism benefits arising out of the Project. BSCDCL shall provide all reasonable assistance to the CONCESSIONAIRE in registering the Project as a clean development mechanism activity. Ninety per cent (90%) of any clean development mechanism benefits arising out of the Project shall be in favour of the CONCESSIONAIRE while the remaining ten per cent (10%) shall be received by BSCDCL.

Set Off

BSCDCL shall be entitled to set off any undisputed amounts payable or liabilities under or in relation to this Contract against the Energy Savings Fee to be paid by BSCDCL to the CONCESSIONAIRE in accordance with Article 16.1. If the amounts to be set off are larger than the relevant Energy Savings Fee to be paid by BSCDCL to the CONCESSIONAIRE, then the balance shall be recovered from future Energy Savings Fees to be paid by BSCDCL.

Payment Security Trust and Retention Account

Retention Account

Within three (3) months of execution of Trust and Retention Account Agreement, BSCDCL shall deposit an amount equal to what it used to pay for one (1) month of electricity bills before the commencement of the Project in the Project Area. Each month thereafter and until the end of the Term, BSCDCL shall deposit an amount equal to what it used to pay for one (1) month of electricity bills before the commencement of the Project in the Project Area. The money shall be deposited in an escrow account, called the trust and retention account, in a reputable bank acceptable to the CONCESSIONAIRE for the benefit of the CONCESSIONAIRE. On the receipt of monthly invoice along with the supporting document raised by the CONCESSIONAIRE, the BSCDCL shall review the invoice and intimate to the bank to pay seventy-five per cent (75%) of the Energy Savings Fee to the CONCESSIONAIRE.The remaining twenty-five per cent (25%) of the amount of the invoice shall be paid by the Bank upon submission by CONCESSIONAIRE of a written approval of its invoice by BSCDCL.

Theft of Energy

If either BSCDCL or the CONCESSIONAIRE is aware of theft of energy, it shall inform the other Party without delay. The magnitude and nature of the energy theft shall be assessed by both Parties. CONCESSIONAIRE shall be responsible for taking all the corrective measures required, and report details of such theft to DISCOM. CONCESSIONAIRE shall report back the status of mitigation of such theft to the BSCDCL within two (2) days of the CONCESSIONAIRE's report. In cases where DISCOM is not able to take

suitable actions to mitigate such theft, BSCDCL shall make due adjustments for arriving at the Energy Savings for the respective switching point(s) and for the payment of the Energy Savings Fee to the CONCESSIONAIRE so as to not penalise the CONCESSIONAIRE for such theft.

Force Majeure

A "Force Majeure Event" shall mean any event or combination of events occurring inside or directly involving the city that is beyond the reasonable control of BSCDCL or the CONCESSIONAIRE, as the case may be, occurring or subsisting after the Effective Date and which (or the effects of which) is unavoidable, notwithstanding the reasonable care of the Party affected, including, in the case of the CONCESSIONAIRE, any SubCONCESSIONAIRE, and, in the case of the CONCESSIONAIRE only, such event(s) could not have been foreseen by an experienced CONCESSIONAIRE, or to the extent that the event(s) could have been foreseen by an experienced CONCESSIONAIRE, such CONCESSIONAIRE could not have reasonably mitigated against the effects of such events. Such Force Majeure Events include, but are not limited to:

(a) War (whether declared or undeclared), invasion, armed conflict or act of foreign enemy;

(b) Rebellion, sabotage, act of terrorism, revolution, insurrection, civil war or epidemic (excluding vandalism);

(c) Strikes, lock-outs, works to rule or go-slows that are widespread or nationwide, or that are of a political nature, unless they are solely related to BSCDCL, the CONCESSIONAIRE or any SubCONCESSIONAIRE; and

(d) Lightning, earthquake, flood, hurricane, typhoon, tornado or volcanic activity.

Such events cannot be caused or contributed to by an act or omission of the Party relying on it or persons for whom that Party is responsible.

If either Party is prevented, hindered or delayed from performing any of its obligations under this Contract by a Force Majeure Event, then it shall notify the other Party in writing of the occurrence of such event and the circumstances thereof within fourteen (14) days after the occurrence of such event, and send a copy of such notice to the Independent Energy Auditor.

The Party who has given such notice shall be excused from the performance or punctual performance of its obligations under this Contract for so long as

the relevant Force Majeure Event continues and to the extent that such Party's performance is prevented, hindered or delayed.

The Party or Parties affected by the Force Majeure Event shall use reasonable efforts to mitigate the effects thereof upon its/their performance of this Contract and to fulfil its/their obligations under this Contract, but without prejudice to either Party's right to terminate this Contract.

No delay or non-performance by either Party caused by the occurrence of any Force Majeure Event shall:

(a) constitute a breach under this Contract;

(b) extend the Term; or

(c) give rise to any claim for damages or additional cost or expenses occasioned thereby.

If the performance of the Services is substantially prevented, hindered or delayed for more than one hundred and twenty (120) consecutive days on account of one or more Force Majeure Events during the Term, either Party may terminate this Contract by giving a notice to the other. If this Contract is terminated pursuant to this Article, BSCDCL shall pay to the CONCESSIONAIRE the part of the Energy Savings Fee payable for the Energy Savings performed prior to the Termination Date. The CONCESSIONAIRE shall not be entitled to any further compensation.

Notwithstanding this Article, Force Majeure Events shall not apply to any BSCDCL's obligation to make payments to the CONCESSIONAIRE hereunder.

Material Adverse Government Action

A "Material Adverse Government Action" ("MAGA") shall mean any act or omission, after the Effective Date, by BSCDCL or any other public entity, which has a Material Adverse Effect.

A MAGA shall include the following circumstances:

(a) Any imposition or change of Law that is directly targeted at the Project and/or projects similar to the Project and/or that is discriminatory against the CONCESSIONAIRE;

(b) Any imposition or change of Law of an environmental or technical nature which would have the effect of making the Laws more stringent than the Laws in force at the Effective Date;

(c) Expropriation or compulsory acquisition, or seizure of the Existing Lighting Facilities by a public entity with respect to substantially the same subject matter;

(d) Any material breach by DISCOM of its obligations, including, but not limited to, failure to supply electricity within the whole or part of the Project; and

(e) Any regulator's decision having the effect of decreasing the CONCESSIONAIRE's remuneration under this Contract.

Within thirty (30) days of notice to BSCDCL of a Material Adverse Government Action, BSCDCL shall procure the remedy of the MAGA in question. Should BSCDCL fail to procure a remedy prior to the expiry of the thirty (30) day period, the Parties shall discuss the issue in an attempt to reach a mutually satisfactory solution that restores the CONCESSIONAIRE to the position it would have been in had such MAGA not occurred (including compensation for costs and loss of profits). If the Parties fail to reach an agreement on a satisfactory solution, the CONCESSIONAIRE shall have the right to terminate this Contract.

The CONCESSIONAIRE shall not be excused from performing its obligations under this Contract upon the occurrence of a MAGA, unless the Material Adverse Effect causes the CONCESSIONAIRE to fail to perform its obligations.

Taxes and Duties

The CONCESSIONAIRE is solely responsible and liable for the payment of all taxes in relation the Services. The CONCESSIONAIRE shall defend, indemnify and hold harmless BSCDCL from and against any liability for payment of such taxes.

The provisions of this Article shall survive the termination or expiry of this Contract.

Schedule 1: Scope of Services

The tender is designed for Design, Supply, installation, operation and maintenance of energy efficient equipment/technologies as per the specifications mentioned in the tender document and adhering to the requirements of the different category of roads in the city of Bhopal. The scope of work is divided in two phases.

4. **Phase I** of the CONCESSIONAIRE project cover validation of status of street light systems, physical installations poles, street light fixtures, existing street light cables or conductors or replacement of any existing damaged poles, meters in street light infrastructure maintained by BSCDCL, prepare the asset register and liaison with respective government departments for necessary approvals related to implementation of the project. The technical specifications and quantities required is provided as part of Contract Document**. The Phase I of the CONCESSIONAIRE project has to be completed within four months from the award of work.**

5. **Phase II** of the CONCESSIONAIRE project includes design, procurement, installation, testing, Commissioning, operation and transfer of LED streetlight and smart feeder panels as per the road-wise specifications provided in the Contract Document. **The Phase II of the CONCESSIONAIRE project has to be completed within 12 months from the award of work.**

6. **Phase III** of the CONCESSIONAIRE project is operation and maintenance of street light system for seven years from the date of issue of Commencement Certificate.

The project will broadly cover following activities:

The phase I of the project will cover following activities

11. Bidders are expected to carry out necessary field surveys to verify the status of switching points, physical installations, geographic area covered and scope of the CONCESSIONAIRE project defined so as to fully satisfy themselves on the existing field conditions and their scope. They will also be responsible for reviewing the baselines established pursuant to Energy Audits completed recently and satisfy themselves on the scope and feasibility of the project implementation for smart Feeder panel and LED light fixtures. The details on existing street lighting system and feeder panel is provided in Information memorandum enclosed as Annexure F;
12. CONCESSIONAIRE shall be responsible for conducting GIS/GPS mapping of street lighting switching points in the Project Area and rationalise the coverage area under the switching points.
13. CONCESSIONAIRE shall be responsible for identifying existing street light cables or conductors or existing damaged poles in street light infrastructure maintained by BSCDCL. In such instances, CONCESSIONAIRE will provide the reasons and related investment costs for replacement with suitable justification wherever required. The replacement of such infrastructure will be done at the cost of CONCESSIONAIRE with the assistance of BSCDCL or DISCOM as the case may be. The CONCESSIONAIRE

will be allowed to merge the total load of two nearby switching points/feeder panels into one feeder panel provided they satisfy following conditions:

a. The total load on any feeder panel should not exceed 15 kW in such case.
b. Approval from BSCDCL for such modifications has to be taken
c. Each feeder panel has a consumer number as per the electricity bills. The two consumer numbers, if has to be merged together then all the load on second consumer number has to be shifted to the first consumer number. The sanctioned demand and contract demand for first consumer number should be revised by laisioning with DISCOM and responsibility for de-functioning of second consumer number and non-issue of electricity bills to BSCDCL lies with CONCESSIONAIRE.
d. All the poles and street light fixtures should be integrated and linked to the new feeder panel; Part load transfer is not acceptable
e. The cost of such modifications will be borne by the CONCESSIONAIRE;
f. The baseline energy consumption will be computed as the addition of baselines fixed earlier for feeder panels which have been merged; The third party energy auditor will approve the revised baseline for the single feeder after merging.

14. The CONCESSIONAIRE will ensure pole numbering with linkage to the respective switching points/feeder panels which caters to these poles (for e.g. SW No./Pole no.). The Feeder panels and switching points from which the street lights on poles are operated and billed will also be numbered using suitable indelible method in consultation with BSCDCL. Pole marking done by Energy Auditors in recent months may be made use of to the extent possible. Numbering of all poles and feeders should be completed within six weeks from award of work to the CONCESSIONAIRE and CONCESSIONAIRE will ensure that these numbers are not erased during project time period. Similarly, any modifications done in the current system has to be appropriately fed to the GPS data and it should be updated on regular basis by CONCESSIONAIRE;
15. CONCESSIONAIRE shall be responsible for providing necessary arrangements to protect their equipment and installations from damage or theft. Suitable protection devices to address fault in conductors or cables, voltage spikes or surges, faulty earthing, phase imbalances, current leakage etc. must be in-built in the design stage itself. If any equipment or installations belonging to the CONCESSIONAIRE are damaged on account of the above mentioned reasons or defective design, installation or operation by the CONCESSIONAIRE, the same has to be replaced within 48 hrs. by CONCESSIONAIRE at its own cost;
16. CONCESSIONAIRE will liaison with DISCOMS during pre and post implementation periods of CONCESSIONAIRE project for addressing all the electricity billing issues such asaverage billing, metering, replacement of defective meters, reduction or increase in contract demand as per the actual loads, power factor incentives etc. BSCDCL will support CONCESSIONAIRE in this initiative;
17. CONCESSIONAIRE will facilitateand coordinate the factory inspection to be conducted by BSCDCL for the verification of the feeder panels and lighting fixtures at the manufacturer's site. This inspection and verification shall be carried out in agreed lot size before despatch of every lot for installation at site;

18. CONCESSIONAIRE will obtain all necessary approvals, sanctions, licences in the name of CONCESSIONAIRE for installation of proposed equipment pertaining to the project from the concerned competent authorities and maintain validity of the same at all times during the project duration. CONCESSIONAIRE will bear the charges or pay deposits or any other amount for such approvals/licences/sanctions as may be necessary. BSCDCL shall issue the NOCs wherever necessary;
19. The baselines for energy consumption for existing street lighting connections at all switching points will be established using the existing energy meters of the Discoms and verified by the third party energy auditors along with the CONCESSIONAIRE. For this purpose, BSCDCL will ensure that all meters are in proper working condition in coordination with DISCOM. Where meters are not in proper working condition, CONCESSIONAIRE shall install a check meter duly tested and certified in accordance with the existing regulations and such check meter will be used for the purpose of energy consumption baselines of CONCESSIONAIRE project. Where CONCESSIONAIRE has doubts regarding the accuracy of any meter, it can contest the same on the basis of records obtained using ACCUCHECK meter and seek replacement of such meters. BSCDCL shall assist the CONCESSIONAIRE for replacement of such meters in coordination with DISCOM;
20. CONCESSIONAIRE willobtain the approval from BSCDCL on the schedule of work for installation of lighting equipment and smart feeder panels and BSCDCL will accord such approvals with adherence to the overall time table of the project implementation as specified in this Bid document. The commencement Certificate will be given by BSCDCL to CONCESSIONAIRE. On acceptance of the commencement certificate, The CONCESSIONAIRE will initiate the work.

Phase II – Installation of LED Street light Fixtures

10. The CONCESSIONAIRE will first install LED street lights fixturesswitching pointwise or feeder panel wise. After installation of LED street light fixtures at individual switching point/feeder panel, the responsibility of operation and maintenance of the respective feeder panel and street lights will be transferred to the CONCESSIONAIRE for the project time period. Once the street lights are changed by LED street light for individual feeder panel, the activity of installation of smart feeder panels as per the new load will commence. The smart feeder panels should be designed for at least 20% excess load than the existing load of LED street lights.
11. CONCESSIONAIRE will submit the schedule for installation of brackets and LED fixtures as per the design and specifications for different category of roads to BSCDCL for approval.
12. The implementation process will be prioritized by first considering A1 roads, followed by A2 roads, then B1 category of roads and lastly B2 category of roads. All the roads with current installations of 250 W HPSV/Metal halide lamps fixtures will be replaced first under the CONCESSIONAIRE project with desired LED Fixtures. This program shall be decided in consultation with BSCDCL
13. The implementation/installations of brackets on poles and LED light fixtures shall be closely monitored by BSCDCL.

14. Post satisfactory completion of installations, independent energy auditor will establish the savings on the feeder panel and submit a report to BSCDCL. BSCDCL shall issue "Commissioning Certificate" for switching point/meters only if the energy savings are found to be equal or more than the guaranteed savings proposed by CONCESSIONAIRE. Generally Commissioning certificates shall be issued in lots of 25 feeder panel/switching points/meters. Commissioning Certificate date shall be the basis to decide the start date of CONCESSIONAIRE's share of savings for the particular feeder panel/switching point;
15. On completion of implementation, CONCESSIONAIRE will take photographs of new streetlight system that covers all feeder panels/switching points and includes street light fixtures, record of new lux levels on roads and photographs of street light poles, conductors and cables, feeder panels etc. All the information must be updated in the GPS street light data of BSCDCL post installation of new system;
16. CONCESSIONAIRE willbe required to submit the monthly reports/daily reportsusing the data collected from the centralised system in formats as agreed with the BSCDCL.

Integration of Customer Complaints system

17. The CONCESSIONAIRE shall provide all necessary assistance for reporting the status of complaints received and addressed to BSCDCL in appropriate reporting formats and in periodicity as may be specified so as to integrate this information with the Grievance Redressal System at BSCDCL level or the State Level as the case may be
18. CONCESSIONAIRE will ensure compliance with all safety standards and fulfil all the statutory obligations in respect of the deputed staff at its own cost, for the full project duration;

    TheCONCESSIONAIRE will obtain feeder/Switching point and road-wise "Commissioning Certificate" from Engineer incharge /authorized official of BSCDCL for CONCESSIONAIRE project in the lot of 25 feeder panels after satisfactory installation of feeder panels;

Schedule 2:Technical Specifications of the Project

General applicable standards to CONCESSIONAIRE Street lighting project

National Lighting Code by Bureau of Indian Standards (IS)- SP 72, 2010, IS 1944, IS 1977 and IEC Standards shall be complied for design and development of street lighting calculations, selection of lighting fixtures, lighting technologies, pole structure and erection, cable selection and sizing, insulation requirements, conductor specifications etc.

The SP 72 (Part 8), IS 1944 (Parts 1) and IS 1970 (Part 2) provides code of practice for lighting of public streets and specifies the street categorisation criteria as detailed in **Table 3**.

Table 4 : Road Classes as per SP 72 (Part 8), IS 1944 (Part 1) and IS 1970 (Part 2)

Main Roads subdivided into two categories	
Class A	
Class A1	Important routes with rapid and dense traffic where safety, traffic speed, and driving comfort are the main considerations
Class A2	Main Roads with considerable volume of mixed traffic, such as main city streets, arterial roads and thoroughfares.
Class B	
Class B1	Secondary roads with considerable traffic such as main local traffic routes, shopping streets
Class B2	Secondary roads, with light traffic
Class C	Lighting for residential and unclassified roads not included in previous groups
Class D	Lighting for bridges and flyovers
Class E	Lighting for town and city centres
Class F	Lighting for roads with special requirement such as roads near air fields, railways and docks

With reference to above road categorization criteria and information collected through field survey, the roads to be covered under the CONCESSIONAIRE projects are broadly classified as Class A and Class B roads. The illumination levels required to be maintained for lighting installations on different classes of roads as per Standards are detailed in **Table 4**.

Table 5 : Standard Illumination Ratios according to Road Classes defined in SP 72 (Part 8), IS 1944 (Part 1) and IS 1970 (Part 2)

Classification	Average Illumination (lux)	Ratio Minimum to average* illumination
Class A1	30	0.4
Class A2	15	0.4
Class B1	8	0.3
Class B2	4	0.3

*In case of roads where the pole to pole distance is not as per the standards, then the guidelines for minimum lux level at the centre needs to be adhered. The minimum required lux for different wattages of LED street lights is provided in the **Table 7**.
In addition to Class A & Class B roads few areas internal to the wards and by-lanes also consist of class C type of roads.
In case of voltage dimming during the time from 11 pm to 5 am following standard illuminations should be maintained. The voltage should not be dimmed below 25% of 240 V between the given time period.

Table 6 Voltage dimming and minimum illumination to be maintained

Classification	Average Illumination to be maintained during operational hours excluding off peak hours (lux)	Ratio Minimum to average illumination	Minimum illumination to be maintained during off peak hours
Class A1	30	0.4	22.5
Class A2	15	0.4	11.25
Class B1	8	0.3	6

Energy efficient LED based luminaires unit for street lighting

I. SCOPE

The scope includes design, development, manufacturing, testing and supply of energy efficient luminaire complete with all accessories, LED lamps with suitable current control driver circuit including mounting bracket for street light and High mast light. The luminaire shall be suitable for rugged service under the operational and environmental conditions encountered during service.

II. PRINCIPLES DECIDING FACTORS FOR SELECTION/ PROCUREMENT OF LED LIGHTS

- Height of luminaire fitting as specified in table below
- Minimum Lux level required as specified in table below
- Minimum working hours (50000 hrs) of LEDs
- Minimum warranty shall not be less than 5 years for LED & Driver
- LED make as specified in document, and complete street light fitting can be of any manufacturer
- Additional cost towards high price of the LED light to be compensated by energy saving and zero maintenance.
- No specific make shall be criteria for selection and procurement of LED luminaires during any tender.

III. TYPE OF LUMINAIRE

The following types of LED luminaires as replacements for conventional fittings are proposed for ULBs:

Table 7 Selection of LED Luminaire against conventional fittings

Type of existing fitting (Street Light)	Wattage of existing fitting*	Wattage of LED fitting (After Accounting Driver Losses)	Initial Lumen Output
HPSV/HPMV	70W	35-40W	4500
	150W	60-90W	8000
	250W	80-110-135 W	11000
	400W	150-200W	18000
Metal Halide	70W	35-45W	4500
	150W	70-80W	8000
	250W	110-135W	13500
	400W	160-200W	20000
FTL	1x40W	18-25W	2500
	2x40W	35-45W	4500
CFL	1x85W	25-35W	3500
T-5	4x24W	45-60W	6000

*** At nominal input voltage of 220V AC**

Table 8: Minimum Illumination Level at Centre

Sl. No.	Type of Luminaries	Vertical Distance from the floor level (Meters)	Minimum Illumination Level (Lux) centre	Colour of Illumination
Street Light				
1	45-50W	5	(12-15)	5000K-6500K
2	100-105W	7	(15-18)	5000K-6500K
3	140-170W	7	(18-20)	5000K-6500K
4	260W	7	(20-22)	5000K-6500K
5	50W	5	(12-15)	5000K-6500K
6	105-110W	7	(15-18)	5000K-6500K
7	190W	7	(20-22)	5000K-6500K
8	25-30W	5	(10-12)	5000K-6500K
9	60W	7	(15-18)	5000K-6500K

IV. ELECTRONIC COMPONENTS

The electronic components used shall be as follows:

a. IC (Integrated Circuit) shall be of industrial grade.
b. The resistors shall be preferably made of metal film of adequate rating.
c. The conformal coating used on PCBs should be cleared and transparent and should not affect colour code of electronic components or the product code of the company.

d. The heavy components shall be property fixed. The solder connection should be with good finish.
e. The infrastructure for Quality Assurance facilities as called for in the Specification shall be available for the manufacturing of this product. The compliance shall be indicated clearly in the tender itself.

V. CONSTRUCTION

a. Extrudedaluminium and pressure die castaluminium(sand/gravity casting not to be considered). Aluminium grade LM 6063 or LM 6 as applicable or above high conductivity heat sink material. Heat sink must be made of extruded Al or pressure die cast Al only. Efforts shall be made to keep the overall outer dimensions and weight as minimum as possible.
b. All light fittings shall be provided with toughened glass of sufficient strength under the LED chamber to protect the LED and luminaires.
c. Suitable number of LED Lamps shall be used in the luminaires.
d. Suitable reflector/lenses shall be provided to modify the illumination angle.
e. The connecting wires used inside the luminaires, shall be low smoke halogen free, tire retardant e-beam/PTFE cable and fuse protection shall be provided in input side.
f. The control gear shall be designed in such a way that the junction temperature of LED should not be more than 25 ºC with respect to ambient temperature.
g. The luminaires shall be such that the glare from individual LED is restricted and shall not cause inconvenience to the public.
h. All the material used in the (luminaires) shall be halogen free and fire retardant confirming to UL 94.
i. The fixture should be impact resistant with suitable protection by cover for driver and LED's.
j. The fixture should have designed for IP65 ingress protection or above.

VI. HIGH POWER AND HIGH LUMEN EFFICIENT LEDS SUITABLE FOR FOLLOWING FEATURES SHALL BE USED:

a. LED Chips of Cree/ Osram/ Philips/ Nichia make shall be used for the purpose. No other make shall be accepted. The manufacturer shall submit the proof of procurement of LEDs from above OMMs at the time of supply.
b. The efficiency of the LED lamps at 110ºC junction temperature shall be more than 80%
c. LED junction temperature should not cross more than 90 ºC for longevity of luminaries
d. Solder point temp should not cross 75ºC
e. The working life of the lamp at junction temperature of 90ºC for 350mA current shall be more than 50,000 hours of accumulative operation and shall be suitable for continuous operation of 24 hours per day these shall be supported with the suitable section of the LM80 report from the manufacturer of LED.
f. Colour temperature of the proposed white colour LED shall be 5000K-6500K.
g. The output of LED shall be more than110 lumen (+-5%) per watt at 350mA operating current
h. The colour rendering index (CRI) shall be of nominal 65 with cool white light output.

VII. ILLUMINATION LEVEL (Lux Measurement):
Lux measurement with the help of lux meter shall be done at distance as shown in table below. Value obtained shall not be less than the lux specified in the table there in considering 10% lumen is absorbed by the reflector.

The fitting shall be so designed that the illumination level shall be evenly distributed and shall be free from glare. Illumination level of different types of luminaires shall be as below:

Table 9 minimum desired illumination levels during peak hours

Sl. No.	Type of LED Luminaries	Type of Road	Lamp mounting height from the floor level (Meters)	Minimum Illumination Level (Lux) at centre of road	Color of Illumination
1	250-260W		Above 18	(20-22)	5000K-6500K
2	190W	A1	Between 11-15	(20-22)	5000K-6500K
3	140-170W	A1	9-15	(18-20)	5000K-6500K
4	90-120W	A2/B1	7-9-11	(15-18)	4300K-5600K
5	70-120W	A2/B1	7-9-11	(15-18)	4300K-5600K
6	70-120W	B1/B2	6-7-9	(15-18)	4300K-5600K
7	70-50W	B1/B2/C1	7-9	(12-15)	4300K-5600K
8	45-50W	B1/B2/C1	5-7	(12-15)	4300K-5600K
9	25-30W	B1/B2/C1	5-7	(10-12)	4300K-5600K

1. Variation in illumination level shall be ± 2% is allowed in input voltage rangefrom 180VAC to 250VAC.
2. The illumination shall not have infra-red and ultra-violet emission. The test certificate from the NABL approved laboratory shall be submitted.
3. Electronic efficiency shall be more than 85%.

VIII. ELECTRICAL/TECHNICAL SPECIFICATIONS
Supply of LED streetlight luminaire complete with pressure die cast/extruded aluminum housing and adhering to the following specifications and lighting design requirements will be as per the actual application:

i. The driver card shall cut off at 270V and shall resume normal working when nominal voltage is applied again. This is to ensure protection of luminaires from neutral faults and error in connection at sites.
ii. Efficiency of driver electronics shall be more than 85%.
iii. The LEDs should be driven at the suitable current and within the permissible limits specified by the LED chip/lamp manufacturer.
iv. The fixture shall be designed so as to have lumen maintenance of at least 70% at the end of 50,000 hours.

v. The luminaire should be operable with auto adjustable 100-270V supply Voltage using the same driver.
vi. Power Factor of the electronic driver should be at least > 0.95 with THD < 10%.
vii. The luminaire should throw the perfect amount of uniform light with exactly the desired intensity, and offer best pole spacing, along with better light control. For this purpose, spacing to height ratio calculations must be attached for all installations were the poles are to be newly installed. The Luminaire shall employ individual optical lens for the each of the LED to ensure better uniformity of light distribution.

IX. ABSTRACT OF KEY SPECIFICATIONS

	Electrical specifications	**18W/25W/35W/45 W**	**60W/75 W**	**120W/150W/200 W**
i)	Voltage range or rating: [130 volt – 270volt AC] on single phase	100-270V	100-270V	100-270V
ii)	LED Output (lumen per watt)	>115 (+5%)	>115 (+5%)	>115 (+5%)
iii)	Frequency range (+/-5)	50Hz	50Hz	50Hz
iv)	Power factor:	>/=0.95	>/= 0.95	>/= 0.95
vi)	Colour temperature	5000K-6500K	5000K-6500K	5000K-6500K
vii)	CRI (Colour Rendering Index)	>=65	>=65	>=65
viii)	LED Life Expectancy	50,000 hrs with 70% Lumens	50,000 hrs with 70% Lumens	50,000 hrs with 70% Lumens
x)	Protection level	IP65 minimum	IP65 min	IP65 minimum
Xi)	Total Harmonic Distortion (THD)	<10%	< 10%	< 10%

X. CONFORMANCE STANDARDS:

Product Certification should be obtained from UL or CPRI or any other NABL certified lab. The following test reports should be provided:

LM-79	Luminaire efficacy (Photometry data)
LM-80	LED chip data
IP 67	Luminaire Ingress Protection
Luminaire Endurance Test	Practical testing of luminaire through 20,000 cycles
EN 60929	Performance
IEC 60598-1	General requirement and tests
IEC 61000-3-2	Limits for Harmonic current emission - THD < 10%

XI. QUALITY CONTROL & TESTING INFRASTRUCTURE

The manufacturer should possess the following in-house facilities and shall

providecalibration reports of the same:

- Prototype Test
- Type Test
- Acceptance Test
- Routine test
- GLOW wire test
- HV Tester
- Adequate number of electrical meters for measurement of different electrical parameter
- Meager (500 Volt)
- Tracking test
- Resistance to heat
- Measuring gauges such as Venire caliper, Micrometers, Dial gauges
- Digital thermometer
- Harmonic analyzer and THD meter
- Digital Weighting machine
- Power analyzer
- Surge Tester
- Temperature simulation facility to test various temperature parameters
- Ingress protection test facility for dust and water jet
- Transportation drop test
- Vibration test
- Compression test
- Humidity test

XII. LIST OF DOCUMENTS TO BE ENCLOSED:

All the luminaires should comply with SP 72 (Part 4) specifications for luminaires and the Bidders shall provide following information for proposed luminaires.

1. Relevant LED and Luminaire data sheets and Type test certificates indicating compliance to the technical specifications / standards.
2. Lumen Depreciation Curves of Lamps
3. Power and lumen output at different voltages.
4. Polar diagram of luminaires.
5. Printout of computer aided calculations for all parameters.
6. Lamp Lumen Maintenance and Survival test data
7. Mounting Instruction sheets
8. Technical catalogue of products.
9. Make of LED, Luminaire and Electronic Driver used.
10. Relevant manufacturing certificates including LM79 and LM 80.
11. Manufacturers Type Test Certificate of Lamp, Luminaires & gears from Government Accredited Test Laboratories /R&D Labs to be provided.

Power Conditioning Feeder Panels

The design and operation of feeder panels shall comply with SP 72 Part 8 of National

Lighting Code 2010.

The typical specifications for the power conditioning panels shall be as follows:

- Principle equipment should be designed on the basis of `Lossless Series Reactance with Secondary Compensation' technology (Auto-transformer)
- The efficiency of such principle equipment should not be less than 99.4% between 50% - 110% of loading
- Other than basic switching components, no other moving parts are allowed to be installed in the feeder panel
- 240 VAC 50 Hz Single Phase Two Wire / 415 VAC 50 Hz Three Phase Four Wire Input
- Three Taps of Single / Three Phase Four Wire Outputs
- Standard Output Taps in each Phase at 200/205/210 VAC @ 240 VAC Nominal Input
- Feeder panels should have GPRS/GSM based remote streetlight monitoring system with capacity for self-protection from short-circuit, over voltage and anti-theft alert
- The rating of the Streetlight controller should be at least 1.3 times the lighting load as measured during the initial studies
- Energy Meters to be installed in separately sealable and open able compartment within the Feeder Panels as per the following specifications:
    - Energy Meters should have Accuracy class of Class 1 or better;
    - Meters could be either three phase whole current or CT operated for LT as may be required based on the load connected to the feeder panel. The space to be created in the feeder panel for housing the meters should consider the same.
    - Energy Meters should be capable of logging parameters for each 15 minute time block with stamping of date and time. Such data logs should be retained in the energy meters for a period of 60 days or more.
    - Such Energy Meters should record the following minimum parameters:
        - Phase to neutral voltages
        - Phase-wise current
        - Phase-wise power factor and frequency
        - Total active power
        - Total reactive power
        - Total active energy
        - Total reactive energy
        - Total KVAH energy
    - Meters should have requisite port (Serial port communication – RS232 or RS485) for enabling remote reading and for connection of Modem for the same;
        - Energy Meter specifications should meet the minimum specifications specified by DISCOM and a sign-off on the same shall be obtained from DISCOM prior to finalizing the specifications;
        - Energy Meters shall be tested, installed and sealed in accordance with procedures specified by DISCOM;

        - A signoff from DISCOM on the design and specifications of the compartment in the Feeder Panel where the meters are to be housed is also recommended;
- Bidder has to install appropriate power conditioning devices to protect the new EE technologies and components of feeder panels from damage. Poor power quality is not allowed as an excuse for non-functioning of the new technologies installed under the project
- Fixed capacitor with appropriate capacity shall be introduced in each feeder panel to always maintain a power factor above 0.90
- In case of Single phase controller unit, 1 pole contactor or multiple parallel pole contactors should be used and in case of 3 phases, appropriate duty 3 pole contactor should be used. The number of contactors used should be suitable for ON/OFF and for changeover between full voltage to various voltage taps and interchanging between taps.The panels should be equipped with a microprocessor based Dual Channel Almanac Timer controller which should be user programmable to enable setting of ON/OFF times and also switching over to savings mode/bypass mode when required
- All the principle equipment's along with input output switchgears, metering, switches (bye pass and tap changers), contactors, fuses, auto transformer coils etc. should be of reputed manufacturers and should meet best engineering practices and norms as applicable in relevant standards
    - Auto transformer coil should have full current operating efficiency of better than 99%
    - The total heat dissipation from single coil should not exceed 6 watts-sec/kVA under fully loaded condition
    - The rated current of the auto transformer should be for continuous 120% that of input rated current
    - The switched fuse units should be of 32 Amp continuous AC current capacities. Fuses used should be of 20 Amp. Rating of high rupturing capacity (S/c current at least 50 kA)
- The bidders should always ensure that the System is capable to capture live data and record it at variable time-intervals. Following parameters should be recorded for every 60-120 minutes time interval:
    - Voltages
    - Current
    - Power Factor
    - Active Power (kW)
    - Apparent Power (kVA)
    - Metering kWh cumulative
    - Metering kVAh cumulative
    - Number of hours the lamps were glowing
    - Special emergency on/off facility with wireless control.
    - Benchmarking capacity so as to generate alert SMS for:
        - Phase-wise currents on crossing threshold values

        - Phase-wise voltages on crossing threshold values
        - BSCDCLB trips
        - Theft alerts
        - Group failure of lights
        - Contactor failure
        - No output supply
    - Alert SMS shall be forwarded to five (5) phone numbers.
    - GPRS/GSM modem should be used
- Enclosure Box of feeder panels shall be IP-56 compliant and should be fabricated out of MS sheet SWG 16 / 14 duly powder coated for corrosion resistance and long life.
    - It should have Single Phase power socket for connecting utility tools like drill machine etc. (capacity 1phase 240Vac / 5Amp socket)
    - Utility Service Lamp inside Panel for use during maintenance work
    - Gland Plates for Cable Entry at Incomer and Outgoing
    - Auto Bypass / Tap Changing in lieu of Manual. The tap changing should be automatic between the full voltage and lower voltage for minimum two numbers selected taps.
- The bidder shall have to get the control panels fabricated from the vendor having type test certificate from CPRI for 31 MVA short-circuit rating up to 400 amp for cubical panels. The copy of the type test certificate shall also have to be produced failing which feeder panels shall not be accepted
- Design life of the control panel should be mentioned in form of MTBF (mean time between failures) and it should be minimum 10 years.

Remotely Controlled Power conditioning requirement for Feeder Panels

Voltage Control:

- 240 VAC 50 Hz Single Phase Two Wire / 415 VAC 50 Hz Three Phase Four Wire Input
- Three Taps of Single / Three Phase Four Wire Outputs
- Standard Output Taps In Each Phase at 200/205/210 VAC @ 240 VAC Nominal Input
- Real time clock
- Three independent channels / output relays (desirable up to 4) with independent ON and OFF programming possibility remotely (User settable)
- System losses should be less than 1% so as to achieve high efficiency.
- Should not introduce any harmonics into the system but should reduce it.
- Other than basic switching components, no other moving parts should be there.
- During voltage tap changing, lights should not be momentarily disconnected which will lead to re-ignition of lights. It is mandatory for supplier to make gapless changeover arrangement when changing from by-pass mode to & from lower voltage energy saving mode and interchanging between the taps. This should be achieved by supplier by any specialized arrangements. The user is expected to produce the Performance assessment certificate for minimum continuous 100 such changeover operations without any lamps

going off in any of the three phases at minimum and Maximum supply voltage conditions. This certificate should be received from reputed Laboratory organisations like CPRI, ETDC, ERTL, IDEMI, SAMEER etc.

- Voltage Rating: 170V to 290V.
- Over-ride for local operation time settings from the central PC on every individual device for user definable time frame with a specific display on the particular device where such override is implemented
- Almanac sunrise and sunset table operation (User selectable option)
- User settable selection between GSM / GPRS operation and manual local operation
- Control of operation times settings from the central PC (in case of GSM)
- Specific data request whenever user desires from control PC
- Fault reporting to central PC and user definable Cell Phone number
- 3 No's Auxiliary Output NO/NC contacts with 5 Amp rating at 240 VAC and 2 no's Auxiliary input terminals (12Vdc or 240Vac) should be provided

Data monitoring:

- Class I (Minimum) accuracy of measurement of data
- All load parameters like Individual phase voltage, current, power factor, VA, Watts. In addition, WH (energy) also should be logged on a continual basis
- Data monitoring interval – One hour (desirable programmable from 1 min to 120 min)
- Serial port communication (RS232) AND (RS485- Desirable)
- Minimum data storage for 12 months (if data logged at 1 hour intervals)
- All data stored in the device regardless of whether the data has been transmitted to the central PC via GSM or not. Such data can then be later downloaded by the user on to a HHU

Other:

- Individual device ID user settable
- Password protected access to control functions
- Operating temperatures up to 55 deg. centigrade continuous
- Humidity up to 98% (Non condensing)
- Software for data monitoring, control, communication and analysis
- GPRS software for live viewing & controlling of functions of every individual unit on a static IP address
- Providing automatic controller compatible with GPRS / GSM or suitable protocol at individual panel level. Controller would perform meter reading, switching, data logging, communication and control.
- Individual meters / controllers operating in given protocol to communicate with individual unaccounted lamps in a given area
- Control cabinet fault monitoring

Central Control Unit (BSCDCLU – Master) should provide additional features and daily user defined report. These features should include:

- Support to export reports on website to other application formats like MS Access, DB, SQL, Oracle etc.
- Printout facility available on web pages
- Inbuilt scalability to support large lighting network. Upton 250 no's of RTUs should be possible to be controlled from one Central Control Unit
- High up-time and immediate fault rectification through SMS intimation to maintenance team.
- Simplified maintenance
- Real-time control

Faults Monitoring:

- Under/over voltage detection
- Main breaker error
- Contactor fault
- Circuit breaker off
- Circuit phase errors (fuse, breaker, etc.)
- Main power failure
- Leakage to ground
- Manual switch activated
- Phase current out of range
- Control cabinet door open
- Lamp failures

Complete monitoring on image of the entire geographic area at the screen and with projector attachment – on back wall, where the operators monitor the streetlight and dispatch maintenance teams. Any alarms and their exact location should be shown on the map for easy and fast overview. System should incorporate hardware modules in the control cabinets and enable communication from the central server location to the control cabinets via wireless (e.g. GSM/GPRS).

Specifications of central server

The central server for web based solutions should have following minimal features:

- The data collection server should work on open protocol having mechanism for assured delivery of data sent by hardware device
- The application software should be based on Service Oriented Architecture
- Backup: The System should have automated back-up facility to have regular back up of the data to ensure availability of the data and information; this should be achieved through mirror imaging of two HDDs
- The Central Server should be adequately back up by 2hrs UPS system for operational reliability

- All the software used on the PC should be licensed softwares
- The right capacity GSM/GPRS modem should be connected to Central server for speedy communication
- Speed of communication between Central control Unit (Master) and Remote unit should be such that maximum time required for acquiring the data should not be more than 30 minutes for 250 no's RTUs

The Power conditioning and Energy Management Panels to be installed for the Street lighting system of _____city shall adhere to the following technical specifications:

General Operating Features:

1. The panel should have provision for 'Auto-Switching' of the street light feeder pillar based on ALMANAC timer which shall ensure that the lights switch on and off at the desired time according to the variations in sunrise and sunset timings throughout the year.
2. The panel shall comprise of fixed capacitor banks of suitable ratings as required to maintain the power factor of the street light feeder between 0.99 lagging and unity
3. The panel shall have a provision of voltage based dimming for energy saving at user selectable time intervals. Selectable choice of Energy Saving mode /Bypass Mode shall be provided.
4. A 3 phase programmable multifunction meter (energy meter) conforming to relevant standardswith accuracy of class 1 installed in a separate lockable compartment with window shall be provided which shall display relevant electrical parameters like Voltage, Current, Power, Power Factor and Energy consumption for all 3 phases.
5. 3 nos separate R , Y and B indicating lamps for corresponding phases shall be provided
6. The incoming switchgear shall be Moulded Case Circuit Breaker (BSCDCLCB) of suitable rating. Rating of switchgear, cables, bus-bars etc. shall be selected based on detailed analysis of load on respective feeder pillar.
7. The panel shall have provision of bypassing the complete power and control circuit of the feeder pillar in case of failure or for maintenance. The indicating lamps and the energy meter shall not be bypassed and shall remain in circuit under all conditions.
8. Suitable Earth leakage protection shall be provided in the panel.
   (Note: It is usually observed that there is always some leakage currents in street lights circuits. If Earth Leakage Circuit Breaker (ELCB) is provided, this leakage current will keep on tripping the ELCB thus operating the panel continuously in bypass mode. UDED and ULBs shall confirm in this regard.)
9. The Bypass Circuit (Refer Circuit 'A' as per Doc No: ECPL/2248/ES/SCHEMA/01) and Energy Saver Circuit (Refer Circuit 'B' as per Doc No: ECPL/2248/ES/SCHEMA/01) shall be rated same as full rated capacity of the panel and this rating shall be the nameplate rating.
10. The panel shall be designed in such a way that the load shifting from one phase to the other phase on outgoing BSCDCLBs shall not be possible, as in such case the entire load of other phase will get shifted to one phase causing overloading of switchgear, bus bars and cables and reactor coil. Therefore on the outgoing side only BSCDCLBs switching mechanism shall be accessible to the operators.

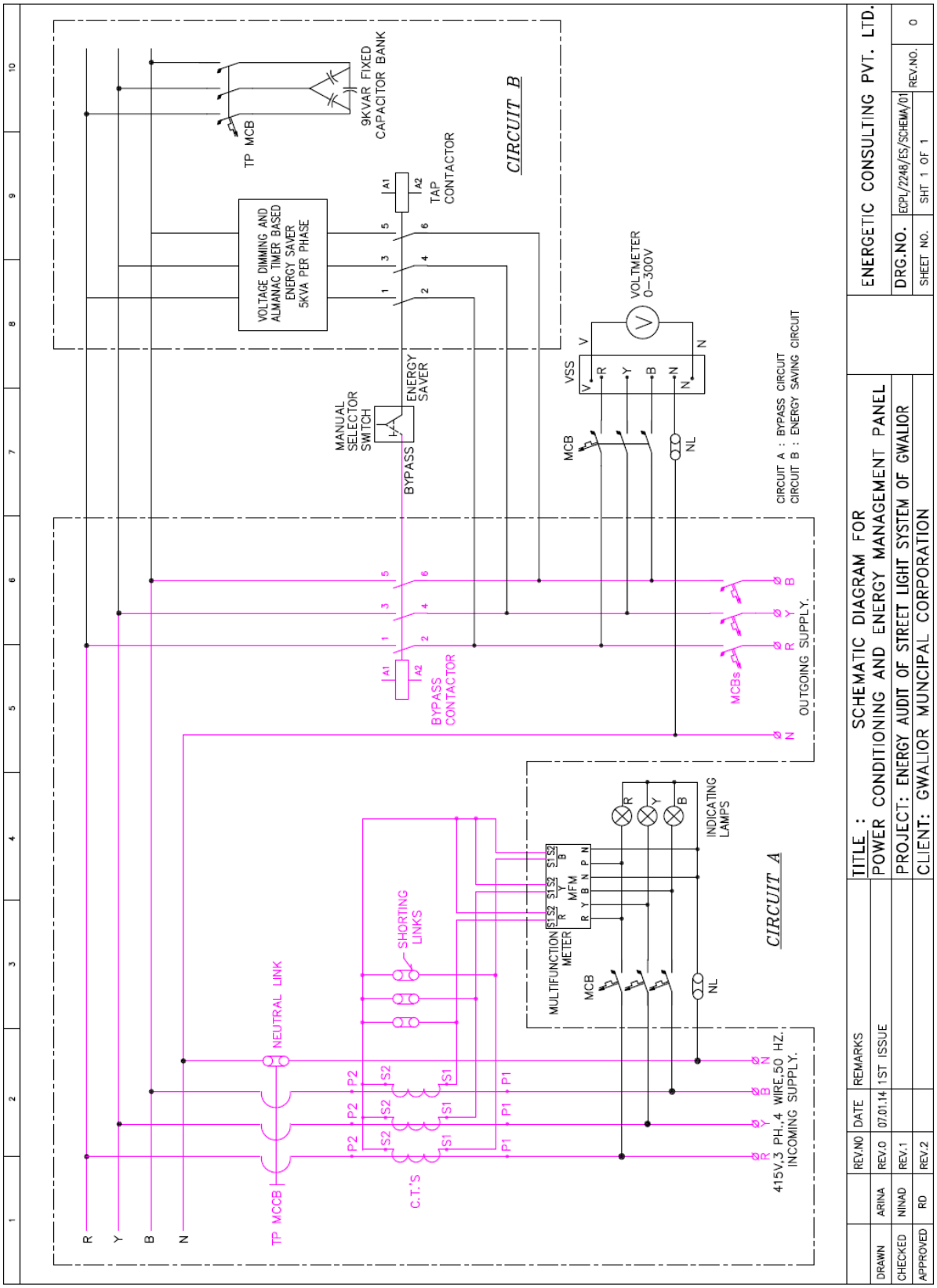
    OR

In case single phasing is common in some areas then the switchgear, cable and busbar rating inside the panel must be rated 3 times of rated capacity however this load shifting shall bypass reactor coil and timer circuit to prevent overloading.

ALMANAC TIMER

Detailed specification:

1. Supply voltage: 110V to 240 V AC
2. Supply Variation: -20% to 10%
3. Frequency: 50 Hz
4. Operating temperature: -10 deg to 55 deg C.
5. The timer shall conform to relevant IS standards.
6. The timer shall have programmable latitude/longitude precise to the minute along with time zone.
7. The timer shall have sunrise/sunset or twilight rise/set trigger modes
8. 12/24 hour display format shall be available
9. The timer shall have at least 6 years of battery reserve
10. Manual override and keypad lock feature shall be provided
11. The timer shall be easy to program and navigate


CIRCUIT B
CIRCUIT A
9KVAR FIXED CAPACITOR BANK
TP MCB
VOLTAGE DIMMING AND ALMANAC TIMER BASED ENERGY SAVER 5KVA PER PHASE
TAP CONTACTOR
MANUAL SELECTOR SWITCH
ENERGY SAVER
BYPASS
VOLTMETER 0-300V
VSS
MCB
NL
CIRCUIT A : BYPASS CIRCUIT
CIRCUIT B : ENERGY SAVING CIRCUIT
BYPASS CONTACTOR
MCBs
OUTGOING SUPPLY.
INDICATING LAMPS
MULTIFUNCTION METER
MFM
SHORTING LINKS
NEUTRAL LINK
TP MCCB
C.T.'S
415V,3 PH,4 WIRE,50 HZ.
INCOMING SUPPLY.
R
Y
B
N
TITLE : SCHEMATIC DIAGRAM FOR POWER CONDITIONING AND ENERGY MANAGEMENT PANEL
PROJECT: ENERGY AUDIT OF STREET LIGHT SYSTEM OF GWALIOR
CLIENT: GWALIOR MUNCIPAL CORPORATION
ENERGETIC CONSULTING PVT. LTD.
DRG.NO. EDPL/2248/ES/SCHEMA/01
REV.NO. 0
SHEET NO. SHT 1 OF 1
DRAWN ARINA
CHECKED NINAD
APPROVED RD
REV.NO DATE REMARKS
REV.0 07.01.14 1ST ISSUE
REV.1
REV.2

Schedule 3: Monitoring and Verification Process for Smart street lighting Project

Establishment of Baseline and Monitoring and Verification Process

UDED has appointed third party energy audit companies to establish feeder panel-wise baseline energy consumption and lux level requirements for the city roads with reference to IS standards (National Lighting Code). The 'pre-implementation stage' baseline for energy consumption and lux level for each feeder panel is clearly defined after completion of the Energy Audit study, same will be again verified and corrected after installation of new smart feeder panels. It is proposed that the monitoring and verification of ongoing savings during the 'post-implementation' stage for arriving at the actual savings will also follow the same methodology with some adjustment factors predefined in the M&V mechanism and mutually agreed between BSCDCL, CONCESSIONAIRE and third party energy auditor.

Since the status and quality of street lighting infrastructure and operational practices vastly influence the baselines, we have designed a practical approach for establishing illumination level and energy consumption for each feeder panel and various roads catered by such feeder panel under the CONCESSIONAIRE project in Bhopal city. The proposed baseline establishment process is outlined as follows:

- ***Asset inventory:***

  Feeder panel-wise accurate street lighting asset base/ inventory is already prepared. This information is made available in Annexure F for all the proposed feeder panels to be covered under the CONCESSIONAIRE project. Inventory includes feeder panel locations, connected load, inventory of streetlight fittings, poles and fixtures mounted, details of types of lamps, types/names of roads, number of poles on each feeder panel and their types etc. Thus a fairly accurate estimate could be developed for theoretical energy consumption (assuming 12 hrs. of daily operation) at each feeder panel proposed to be considered in CONCESSIONAIRE project;

- ***Review of Actual/ metered and billed energy by DISCOMDISCOM for individual feeder panels for pre-implementation period:***

  Around 90% of the street lighting is billed on metered consumption in Bhopal. The analysis of monthly bills for the preceding one year which is part of Annexure F provides the monthly kWh consumption on each feeder panel. One of the possibilities could be that for areas which are under development and where new poles are getting added to the street light feeder panel system may provide large variation in baseline for calculating kWh consumption for the concerned feeder panel. To address these issues, it is proposed to provide adjustment factor to baseline energy consumption to such feeder panels where it is found that energy consumption has substantially increased in the past 12 month electricity bills based on analysis. The adjustment factor will be computed by third party energy audit company from the methodology proposed for energy consumption identification from asset inventory process and energy audit study report.

  The actual metered and billed energy consumption by DISCOMS on feeder panels with the appropriate adjustment factor identified from energy audit measurement and using the methodology mentioned under asset inventory process of street light system is considered to arrive at kWh/month for each feeder panel selected for CONCESSIONAIRE project implementation. The feeder panelswhere the connected load of street light fixture is fairly constant for atleast last four months from the energy consumption data of last twelve months will be prioritized for selection under CONCESSIONAIRE project.

- ***Pre-implementation Energy Audit Study:***

  The pre-implementation energy audit will measure the energy consumption at every feeder panel, analyse/compare the metered energy consumption recorded by DISCOM on such feeder panels and corroborate it with the wattage of fixtures/ bulbs in working condition for a particular billing cycle (latest two months of energy audit work), thus fixing the baseline for each street light feeder panel considered under CONCESSIONAIRE project.

- ***Poor status of utility/DISCOM metering during post-implementation period:***

  To address this issue it is proposed that CONCESSIONAIRE will install one more meter on the feeder panel after utility meter. The specification for this meter will be approved by DISCOM and all the meters prior to installation will be tested in accredited laboratories and approved by utility/DISCOM as per the standard procedure.The cost for meters, their testing and installation will be borne by CONCESSIONAIRE. Once these meters are installed BSCDCLs shall agree to accept the energy consumption based on reading taken from CONCESSIONAIRE meter in case the DISCOM meter is found to be inaccurate/non-functional/defective/burnt out.

  If for the same time period, it is found that there is variation of more than 5% in energy consumption recorded by the meters installed by DISCOM and meter installed by CONCESSIONAIRE, the meter that is required to be recalibrated or replaced need to be identified by using appropriate verification equipment (e.g. clamp on meters / accu-check, etc). The defective meter will be identified using the abovementioned methodology and will be the one whose readings are in maximum variation from the readings shown by calibrated meter / equipment. The defective meter identified using the above process needs to be removed and replaced by accurate meter within next 10 days by the CONCESSIONAIRE or DISCOM, as relevant. Till the time defective meter is restored the energy consumption readings from the other accurate meter (either of DISCOM or CONCESSIONAIRE) will be considered for calculating savings accrued for that particular period.

- ***Practical and scientific approach to likely issues:***

  The provision is made for making necessary adjustments in the energy savings / energy consumption data on mutual agreement with due opinion from third party energy auditor. The adjustment could be done during the post-implementation phase arising due to unavoidable practical issues of power outage, non-functioning of bulbs/ fixtures, power supply conditions not met, temporary installation of lights during festivals with connections taken from existing street light feeders, increase in the connected load due to addition in baseline street light fixtures or installation of higher wattage lamps because of road widening etc.

- ***Instances of changes in lighting infrastructure where historical utility billing as baseline may not be appropriate:***

  In such cases the third party energy auditor will revise the baseline as per the initial connected load and post implementation connected load and receipt of first month's bill post revised load, the energy savings should be established by understanding the incremental energy consumption and providing the adjustment factor to the future bills for rest of the monthly billing cycles.

- ***Measuring the lighting quality aspects post implementation:***

  The lighting parameters like efficacy of lamps, lux levels, lumen depreciation rate, colour temperature and applicable lighting standards to the street lighting system will be measured once in six months by third party energy auditor on sample basis for the period of CONCESSIONAIRE contract and compare them with the pre-implementation baseline established earlier for this project. The impact of lighting aspects on reduction of energy consumption will also be established and accordingly adjusted from the monthly savings achieved by CONCESSIONAIRE. **Table 10** provides the scope of work and suggested format for third party energy audit (on sample feeders selected by random sampling method) after every 6 months.

- ***Documentation process for establishing Savings*:**

  For each feeder panel the baseline energy consumption is already determined as mentioned in preceding paragraphs in three ways: 1. Based on existing electricity meter data; 2. Using calibrated energy audit meters; and 3. Based on connected load on the feeder panel with recorded hours of operation of lamps. The CONCESSIONAIRE shall install Feeder panels which will enable remote operation, monitoring and data logging facility to be controlled through a centralized call centre/ data centre to be operationalized by the CONCESSIONAIRE at the earliest from date of commencement of work, but in no case later than 6 months from the date of commencement of work. The energy consumption data on daily basis will be compiled by CONCESSIONAIRE from the centralized monitoring system by the end of each month in line with the monthly billing cycle of DISCOM. It will be co-related to the baseline data and actual metered energy consumption from DISCOM meter. The energy savings will be evaluated by the CONCESSIONAIRE for each month. The copy of report on monthly energy savings will be sent to the engineer in charge of the project from BSCDCL and third party energy auditor. The engineer in-charge will approve the energy savings based on the comparison of the data provided and the baseline established. The Engineer may ask for any additional data to substantiate/evaluate the savings. In case the CONCESSIONAIRE is in disagreement of the proposed savings approved by engineer in-charge, the third party energy auditor will review/analyse the energy consumption data and provide recommendations on report to decide what should be the accurate way for establishing the savings. Based on the decision of third party energy auditor, the energy savings achieved for that month will be established and the payments to the CONCESSIONAIRE will be made accordingly.

  All the feeder panels installed will consist of two meters at feeder panel. Such data logger/ metering equipment shall have remote connectivity with the CONCESSIONAIRE Call Centre/ Data Centre and the CONCESSIONAIRE shall maintain updated hourly consumption data for each street lighting feeder panel. Summary, of consumption for each stretch, estimated number of working/ non-working points and dimming report shall be emailed/ sent to BSCDCL by the CONCESSIONAIRE before 10 AM next morning on a daily basis. Failing to provide such data within the stipulated timeframe for more than 3 days during any particular month shall attract for penalty (to be specified in the tender document). The formats are provided in **Table 5and Table 6.**

Table 10: Report on Daily Non-functional points

Daily Report on Non-Functional Points
Report Date:

Feeder panel No./Name	Total Number of light points as on Date (EOD)	Total Number of Non-Functional Points as on previous day (EOD)	Total Number of Non-Functional Points as on date (EOD)	Number of Non-Functional Points for the day	Action Taken	Remarks

- The identified non-functional points shall be replaced the very next day of occurrence of such event in the presence of engineer from BSCDCL and appropriate records must be created for such works undertaken on a particular feeder/ feeder panel during a particular energy billing month.
- The CONCESSIONAIRE shall undertake billing for each feeder/ feeder panel for the same period as the Energy Billing done by utility. The billing to be done by the CONCESSIONAIRE shall outline the following aspects:
    - Start Date/ End Date for billing period and corresponding meter readings;
    - Comparative of energy recorded in DISCOM meter vs. CONCESSIONAIRE Meter/ Data logger; appropriate meter testing shall be undertaken for the purpose of arriving at demonstrated savings in case the difference between the two meters is found to be more than 5% during any month/ billing period.
    - Day wise adjustments to be made in baseline to be used for the purpose calculation of actual energy savings achieved:
        - Duration of power outage. Power outage could be because of non-availability of supply from DISCOM or due to main cable fault;
        - No. of non-functional points along with duration that such points remained non-functional;
        - Proportionately adjusted baseline shall be calculated for each day based on above;

Table 10below provides the daily reporting format for individual feeder panels.

Table 11: Daily report format for individual feeder panels under CONCESSIONAIRE project

DAILY REPORT FOR FEEDER PANEL																										
Report Date																										
Feeder Panel/E.B No.																										
Feeder panel No./Name																										
Hours	**Meter No.**	**Energy consumption kWh**	**Avg. I/P voltage V**	**Avg. O/P voltage V**	**Current A**	**kW**	**Power Factor**	**Power availability (in mins.)**			**Burning load (Watts) as per the type of lamps installed**							**Non Burning load (Watts)) as per the type of lamps installed**							**Remarks**
								Phase I	**Phase II**	**Phase III**																

- The difference between the adjusted baseline and the actual consumption recorded for the particular day shall be considered as the demonstrated savings for that particular day.
- The demonstrated savings and the total adjusted baseline for each particular day during the month/ billing period shall be added to arrive at the total demonstrated energy savings and the total consumption as per the adjusted baseline.
- Provided ratio of the demonstrated savings and the adjusted baseline for the month/ billing period is equal to or more than the guaranteed level of savings agreed by the CONCESSIONAIRE, the demonstrated savings in units shall form the basis for invoicing by the CONCESSIONAIRE to the BSCDCLs.

The format for submission of monthly energy saving data is provided in Table 11.

Table 12 Format for Third Party Energy Audit Report on sample feeders

THIRD PARTY STREET LIGHT ENERGY AUDIT REPORT FORMAT (PROPOSED EVERY 6 MONTH FOR SAMPLE FEEDER PANEL M&V)

SECTION (Area)

WARD NO.

FEEDER NAME/NO.

TOTAL NO. OF E.B BOXES INSTALLED ON FEEDER

TOTAL NO. OF POLES

TYPE OF POLES and pole arrangements (FOR E.G. butterfly, one end of single road, both side of road)

				EB METER READING			ENERGY AUDITOR CALLIBRATED METER READING					Actual load (Watts)							Actual load not in operation (Watts)							AVG. LUX	Remarks
DATE OF STUDY	READING TAKEN BY	E.B BOX NO.	TIME WHEN READING TAKEN	OPENING READING (kWH)	CLOSING READING (kWh)	HOURLY CONSUMPTION (kWh)	VOLTAGE	CURRENT	kW	POWER FACTOR	HOURLY CONSUMPTION (kWH)	40W TL	70 W SVL	150 W SVL	250W SVL	250W MHL	400W MHL	LED 70 W	40W TL	70 W SVL	150 W SVL	250W SVL	250W MHL	400W MHL	LED 70 W		
DD/MM/YY			HOUR 1																								
			HOUR 2																								
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			HOUR 13																								
			HOUR 14																								

Schedule 4: Scope of Work for Independent Energy Auditor

The scope of work of the Independent Energy Auditor for the Third Party Energy Audit to be undertaken in the presence of both BSCDCL and CONCESSIONAIRE for establishing the energy baseline consumption for street lights is as follows:

1. Scope for joint third party energy audit for energy baseline consumption for existing system for each switching point proposed to be covered under the Project

1.1. Verification of asset data / marking

(a) Verification and certification of switching points (metered connection points or feeder panels) and inventory of street lighting assets, including the following:

- type of fixtures including wattages of bulbs, ballasts, chokes, etc. (as per actual consumption) and total number of fixtures of each type ;
- total number and height of street lighting poles;

(b) Switching point wise - Names of the streets to which the switching point electrical lighting circuit caters to, total length and widths of streets illuminated (lighting stretch catered to by the switching point) ;

(c) Validation of switching point wise pole numbering/ marking, as done by CONCESSIONAIRE;

(d) Validation of single line diagram and indicative maps, if any, indicating location of switching point, metering equipment, fixtures, poles, etc.

Measurements and analysis to be undertaken for a switching feeder post completion installation of feeder panel/ metering.

(e) Installation of data loggers calibrated and certified by a recognized laboratory in series with energy billing meters on each switching point on receipt of intimation from BSCDCL/ CONCESSIONAIRE. The responsibility of installation and safety of data loggers shall lie with the Independent Energy Auditor;

(f) Isolation of the voltage dimming, remote switching and all other circuits (if any) in the feeder panels installed by CONCESSIONAIRE, except the energy billing meter, from the street lighting circuit;

(g) Measurement of the electrical parameters, such as voltage, current, active/ reactive power, power factor, etc. using calibrated instruments/data loggers for three (3) consecutive days (recording hourly energy consumption) on all street lighting feeders, for the entire duration of the time; Presence of BSCDCL and DISCOM members at the site for some time, during measurement is essential.

(h) Logging of data on actual power availability during street lighting operating hours for the period during which measurements of electrical parameters are undertaken;

(i) Half-hourly verification of the number of points glowing and not-glowing during street light operating hours for each day during which measurements of electrical parameters are undertaken;

(j) The hourly data for switching points/ feeders must be developed in accordance with the formats given in the metering & verification plan for the period of three (3) days;

(k) Calculation of per switching point/ per feeder energy baseline consumption norm based on kWh consumption per fixture per hour data and number of each of the type of fixtures connected to the switching point from the electrical measurements undertaken, after duly adjusting for the duration for which power remained unavailable and fixtures which were not glowing/ operational (with due consideration to the actual duration for which such fixtures remained non-glowing). The energy parameters measurements for the entire period of three (3) days during which the audit was conducted shall be used for arriving at the energy baseline consumption norm; BSCDCL should ensure that all fixtures connected to the switching point are in working condition when the intimation is given to the CONCESSIONAIRE.

(l) Certification of switching point/ feeder wise energy baseline consumption norm based on

kWh/ fixture/ hour as the basis as described above.

1.2. Switching point wise report submission

(a) Detailed report on data collected and analysis of hourly energy consumption along with details such as power availability duration, glowing/ non-glowing status of fixtures should be summarized to demonstrate the certified energy baseline consumption norm for a particular switching point. The reports should be submitted within five (5) working days from completion of field exercise for each switching point. The Independent Energy Auditor shall certify the per fixture hourly consumption norm or the baseline for the particular switching point catering to a particular stretch of street lighting fixtures.

(b) Such baseline figures shall be signed off by both BSCDCL and CONCESSIONAIRE in addition to the Independent Energy Auditor and shall become binding for the entire life of the Project for the particular switching point.

(c) Along with kWh consumption per fixture per hour data (baseline for the particular switching point) the number of each of the type of fixtures connected to the switching point shall be reported and accepted by all parties.

(d) The CONCESSIONAIRE shall implement its ECMs on each stretch once the TPEA is conducted and the energy baseline consumption is determined and formally signed off.

(e) Those ECMs which come embedded with the feeder panel shall be disabled/ by passed by the CONCESSIONAIRE before the TPEA, as mentioned earlier in 1.1(f).

2. Undertaking periodic third party verification of lux level measurements on street lighting fixtures on sample basis

(a) Undertaking lux level measurements on randomly selected five per cent (5%) of the street lighting fixtures covered under the Project. Such sampling may be decided in mutual consultation with BSCDCL. In case of non agreement in sampling during mutual consultations, fifty per cent (50%) of the sample size (two point five per cent (2.5%) of street lighting fixtures) would be decided by BSCDCL.

(b) The Independent Energy Auditor shall be responsible for arranging all requisite measuring equipments duly calibrated and certified from a recognized laboratory required for undertaking the lux level measurements on the selected sample points in adequate quantity.

(c) The Independent Energy Auditor shall deploy adequate number of personnel required for undertaking the lux level measurements on the selected sample within the timeframe specified by BSCDCL.

(d) Such lux level measurements shall be undertaken in accordance with standard procedures including measurements along the pole, under light fittings, middle of the road and both edges of the road. Between two poles, the lux level should be measured towards verge, middle of the road and both edges of the road.

The procedure of calculating the lux level measurements based on the nine point methodology to be adopted for the lux level measurements, as per the guiding principles of the Bureau of Energy Efficiency Lighting Code, 2006, shall be as outlined below:

- The measurements should be conducted in night. The lamps must be switched on at least thirty (30) minutes before the measurements to allow for the lamps to completely warmed up;
- The dimming controls should be fixed at different levels as agreed in energy performance contract and simultaneous power and lux measurements should be carried out for selected lamps;
- Stray light from the surrounding areas should be minimized at the time of measurements;
- The measurement height should be one (1) meter above the road surface;
- The measurement grid should be positioned to cover a representative area of the working plane. The lux meter should be positioned at minimum nine (9) number of measurement points as per the diagram provided below

Measure illuminance using a calibrated lux meter at each point. Calculate the average value of measured illuminance at all points. If E1, E2,..., En are illuminance measurements at points 1,2,...., n

$$\text{Average illuminance, } Eav = \frac{E1+E3+E9+E7}{16} + \frac{D2+D6+D8+D4}{8} + \frac{C5}{4}$$

2. Report submission

The Independent Energy Auditor shall submit within five (5) days of completion of field exercise of measurements its detailed report meeting the following requirements:

(a) providing point wise results, giving the asset number indicated in the pole marking for each such point, the results of the lux level measurements;

(b) comparison of the results of lux level measurements with the recommended lux level for each point; and

(c) Percentage of points found to be compliant with the recommended lux level standards.

The Independent Energy Auditor shall also provide detailed report of survey highlighting the above mentioned points and provide switching point/ street wise results of measurements with stress on bringing out instances where non-compliance is high.

3. Disputes between the Parties as per Article 28 of the Contract

Failing an amicable settlement pursuant to Article 28.1 of the Contract within thirty (30) days of receipt of the request provided therein, any dispute, controversy or claim shall be referred by either Party to the Independent Energy Auditor. The Independent Energy Auditor, on the request made by a Party, shall endeavour to resolve the issue and arrive at a settlement mutually agreeable to both Parties. Decisions taken by the Independent Energy Auditor shall amount to recommendations to both Parties only and shall not constitute binding decisions therein. If any dispute, controversy or claim has not been resolved between the Parties through an amicable settlement or based upon the decision taken by the Independent Energy Auditor, such dispute, controversy or claim may then be submitted to litigation as provided in Article 28.3 of the Contract.

Schedule 5: Trust and Retention Account Agreement

[To be filled in after the award of the winning offer, prior to the execution of the Contract]

THIS TRUST AND RETENTION ACCOUNT AGREEMENT (this **"Agreement")** is entered into on [•] by and among:

1. **_____ Municipal Corporation** of the city of _____, State of Madhya Pradesh, having its registered office at [•] and its legal representative being [•] **("BSCDCL");**

2. [•], a company duly registered in India as per the Companies Act of 1956, as amended from time to time, located at [•] and its representative being [•], duly authorized **("CONCESSIONAIRE");** and

3. [•] , a bank duly registered in India, having its principal office at [•] , and represented by [•] (the **"Escrow Agent").**

BSCDCL, CONCESSIONAIRE and the Escrow Agent are referred to herein collectively as the **"Parties"** and individually as a **"Party".**

WHEREAS:

A. According to the energy performance contract entered into on [•] between BSCDCL and CONCESSIONAIRE (the **"EPC"),** BSCDCL and the Escrow Agent shall establish an escrow account for the benefit of CONCESSIONAIRE. BSCDCL shall fund such account (pursuant to the terms of this Agreement), which shall serve to secure part of BSCDCL's payment obligations towards CONCESSIONAIRE under the EPC.

B. The Escrow Agent is willing to serve as an escrow agent in accordance with the terms and conditions of this Agreement.

C. Unless otherwise defined herein, all capitalized terms shall have the meaning ascribed to them in the EPC.

NOW, THEREFORE, the Parties hereto agree as follows:

1. ESCROW ACCOUNT

1.1 Appointment

BSCDCL and CONCESSIONAIRE hereby appoint the Escrow Agent to serve as the escrow agent for the purposes of this Agreement and subject to the terms of this Agreement and the Escrow Agent hereby accepts this appointment.

1.2 Escrow Account

Within five (5) Business Days of the date hereof, BSCDCL and the Escrow Agent shall establish an escrow bank account denominated in Indian Rupees for the benefit of CONCESSIONAIRE (the **"Escrow Account").**

1.3 Deposit

1.3.1 No later than three (3) months following the establishment of the Escrow Account in accordance with Article 1.2 above, BSCDCL shall transfer an amount equivalent to what it used to pay for one (1) months of electricity bills before the execution of the EPC in the Project Area (as defined in the EPC) (the "Initial Deposit").

1.3.2 Each month following the Initial Deposit, BSCDCL shall transfer into the Escrow Account, in immediately available funds, an amount equal to what it used to pay for one (1) month of electricity bill before the execution of the EPC**.** The Deposit shall be held in escrow by the Escrow Agent until it is released in accordance with the terms and conditions of this Agreement.

1.3.3 Failure to comply with this Article 1.3 shall be deemed a BSCDCL Event of Default underArticle **Error! Reference source not found.**of the EPC.

1.3.4 The Initial Deposit and the Deposits made each month by BSCDCL shall be collectively referred to as the "**Escrow Amount".**

1.4 Identification and Separation

1.4.1 The Escrow Agent shall clearly identify in its records the Escrow Account as an escrow account and shall keep the funds standing to the credit of the Escrow Account segregated from and not commingled with the Escrow Agent's own funds or the funds of any of its other customers or third parties.

1.5 Fees

1.5.1 BSCDCL shall bear the costs of the fees to be paid to the Escrow Agent for the establishment and management of the Escrow Account.

1.5.2 Any payment made by BSCDCL under this Agreement shall be made from the following account or from such other account which BSCDCL may designate from time to time:

Bank:
Account number: BIC (SWIFT):
Address of Bank:

1.6 Escrow Account Statements

The Escrow Agent shall provide monthly statements regarding the Escrow Account to BSCDCL and CONCESSIONAIRE.

1. ESCROW AMOUNT

2.1 Promptly upon the Deposit being transferred to the Escrow Account, the Escrow Agent shall send to BSCDCL and CONCESSIONAIRE a notice informing them of the transfer.

2.2 The Escrow Agent shall hold the Escrow Amount in escrow for the sole benefit of CONCESSIONAIRE. The Escrow Agent shall not release any of the Escrow Amount for any person other than CONCESSIONAIRE. In particular, the Escrow Agent shall not accept any requests for withdrawals or transfers of the Deposit or the Escrow Amount from BSCDCL for the benefit of BSCDCL or any third party, unless it is made in accordance with this Agreement.

2.3 The Escrow Agent shall not apply any right of set-off against the Escrow Amount, grant any lien over the Escrow Amount, or apply any fee or deduction in relation to the Escrow Amount.

At the end of each calendar year, the Escrow Agent shall transfer into an account of BSCDCL as BSCDCL shall designate, any amount exceeding an amount equivalent to the Initial Deposit. Thus, the Escrow Amount at the end of each calendar year shall be equivalent to the amount of the Initial Deposit.

3. PAYMENT

3.1 Each month, CONCESSIONAIRE shall issue an invoice and send it to the BSCDCL along with supporting documents, with a copy to Escrow agent. Pursuant to the review of the supporting documents, the BSCDCL shall intimate the Escrow Agent to pay the CONCESSIONAIRE seventy-five per cent (75%) of the amount mentioned on the invoice within five (5) Business Days following the receipt of such invoice.

3.2 The remaining twenty-five per cent (25%) of the amount of the invoice shall be paid by the Escrow Agent upon submission by CONCESSIONAIRE of a written approval of its invoice by BSCDCL. In the event the Escrow Agent does not receive a written approval by BSCDCL, it shall not release the remaining twenty-five per cent (25%).

3.3 Upon the expiry of the Term of the EPC, BSCDCL shall send instructions to the Escrow Agent requesting him to release and transfer any due and payable amounts to the CONCESSIONAIRE and any remaining amounts to be transferred to BSCDCL.

1	BRTS Corridor
2	Main road no 2
3	Main road no 3
4	Kolar Triangle to Gehunkheda
5	Subhash schook to Rajeev Gandhi Collage
6	Karod square to Bhadbhada (Nishatpura Railway crossing DIG Banglow, Bhopal Talkies, Bus Stand, Railway stations, PHQ, Roshanpura)
7	VIP road
8	Air port to LalGhati
9	Plate form no 1 to Habibganj Naka
10	Bharat Talkies to Anand Nagar
11	74 Bunglow Area
12	Char Imli Area
13	45 Bunglow Area
14	Van Vihar to D B mall
15	Bans Khedi road
16	10 No market to K N Pradhan Estate
17	DRM Office to 4 B Saket Nagar
18	RRL Office to Aims
19	Best Price to DIG Bunglow
20	Royal Market Bhopal Talkies
21	Royal Market lady Hospital
22	J P Nagar to Plate form no 06
23	D B Mall to Lily Talkies
24	Gamon India to MANIT
25	Bharat Mata Square to Polytechnic square
26	Bharat Mata Square to C M house
27	P & T square to Shabri Nagar
28	Lalghati square to Nevri mandir
29	Kamla Nagar Ekta Market to Vaishali nagar
30	Kalpana nagar to J K road
31	Azad market Bhavani chowk, Somwara, Jumerati, Chowk Bazar, Ghoda Nikkas
32	New market area
33	Shahapura A, B,C sector
34	Eid Gah hills
35	Bairagarh
36	Shakti nagar,
37	Saket Nagar
38	Arvind Vihar
39	Bagh Mughaliya
40	Sindhi colony
41	Kabad Khana area
42	Lalghati Gufa Mandir

43	Danish Kunj,
44	Sarvdharm colony
45	Misrod
46	Vidhya Nagar
47	Housing board colony Karod
48	Chholla
49	Ashoka Garden
50	Old and new Subhash nagar area
51	Ashok vihar, 80 feet road
52	Jeewan Jyoti
53	Ashbagh are
54	Pushpa nagar, chand bad,
55	Naveen Nagar, Dwarka nagar, Rajend nagar, Shankracharya Nagar
56	Punjabi bagh
57	Indrapuri A, B, C sector
58	Nehru Nagar
59	Kotra
60	Kamla Nagar
61	Rachna Nagar
62	Aradhna nagar
63	Gautam nagar
64	Shanti niketan
65	1100 Quarter
66	E 1 to E8
67	Sonagiri A,B,C Sector
68	Koh-E-fiza , Housing board and B D A
69	Shyamla hills area
70	Professor colony