Solar Street Lights: Project Management, Technical & Procurement Guidelines for Municipalities

Alternative Energy Promotion Centre
Ministry of Science, Technology and Environment
Government of Nepal

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Disclaimer
This document was prepared under a strategic partnership between AEPC and CIG. The views expressed in this document are those of the authors and do not reflect the official opinions of AEPC or CIG.
Forward

Since its very establishment, the Alternative Energy Promotion Centre (AEPC) has been promoting sustainable energy solutions to off-grid rural households and communities within Nepal. More recently, AEPC has also been promoting solar options to urban areas in an effort to lessen energy demand from the grid. The Government of Nepal has recently initiated a new program on solar street lighting to light the streets in urban areas.

This document breaks fresh ground as being the first on this subject to be published within the country. Evolving technologies are providing the country with many different opportunities to light the streets and footways of urban Nepal. This guideline aims to promote renewable energy in urban areas, as well as to promote the necessary illumination that will keep our road users safe. In addition, the promotion of LED lights also lights the way to energy efficiency.

While this document should not be taken as a policy, standard or legislation, this document does provide guidelines to municipalities on different aspects of a solar street-lighting project. We hope that Solar Street Lights: Project Management, Technical and Financial Guideline for Municipalities provides the focus, knowledge and leadership required to “super charge” a Municipality when trying to provide a safe and pleasant environment for residents and all member of the travelling public. This document also serves as a reference to city planners, engineers and other local bodies that wish to promote solar street lighting in the country.

Finally, I would like give special thanks to Mr. Bishal Parajuli, Mr. Laxman Khatiwada and the CIG team for bringing the idea, expertise and all the hard work needed to produce such a useful instrument.

Ram Prasad Dhital
Executive Director, AEPC
Preface
This document is provided to help you through the planning phases for setting up Solar Street Lighting (SSL), as well as to give you technical guidelines that will help you during the procurement, installation, and maintenance processes. In addition, these guidelines are given to help planners work better together with the Alternative Energy Promotion Centre (AEPC) and any plan partners. This document is specifically designed for the municipality staff who are interested in starting a SSL program with assistance from the AEPC. These guidelines will help staff through each stage of the project, from expressing an interest to the AEPC, to getting lights up and running. Others helping municipality staff may also be interested in the technical guidelines, as they contain a good summary of SSL and solar lighting technology. This document is specifically designed for the municipality staff who are interested in starting a SSL program with assistance from the AEPC. These guidelines will help staff through each stage of the project, from expressing an interest to the AEPC, to getting lights up and running. Others helping municipality staff may also be interested in the technical guidelines, as they contain a good summary of SSL and solar lighting technology. This document is organized by:

- Project management guidelines (Section 1)
- Technical guidelines (Section 2)
- Procurement guidelines (Section 3)
- Annexes

The annexed information included with this document contains information about SSL systems already up and running in Nepal, as well as samples of required forms, contracts, and plans. These best-practice examples and samples are included to help you produce a quality SSL program.

Acknowledgments
This document has been prepared by the following team:

- Mr. Khemraj Bhandari, CIG
- Mr. Bishal Parajuli, AEPC
- Mr. Laxman Khatiwada, AEPC
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In addition, overall guidance was provided by Mr. Ram Prasad Dhital, Executive Director of AEPC, Mr. Samir Thapa, Assistant Director of AEPC, Mr. Jeffrey C. Fine, Director of CIG (a project funded by DFID Nepal, and managed by Adam Smith International) and Mr. Harry Jones from the Overseas Development Institute London (ODI).

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<th>Description</th>
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<tr>
<td>AC</td>
<td>Alternating current</td>
</tr>
<tr>
<td>AEPC</td>
<td>Alternative Energy Promotion Centre</td>
</tr>
<tr>
<td>CIG</td>
<td>Centre for Inclusive Growth (Nepal)</td>
</tr>
<tr>
<td>CRI</td>
<td>Colour Rendering Index (as in light source rating)</td>
</tr>
<tr>
<td>EOI</td>
<td>Expression of Interest (application)</td>
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<tr>
<td>DC</td>
<td>Direct current</td>
</tr>
<tr>
<td>DDC</td>
<td>District Development Committee (the term municipality is used in this document)</td>
</tr>
<tr>
<td>GoN</td>
<td>Government of Nepal</td>
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<tr>
<td>HPS</td>
<td>High Power Sodium (as in light fixture)</td>
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<tr>
<td>LED</td>
<td>Light-emitting diode (technology)</td>
</tr>
<tr>
<td>lux</td>
<td>Unit of luminosity</td>
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<tr>
<td>MoSTE</td>
<td>GoN’s Ministry of Science, Technology and Environment</td>
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<tr>
<td>MPTT</td>
<td>Maximum Power Point Tracking (as in solar charge controller)</td>
</tr>
<tr>
<td>NEA</td>
<td>Nepal Electricity Authority</td>
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<tr>
<td>NPR</td>
<td>Nepali Rupee (ISO 4217 code)</td>
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<tr>
<td>ODI</td>
<td>Overseas Development Institute (London)</td>
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<tr>
<td>PPA</td>
<td>Public Procurement Act</td>
</tr>
<tr>
<td>PPMO</td>
<td>GoN’s Public Procurement Monitoring Office</td>
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<tr>
<td>PPP</td>
<td>Public-Private Partnership (as a mode of operation)</td>
</tr>
<tr>
<td>PWM</td>
<td>Pulse Width Modulation (as in solar charge controller)</td>
</tr>
<tr>
<td>RFP</td>
<td>Request for Proposal</td>
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<tr>
<td>SSL</td>
<td>Solar Street Lights</td>
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<tr>
<td>ToR</td>
<td>Terms of Reference</td>
</tr>
<tr>
<td>VDC</td>
<td>Village Development Committee (the term municipality is used in this document)</td>
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Section 1. Project Management Guidelines for SSL

Managing & Funding SSL Projects
Installing and managing Solar Street Lighting (SSL) requires a considerable amount of resources, both financial and in human resources. This section provides guidance on how to manage the installation and maintenance of SSL from start to finish, drawing on past experiences of installing SSL in Nepal.

Funding Requirements
A SSL system is a costly bit of infrastructure, and requires considerable funding. These systems require high-tech components, to include deep cycle batteries, electronic controllers and Photovoltaic (PV) panels for example. In addition to the initial costs of parts, there is a need for skilled engineers to design and assemble the systems and ensure that they are properly installed onsite. In addition, repair and maintenance is needed, as well as replacement parts when component lifespans expire. Salaries for the people who will operate and look after the maintenance of the SSL system is also a consideration.

Choosing different options for various components will result in different cost profiles. However, it would be a mistake to think that a system that has cheaper components is likely to be the least expensive overall: cheaper components will often have shorter lifespans or shorter warranties, or may require more time and money spent on their maintenance and upkeep. You may pay less money up front for installation, but you may end up paying considerably more in total over the life of the system. In addition, cheaper components will result in more frequent interruptions to the lighting service.

In this light, it is recommended that you ask firms bidding during the procurement process to provide a breakdown of the total costs, estimated over a 10-year timeframe (minimum). Also make sure that costs are inclusive, especially for replacement parts (according to their expected lifespan), as well as the cost of routine maintenance and the appreciation of component costs & operation. In addition, look for long warranties on parts and services.

Table 1 shows cost estimates for installing and maintaining SSL. It should be noted that different types of systems will have different levels of cost, but as solar technology progresses and solar companies advance, SSL may become less expensive over time. At the time of writing, here are the typical costs for SSL:

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost Type</th>
<th>Cost in NPR</th>
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<tbody>
<tr>
<td>SSL, standalone type, having a single light arm design</td>
<td>Unit</td>
<td>120,000 per unit</td>
</tr>
<tr>
<td>Maintenance and replacement parts</td>
<td>Annual</td>
<td>5,000 per unit</td>
</tr>
</tbody>
</table>

Table 1. Typical costs for SSL

In some cases, rights to advertise on the SSL poles have been sold in order to defray the installation and/or maintenance costs. For example, in Butwal, this strategy raised NPR 9,600 per-pole, per-year; in Pokhara, NPR 20,400 per-pole, per-year was raised. These cases show that as long as the lights are in good working order, SSL systems can be a regular and ongoing revenue stream.
Human Resource Requirements
Case studies show that there are considerable human resource requirements for installing SSL. There are three main requirements for municipalities or others to staff the program:

1. Technical expertise
2. Procurement & process knowledge
3. Coordination

Technical Expertise
You will need to draw on technical expertise in the field of renewable energy and solar technology. If your engineers don’t have this capacity in-house, the AEPC may be able to provide help in this regard. But in absence of having sufficient access to these resources, you will need to bring in external help in order to ensure the quality and value for money of your SSL system.

Anywhere from 10 to 40 days of time may be required from a solar expert. Some suggestions for a solar expert ToR is provided in Figure 1 below:

Content suggestions for a solar expert ToR

Tasks might include:

- Drafting technical specifications or providing feedback on draft specifications
- Assistance with assessing tenders, for example, drafting a mark scheme, evaluating proposals, etc.
- Input to the SSL installation contract agreement document
- Technical oversight, equipment inspection and quality check, component testing and sign-off of the installed SSL

Required competences might include:

- Bachelor’s degree in Electrical or Electronics Engineering, followed by a Post-graduate degree in engineering or other related field
- At least 5-years work experience in the design, installation and maintenance of solar PV lighting

Note: The solar expert selected should have no formal or current association with the companies responding to the procurement EOI.

Figure 1. Content suggestions for a solar expert ToR

Procurement and Process Knowledge
Ensuring that procurement processes, financial flows, etc. are compliant with relevant Government laws, procedures and rules is not easy, but getting this right is a necessary component for a successful SSL initiative. Some projects may have relatively straightforward requirements, for example, where only government money is involved. However, when other sources of funding are involved, or the SSL is overseen by others (user groups, PPP modality, etc.) then procurement and process matters become complex.
In this case, AECP advice is to have access to an expert in procurement law involved with the project, for example, a resource from the public procurement monitoring office, or your district administration office can help you through each step of the program delivery process.

Coordination
Crucial inputs will be required from a number of different stakeholders throughout the program. Some will need to be kept informed, and there are some issues that will arise where collaborative and negotiated decisions will be need to be made. Without someone who is actively facilitating and coordinating the process, this may not happen, so it is strongly recommended that a SSL project coordinator be involved, one who can help liaise between groups and ensure the smooth management of the program. Some suggestions for a project coordinator TOR is provided in Figure 2 below:

Content suggestions for a project coordinator ToR

Tasks might include:

- Liaise with local stakeholders, including community groups, business associations, etc.
- Convene meetings for SSL partnerships, working groups, etc.
- Manage tasks and activities on a day-to-day basis, to include follow-up on issues
- Facilitate the planning and management of SSL
- Perform administration and financial reporting

Required competencies might include:

- At least 10 years of experience working in, or directly with, local government
- Strong stakeholder engagement or mobilization skills

Figure 2. Content suggestions for a project coordinator ToR

Allowing Enough Time
Completing a SSL project takes time. While the actual installation process can take as little as 3 months, the process of completing the full project will take at least 9 months after all the steps are completed. For a summary checklist of project steps, see Table 2. SSL project planning checklist on page 11, and for a full description of the steps needed to complete the program, see The Staging of SSL Projects that follows.
The Staging of SSL Projects

Supporting the installation of SSL requires the completion of certain tasks during different project stages. This section describes what is needed at each stage, highlights some potential challenges, and suggests ways to overcome these challenges.

Stage 1. Social Feasibility and Demand

You will need to submit a letter to the AEPC indicating your interest in installing SSL, and highlight the commitment of local stakeholders. Your responsibilities at this stage are to:

- Complete the AEPC Pre-feasibility form (see Annex 1.1: The AEPC Pre-feasibility Form on page 32)
- Conduct a social feasibility assessment with local consultation with private sector and community groups
- Provide initial information on likely budget commitments
- Write to the AEPC about your interest in building SSL systems

Assessing social feasibility is carried out first. You should consult with local stakeholders to find the answers to the following questions:

- Who would like to have SSL?
- Where would SSL make the biggest impact?
- Who would be likely to benefit from SSL?
- Who is willing to give time and/or money to help ensure that SSL is installed?
- Does the land or building owner permit the erection of a SSL unit on their property?

You should have a wide consultation. Discuss the project with many local stakeholders. In particular, find areas of the municipality that has the biggest need for lighting. Then, drawing on the interested stakeholders identified in the social feasibility assessment, establish a working group or coordinating committee to oversee the SSL project.

The first task for this group is to assess where to install lights, what types of system might be required, and what the available budget and capacities might be. In addition to management and financial arrangements, stakeholder expectations should be identified regarding lighting requirements (for example, how bright, what times, warm or cool light output, etc.).

Based on the results of this consultation, the SSL committee should fill out a Pre-Feasibility form (see Annex 1.1: The AEPC Pre-feasibility Form on page 32, or the AEPC website). This form helps you provide details and estimates about your municipality needs and interests in SSL. In particular, you will include the amount of your own budget that you can commit to the project, and information about other funding commitments from local stakeholders. Attach this form to a demand letter, and then send to the AEPC.

The AEPC will select a number of SSL projects and provide them with financial and technical support, as well as help with the facilitation of the program. AEPC prefers to provide assistance to projects where:

- The proposed project is of a larger scale (more than 20 lights)
- There is a high level of funds committed by the municipality and other stakeholders
Stage 2. Assessing Feasibility

At this stage, you assess the technical feasibility of the SSL project, set broad parameters for your SSL program, and make arrangements that ensure a smooth project roll-out. The key responsibilities for your municipality at this stage are to:

- Oversee the technical feasibility assessment
- Finalise resource commitments from involved stakeholders
- Draft a detailed plan for funding, management, technical and procurement

The SSL committee or working group should now work to fix key parameters for the technical feasibility study. This involves assessing the proposed area for the SSL, identifying project requirements and needs, as well as identifying potential obstacles and challenges for the installation and operation of SSL in the target area. The output of the feasibility study often contains fixed specifications for the SSL system, but alternatively, you can opt for an output-oriented procurement process as explained in Figure 3 below:

**What is an output-oriented procurement process?**

Output-oriented procurement means that instead of requiring SSL companies to provide proposals that involve particular inputs or technical specifications, you require that a certain output is produced (e.g. 40W light for 6hrs per night), giving companies flexibility on how the system is designed to specifically deliver these outputs.

The advantage of output-oriented procurement is that it gives space for innovation, enabling potential cost savings and improving overall effectiveness. It also means that you can draw on the technical capacities of the private sector when designing your SSL.

There have been some cases where sub-standard SSL systems have been installed due to poorly chosen technical specifications being fixed (as part of the feasibility study). The bidding companies had reported to the municipality reasons why the SSL specifications would not produce enough light, but were unable to propose a different design due to the fixed specifications.

**Figure 3. What is an output-oriented procurement process?**

Certain challenges may arise during your stakeholder consultation and decision-making processes, and the following are worthy of note:

**Challenges during this Stage**

In some cases, stakeholders may demand that lights are placed as to provide them with maximum benefits. For example, a stakeholder may ask for poles to be put in front of their shop or house, while others may ask to put poles on the borderline of main roads and sidewalks. Here is an appropriate response:

- Lights should be installed where there might be the highest potential to attract funding (from communities, businesses or advertisers), and where they might have the biggest impact on people’s personal security and/or on the local economy.
Often it is difficult to judge genuine ownership; people may express interest at meetings but may not have the sufficient commitment required to actually assist with the process. Here is an appropriate response:

- Stakeholders who wish to be involved in decision making and management of lights, and those who wish to most directly benefit from them, should be required to make contributions towards the installation and management process (whether in-kind, or in funds). You should also move quickly from project concept towards real actions as soon as possible.

In some cases there may be an interest to pursue SSL projects in different locations within the same municipality. Here is an appropriate response:

- Where possible, SSL projects in multiple sites should be grouped under one umbrella project, at least for the duration of the procurement and installation phases. You should group more than one project together at the earlier stages in order to allow for efficient use of human resources, as well as to gain economies-of-scale from SSL suppliers. After installation of different SSL systems across multiple sites, the management and maintenance of these sites can be unbundled, where the ongoing management and maintenance is handled by those directly benefiting from the lights.

In some cases, the proposed sites may have existing poles owned by the Nepal Electricity Authority (NEA). Here is an appropriate response:

- Consult with the NEA to see if existing light poles can be used to mount the new lighting system, thus saving on the cost of poles.

Finally, based on SSL committee decisions, and on the technical feasibility assessment, a detailed plan for the installation and management of the SSL should be submitted to the AEPC that includes the finalised resource commitments. The AEPC can provide different types of support during this stage, to include:

- Technical assistance with the feasibility study
- Assistance with mobilization of local stakeholders and the private sector
- Municipal funding contributions (based on full proposals received by the AEPC and approved by MoSTE)

**Stage 3. Procurement Process**

At this stage, a formal procurement process should be constructed that chooses a preferred company to install the SSL. The recommended procurement process is described in full here: Section 3. Procurement Guidelines for SSL on page 25, but in short, your responsibilities are to:

- Publish a call for EOIs
- Shortlist companies
- Publish a request for full proposals
- Evaluate the proposals
- Identify the winning bidder
The following provides suggestions for the management of a process acceptable to key stakeholders, and contains suggestions on how to get high quality, good value products and services. Basically, you need to:

1. Set SSL parameters
2. Inform key groups
3. Conduct stakeholder evaluations
4. Begin to mobilize funding

**Setting SSL parameters**
In order to set the key details in the call for EOIs, technical staff, non-technical staff, and the intended beneficiaries of the lights should all be brought together to make these key decisions. While technical capacity is required in order to write these documents, decisions about technical parameters do have implications for funding and the output of the SSL, and hence the preferences of other stakeholders must be taken into account. During this stage, make sure that intended beneficiaries and all funders of the SSL are able to discuss the options for SSL design with the technical staff.

**Inform Key Groups**
It is recommended that key stakeholder groups - in particular those who will be relied upon for funding, or for the future management, operation or maintenance of the SSL - should be kept regularly informed of the process as it progresses. Without transparency and an openly managed process, even a fairly run procurement processes can come up against perceptions of corruption or favouritism.

To avoid this situation, request that bidding companies make public presentations of their proposal and are available to answer questions from local residents, the AEPC and the target municipality at large.

**Conduct Stakeholder Evaluations**
In some cases, it may be appropriate to give role-evaluating proposals to representatives of key stakeholder groups and funders. This helps build trust between implementing partners, and also helps ensure that the bids chosen meet the needs and preferences of the key groups.

Look for opportunities to give elements of the proposal evaluation to representatives of SSL funders and other key stakeholders. These representatives can help evaluate the non-technical dimensions of the project, such as the organisational capacity of SSL companies (functioning of the SSL Company branch office, reputation for good after-sales and service, past performance of the company, etc.).

**Begin to Mobilize Funding**
Although the exact cost of the SSL will not be known until a preferred bidder is selected, it will be useful to begin to mobilise funding in advance of the selection. Especially where community groups are contributing funds, or the intended users or beneficiaries of the SSL will be making a contribution, collecting these funds may take some time. Plans and activities relating to funding mobilisation should start as early as possible.
Main activities during this state include:

- The municipality is leading the procurement process
- The AEPC is kept informed, and is involved overseeing or providing the technical assistance required for the procurement process
- Local groups are kept up-to-date and consulted, and in the case that they are contributing funding (Public Private Partnership mode) local groups are made part of the working group overseeing the procurement process
- In cases where it has been decided that partial funding for the installation can be raised through selling advertising on light poles, potential advertisers are contacted for interest in the program

Stage 4. Contracting and Installation

After a winning bidder is selected from the procurement process, a number of tasks must be completed before you have a functioning SSL up and running. Your responsibilities are to:

- Finalize the contract with the winning bidder
- Optionally, find an advertiser
- Mobilise funding
- Oversee the installation

For legal requirements laid out in the Public Procurement Act (PPA), see Section 3. Procurement Guidelines for SSL on page 25.

Finalising the SSL Contract

A contract must be negotiated with the winning bidder (or, if no contract can be agreed with the winner, a move to the second-placed company is made). A sample contract is provided on page 65 to help in this regard. Some of the main management tasks for contract negotiation and signing include:

- **Making adjustments to the plan**: many of the key parameters for lights will have been set as part of the tender submitted during the procurement process, but it may be that some details will need to be adjusted to take into account new information or preferences realized along the way.

- **Making adjustments to costs**: costs may be slightly different depending on several factors, for example, exchange rate differences between when the proposal was submitted and when the procurement process concluded. Deals and discounts may be negotiated at this stage as well.

- **Establishing the payment schedule**: possibly the most important issue in the contract will be the payment schedule, and how it is linked to equipment delivery and installation milestones. For example, the company will need sufficient money to purchase materials, while the municipality and SSL committee will want to ensure the company has sufficient incentive to perform. So it is crucial to design payment milestones, and the percentage of payment for each milestone, in a way that spreads the risk between the company and the municipality. Note that performance guarantee deposits can be used here.
Finding an Advertiser
If it has been decided to sell advertising on the SSL poles, now is the time to make that happen. A call for proposals should be published and advertised widely, and the winning advertiser should be selected. The competition can be based solely on which company bids the highest amount per pole, or they could be sold off in blocks, if one single advertiser cannot be found. A sample Call for EOI can be found on page 98, as well as a sample Advertising Contract on page 102; these documents will help you set up advertising on SSL poles.

Planners should be sensitive regarding local businesses who may be concerned about out-of-town advertising being placed right outside their own business establishments. Concessions can be made; for example, the plan could specify keeping a certain number of poles for local advertisements.

Managing and Mobilising Funds
It will be important at this stage to ensure that funds are transferred from the various groups in a PPP mode of implementation, and here are a few recommendations in this regard:

- In the case where the installation is being handled by a body outside the municipality, it is wise to agree on basic financial procedures and reporting systems, with oversight coming from all stakeholders who are providing the funding
- Establish a bank account to manage the shared funds, where signatures are required from representatives of each stakeholder group
- Where other stakeholders are transferring money that will be managed by the municipality, it is recommended that heightened transparency measures are put in place

Overseeing the installation
Many of the installation tasks may require assistance or compliance from local stakeholders, for example, to ensure that the foundations and poles are installed properly and that the road is kept clear as the concrete sets, or when panels must be installed on buildings where owner cooperation is needed. It is suggested that this cooperation is achieved by working with, or through, local groups and representatives, as well as with the SSL coordinator, who should be on hand to help facilitate a smooth installation.

Some of the main management tasks for overseeing the installation are to:

- Establishing the permissions for advertising, and the use of local infrastructure and roads
- Monitoring the release of AEPC funding according to tranches, as agreed upon during the finalizing the SSL contract. AEPC may also provide technical assistance with carrying out component testing and technical checks, and this needs to be managed as well
- Managing the assistance given by local stakeholders to the installing company, and making sure the company has access to installation sites

Stage 5. Operation & Maintenance
Once the SSL system is installed, various ongoing tasks are needed to ensure the system continues to function, so it is recommended that a user committee be established. Members of the user committee should come from groups who have funded the lights - but more important - there should be community
and business representatives on the committee who live on the roads where the lights have been installed. These members will be responsible for the ongoing functioning of the system (including ongoing operation and maintenance).

**Managing Maintenance Tasks**
A discussion of SSL maintenance tasks can be found on page 22, but here are a few guidelines on how to manage maintenance tasks:

- Preventative maintenance can be carried out by training local individuals who are part of, or managed by, the user committee - with spare parts provided by the SSL Company. But major maintenance should be carried out by the company that initially installed the SSL system.

- Stocking of key spare parts is managed, with the commitment to stock made during the procurement process. This commitment should include a provision for purchasing spare parts at a reasonable price.

- Alternatively, the maintenance of SSL systems can be put out to bid as part of an annual service contract; as this approach has proved successful in past SSL projects completed in Nepal.

**Funding SSL Maintenance**
The funding for maintenance should be budgeted before the SSL system is installed. If advertising has been sold on the poles, then these revenues may be the primary source for funds, or otherwise, the funds should be mobilised from the municipality budget and local stakeholders. In some instances, there may be excess funding remaining (where advertising revenues are more than maintenance costs). In this case, the savings can be assigned to future maintenance costs, or the saving could be used to fund the installation of more lights, so the SSL system grows as the years go by.
### Project Planning Checklist

Table 2 summarises the key stages of the process for applying for, installing, and managing a SSL system, to include a checklist of your responsibilities and the assistance you can expect from the AEPC:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Municipality Responsibilities</th>
<th>AEPC Assistance</th>
</tr>
</thead>
</table>
| **Stage 1. Demand**    | □ Complete pre-feasibility form  
□ Provide information on likely budget commitments  
□ Conduct a social feasibility assessment  
□ Write to the AECP expressing interest in building a system | • Select municipalities to be given support for feasibility and procurement stages, based on the level of the local budget commitment and scale of the projects |
| **Stage 2. Feasibility** | □ Form a SSL committee with assigned SSL coordinator  
□ Oversee a technical feasibility assessment  
□ Finalise resource commitments from involved stakeholders  
□ Send AECP a detailed project plan (funding, management, procurement, etc.) | • Provide technical assistance to chosen municipalities  
• Send Mobilisers where a partnership approach is to be used, and mobilizers provide support  
• Based on final plans received, recommend to MoSTE the projects selected to receive AEPC funding |
| **Stage 2. Procurement** | □ Oversee the procurement process:  
□ Publish a call for EOIs  
□ Shortlist companies  
□ Publish RFP  
□ Evaluate proposals  
□ Identify the winning bidder | • Support provided on technical and procurement details  
• Ongoing mobilisation and coordination support |
| **Stage 4. Contracting & Installation** | □ Finalize contract with winning bidder  
□ Mobilise funding  
□ Oversee installation | • Inputs to the development contract milestones and funding tranches in the SSL contract  
• Technical experts provided to monitor and oversee contractor delivery  
• Tranches of funding released to the municipality based on monitoring assessments |
| **Stage 5. Ops & Maintenance** | □ Establish committee to oversee operation & maintenance | • Technical assistance provided to the committee on demand |

*Table 2. SSL project planning checklist*
Section 2. Technical Guidelines for SSL

Introducing SSL Technology
Solar Street Lighting Technology is a renewable energy solution used for illuminating road, pathway, parking place or other similar outdoor areas. A standalone SSL system is an outdoor lighting unit used for illuminating a street or an open area, and having no connection to the local electricity grid.

Solar Panel or Solar Photovoltaic (PV) Modules convert solar energy into electricity, which is stored in the battery via a solar charge controller. The Solar Light (preferably an energy efficient LED) will work during night times automatically by incorporating a light-sensor control, and provide light during evening and night hours only. In a stand-alone SSL system, direct current (DC) power is used to operate the connected Light Fixture, unlike the use of alternating current (AC) that is supplied through the local electricity grid. Electricity generated by the solar panel charges the battery during the day, which is then discharged and powers the Solar Light from dusk to dawn. All switching of lights from on to off is done automatically, with no direct intervention required.

Components Used in a SSL System
The SSL system consists of a solar PV module, a deep-cycle storage battery, a solar charge controller, a Solar Lamp or Luminaire, interconnecting wires and cables, and a module mounting metal pole to include hardware and a battery box. See Figure 4 for an illustration of a single SSL system on a pole.

Solar PV Module or Panel
Solar panel electricity systems, also known as solar photovoltaic (PV), capture the sun’s energy using photovoltaic cells. These cells produce electricity when direct solar radiation falls into them, but they can also generate some electricity on a cloudy day, even when there is no direct sunlight. The cells convert the sunlight into electricity, which can be used to run the lighting units. The solar PV module capacity is measured in Watt-peak (Wp). In solar street lights, PV panels are generally mounted on top of the metal pole as shown in Figure 4.

Note: in Nepal, solar panels should be mounted at an angle of 30-45° facing south, so that it receives solar radiation throughout the day.

Solar Charge Controller
The solar charge controller is generally placed with the street lamp set, or in the battery or control box, provides light control, time control, battery overcharge and over discharge protection, as well as reverse polarity protection for the system. Intelligent (advanced) charge controllers have additional functions for light control, power control, time control and intelligent charging and discharging. Use of an intelligent charge controller extends the life of the battery and reduces maintenance and operation costs, providing
better value for the money. Solar charge controllers are rated in Amperes (Amps). The commonly available technologies are Pulse Width Modulation (PWM) and Maximum Power Point Tracking (MPPT) controllers.

**Solar Battery**

Batteries are used to store electricity generated by the solar panels during the day, so that generated electricity can be used during the night, or as needed. Batteries allow for lighting even when the system is not charging. Solar applications typically use deep-cycle batteries since they can endure repeated and deep discharges, which are typical in off-grid renewable energy systems like SSls. There are various types of batteries currently used in SSL systems; but maintenance free GEL batteries are preferred over traditional lead acid batteries that require more maintenance (see Figure 6 for photo of a solar GEL battery). In a standalone SSL system, the battery is placed in a water proof box attached to the pole. The form of electricity stored and supplied from the battery is DC. The battery capacity is measured in Ampere-hour (AH) and the most commonly available battery voltage systems are 12 Volt, 6 Volt and 2 Volt.

**LED Light or Lamp**

The most important element of a SSL system is the light source, which is mounted on an arm attached to the main pole. An electric light source is a device, which transforms electrical energy into visible electromagnetic radiation, or in simple terms: light. This light source is the principal determinant of the visual quality, as well as the cost & energy efficiency of the illumination system. The preferred type of light source is LED (Light Emitting Diode), and LEDs are rated in watts at the required voltage level. LEDs combine perfectly with solar energy, as LEDs operate under low voltage, low heat and low power requirements. LEDs are also preferred the light source for SSL, as LEDs provide much higher lumens.
with lower energy consumption. The energy consumption of a LED fixture is at least 50% lower than High Power Sodium (HPS) fixtures, which are widely used as a lighting source in traditional (non-solar) street lighting systems. See Figure 7 for a photo of a Solar LED fixture.

**Light Pole & Metal Support Structure**

The support structures are the metal framed light poles or roof-mounting solar panel structure that will hold the solar panel and other parts of the system. These light poles are designed to hold all the solar electric items (PV module, lamp, battery and controller) and should withstand bad environmental conditions, such as high winds. For an outdoor application, the metal pole is required to be galvanized to avoid corrosion and rust. See Figure 8 for diagram of SSL on pole.

**Note:** a certain distance must be maintained between the existing municipality electricity supply line and the newly constructed metal pole. Per NEA rule, the metal pole shall be mounted at least 1.25 meters away from the existing 415 Volt and 11kV power distribution lines.

**Sample Specifications for a Pokhara SSL System**

The following table illustrates specifications for a case-study example of a SSL system already in operation (in Pokhara, Nepal). For more information on this project, see page 40.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar Panel</td>
<td>150 Wp under STC (Cell Efficiency ≥17%)</td>
</tr>
<tr>
<td>Battery</td>
<td>Deep Cycle Tubular GEL 12 Volt, 100AH@C10</td>
</tr>
<tr>
<td>Light Source</td>
<td>40Watt LED (Minimum 100 lumen/watt light output, minimum value of CRI 70, LED view angle above 120°, and minimum 50,000 hours LED life)</td>
</tr>
<tr>
<td>Charge Controller</td>
<td>20 Ampere, PWM controller</td>
</tr>
<tr>
<td>Light Output</td>
<td>Minimum 15 LUX when measured at the periphery of 5 meter diameter from the height of 7.5 meters.</td>
</tr>
<tr>
<td>Mounting Height</td>
<td>7.5 meter pole (out of 9 meter total pole length)</td>
</tr>
<tr>
<td>Duty Cycle</td>
<td>Dusk to Dawn (6 hours full power + 6 hours half power)</td>
</tr>
<tr>
<td>Battery Autonomy</td>
<td>Above 2 days</td>
</tr>
<tr>
<td>Light Pole</td>
<td>Hot Deep Galvanized with 100mm diameter and 4mm thickness at bottom</td>
</tr>
<tr>
<td>Warranty</td>
<td>Overall system component warranty: 5 years</td>
</tr>
</tbody>
</table>

*Table 3. Sample specifications for the Pokhara SSL System*

**Assessing the Technical Feasibility of a SSL Project**

When assessing the technical feasibility of SSL, there are several factors to be considered:

- Street lighting requirements
- Whether to retrofit or install new poles
- Whether to design a central system or use standalone systems
- Placement of poles considering sunlight and shade
Street Lighting Requirements
When designing or making changes in street lighting, it is important to first understand the light requirements of the road being lit. Best practice case studies show that better-designed street lighting is based on the traffic density of the road being lit. Using Table 4, the engineer can match the type of road with specifications discussed further in this section:

<table>
<thead>
<tr>
<th>Type of Road</th>
<th>Road Characteristics</th>
<th>Typical Vehicle Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Important traffic routes carrying fast track</td>
<td>&gt;60km/h</td>
</tr>
<tr>
<td>B</td>
<td>Main roads carrying mixed traffic including cycles</td>
<td>&gt;30 km/h and &lt;60 km/h</td>
</tr>
<tr>
<td>C</td>
<td>Secondary roads with considerable slow moving vehicles, such as shopping streets</td>
<td>&gt;5km/h and &lt;30km/h</td>
</tr>
<tr>
<td>D</td>
<td>Residential and unclassified roads</td>
<td>Walking speed</td>
</tr>
</tbody>
</table>

Table 4. Road types and characteristics

Retrofit or New Installation?
Based on the purpose and lighting requirements of the roadway, as well as the age of the existing lighting infrastructure, a decision is made on whether a new design and installation of street lighting is required, or whether the project goals can be best accomplished by retrofitting the existing lighting infrastructure. To retrofit existing street lighting, it must be determined whether the existing poles can be used (replacing only the lighting system itself), or if the ground needs to be dug up to construct new bases for poles.

Central System or Standalone SSL?
Standalone solar street lights have photovoltaic panels mounted on the light pole or structure. Each street light has its own PV Module or panel, battery storage and charge controller, and is independent of the other lamps. The SSL system in Pokhara is an example of a standalone system. In a central system, arrays of PV panels are fixed at a convenient location and the power output from the source is distributed to lights in a particular group via distribution cables. Preference of one system over the other will depend on the location, and on the technical losses that can occur during power distribution.

Sunlight & Shade
Just a little shade can affect solar panel power-output dramatically. Diffuse shade from a soft source, like a distant tree branch or cloud, can significantly reduce the amount of light radiation reaching solar panel cells. Hard sources stop significant light from reaching solar cells, such as debris or bird droppings

Note: even if one full cell is hard-shaded, the voltage of the solar panel drops to half, in order to protect itself. If enough cells are hard-shaded, the PV module will not convert any energy, and will become a significant drain on the entire system. So it is important to consider PV panel placement in relation to these regions of soft and hard shading.
SSL Technical Design & Installation

When designing SSL systems, there are many technical factors to be considered:

- Solar power system design (to include PV panel size, battery size, charge control capacity, etc.)
- Lamp selection
- Mounting height for lamps
- Spacing and placement of poles

In addition, there are documented best practices to follow, as well as recommendations and mandatory requirements as laid out by the AEPC.

Solar Power System Design

Several basic factors need to be considered when designing solar power systems, and they include:

- The average sunshine hours available per day onsite
- System voltage design
- The number of battery-autonomy\(^1\) days
- The allowable battery depth of discharge
- Any system losses, etc.

When selecting SSL equipment, the system designer specifies the size and quality of components, such as Thin-film, Mono or Poly crystalline solar cell, MPPT or PWM controller, VRLA GEL or AGM Battery, Warm or Cool type light, etc. The following formulas will help you when making these decisions:

**PV Panel Sizing**

\[
PV\ array = \frac{Power\ of\ the\ Lamp \times Operating\ Hours \times No.\ of\ Lamps^2}{peak\ sun \times loss\ factor^3}
\]

Where, peak sun should be either 4.5 or site specific (derived from geographic coordinates) under no-shade condition. Depending on the hours of shading, peak sun will decrease (for example, a shading time period of 1.5 hours will reduce the peak sun value from 4.5 to 3).

**Charge Controller Sizing**

\[
CC = Total\ Short\ Circuit\ Current (Isc)\ of\ PV\ Panel \times 1.3\ (Safety\ Factor)
\]

**Battery Sizing**

\[
Battery\ Size\ (Ah) = \frac{Power\ of\ the\ Lamp \times Operating\ Hours \times Autonomy\ Days}{DoD \times System\ Battery\ Voltage}
\]

Where autonomy days = 3; System Battery Voltage\(^4\) = 12V, 24V or 48V; Depth of Discharge (DoD) = 0.8

---

\(^1\) Battery autonomy refers to how long a period of time a battery can supply power to system loads without needing further charging

\(^2\) No of lamps=1 for stand-alone system

\(^3\) Loss factor = 0.7 (which indicates total system loss = 30 %)

\(^4\) 12V used for standalone system, and 24V or 48V used for central system
**System Example**

For a solar power system with a 40W LED light that runs from 6pm to 12am on full power, and from 12am to 6am on half of its power, the calculations are as follows:

\[
PV\ array = \frac{(40W \times 6\ hours) + (20W \times 6\ hours)}{4.5\ hours \times 0.7} = 114.28\ Watt
\]

So, the size of PV panel should be the next greater size available in the market.

\[
CC = 6.5 \times 1.3 = 8.45\ A
\]

CC size should be no less than 8.45A. 10A is the usual size available in the market.

\[
Battery\ Size\ (Ah) = \frac{[(40W \times 6\ hours) + (20W \times 6\ hours)] \times 3}{0.8 \times 12} = 112.5\ Ah
\]

The size of the battery, for autonomy day=3, should be the next greater size available in the market.
Section 2. Technical Guidelines

Selection of Lamp & Recommended Levels of Illumination

The rate of converting electrical energy into visible light is called luminous efficacy and is measured in lumens per watt. The types of lamps commonly used for street lighting are listed in Table 5, along with brief descriptions of each lamp's capacities:

<table>
<thead>
<tr>
<th>Type of Lamp</th>
<th>Luminous Efficacy</th>
<th>Colour Rendering Properties</th>
<th>Lamp life in hours</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Pressure Mercury Vapour (MV)</td>
<td>35-65 lm/W</td>
<td>Fair</td>
<td>10,000-15,000</td>
<td>High energy use, poor lamp life</td>
</tr>
<tr>
<td>Metal Halide (MH)</td>
<td>70-130 lm/W</td>
<td>Excellent</td>
<td>8,000-12,000</td>
<td>High luminous efficacy, poor lamp life</td>
</tr>
<tr>
<td>High Pressure Sodium Vapour</td>
<td>50-150 lm/W</td>
<td>Fair</td>
<td>15,000-24,000</td>
<td>Energy-efficient, poor colour rendering</td>
</tr>
<tr>
<td>Low Pressure Sodium Vapour</td>
<td>100-190 lm/W</td>
<td>Very Poor</td>
<td>18,000-24,000</td>
<td>Energy-efficient, very poor colour rendering</td>
</tr>
<tr>
<td>Low Pressure Mercury Fluorescent Tubular Lamp</td>
<td>30-90 lm/W</td>
<td>Good</td>
<td>5,000-10,000</td>
<td>Poor lamp life, medium energy use, only available in low wattages</td>
</tr>
<tr>
<td>Energy Efficient Fluorescent Tubular Lamp</td>
<td>100-120 lm/W</td>
<td>Very Good</td>
<td>15,000-20,000</td>
<td>Energy efficient, long lamp life, only available in low wattages</td>
</tr>
<tr>
<td>Compact Fluorescent Lamp</td>
<td>50-70 lm/W</td>
<td>Very Good</td>
<td>6,000-15,000</td>
<td>Poor lamp life, low energy use</td>
</tr>
<tr>
<td>Light Emitting Diode (LED)</td>
<td>70-160 lm/W</td>
<td>Good</td>
<td>30,000-90,000</td>
<td>High energy savings, low maintenance, long life, no mercury. High investment cost, nascent technology</td>
</tr>
</tbody>
</table>

Table 5. Types of street lighting lamps

Lamp Selection

The selection criteria for street lights are: light-colour temperature, colour-rendering index, lumen output, lamp efficacy, lamp-life in hours, etc. Although there are various technologies available for conventional street lighting, LED technology is preferred for a SSL system. LED technology is evolving quickly, with significantly less energy consumption when compared to other lighting technologies. For example, operating on an average of 10 hours per day, LEDs can have a life span of up to 13 years, and provide a pleasant light spectrum throughout. The lifetime and performance of a LED lamp depends on the quality of the LED, the system design, and the operating environment.

5Colour Rendering Index (CRI) is a rating index commonly used to represent how well a light source renders the colours of objects that it illuminates. For a CRI value of 100, the maximum value, the colours objects can be expected to be seen as they would appear under an incandescent or daylight spectrum of the same correlated colour temperature. The higher the CRI (based on scale of 0 -100), the more natural the colour will appear. Sources with CRI value less than 50 are generally regarded as rendering colours poorly, that is, colours may appear unnatural. A CRI index of 75 or greater is recommended for street lights.
**Recommended Levels of Illumination**

Table 6 below will help you determine the best level of illumination for the road type being lit:

<table>
<thead>
<tr>
<th>Type of Road</th>
<th>Road Characteristics</th>
<th>Recommended Level of Illumination</th>
<th>Ratio of Minimum/Average Illumination</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Important traffic routes carrying fast traffic</td>
<td>30 lux</td>
<td>0.4</td>
</tr>
<tr>
<td>B</td>
<td>Main roads carrying mixed traffic like city main roads including cycles</td>
<td>15 lux</td>
<td>0.4</td>
</tr>
<tr>
<td>C</td>
<td>Secondary Roads with considerable traffic like slow moving vehicles, shopping streets</td>
<td>8 lux</td>
<td>0.3</td>
</tr>
<tr>
<td>D</td>
<td>Residential and unclassified roads</td>
<td>4 lux</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Table 6. Recommended Illumination based on road type

**Mounting Height of Lights**

One of the important aspects of designing new solar street lighting system is to determine the optimum position of the luminaires and the capacity of the light sources. This can be done after comparing various options. The optimum mounting height should be chosen by taking into account the light output of the sources, the light distribution of the luminaires, and the geometry of installation. The mounting height should be greater for powerful lamps, to avoid excessive glare. *Table 7. Recommended mounting heights based on road type* shows the recommended mounting heights, while *Table 4. Road types and characteristics* on page 15 correlates road types common characteristics of each road type.

**Spacing & Space-Height Ratio**

Spacing is the distance, measured along the centre line of the road, between successive SSLs in an installation. To preserve longitudinal uniformity, the space-height ratio should generally be greater than 3. For example, distance between two poles of 9m height is recommended to be greater than 27m on a straight road; see Figure 9 for illustration.

**Placement of SSL Poles**

Depending on the installation site locations, the configuration of SSL Lamp Poles is determined by four fundamental types of light placements:

1. Single-sided placement
2. Opposite placement
3. Offset arrangement
4. Axial arrangement

*Figure 9. Spacing and space-height ratio*
**Single Sided Placement**
In a single-sided placement (Figure 10), the luminaires are on one side of the road. This is recommended only when the width of the road is equal to or less than the mounting height.

![Figure 10. Single-sided arrangement of poles](image)

**Opposite Placement**
In opposite placement (Figure 11), the luminaires are situated on either side of the road opposite to one another. This is advisable for road widths more than 1.5 times that of the mounting height.

![Figure 11. Opposite-side placement of poles](image)

**Offset Arrangement**
In an offset arrangement (Figure 12), the luminaires are placed on either side of the road in a zigzag formation. This is recommended when the road width is 1.5 to 2 times that of the mounting height.

![Figure 12. Offset arrangement of poles](image)

**Axial Placement**
With axial placement (Figure 13), the luminaires are placed along the axis of the road. This is recommended for narrow roads the width of which does not exceed the mounting height. In this case a single pole with two light arms is found to be more economical than mounting two light poles.

![Figure 13. Axial arrangement of poles](image)
Best Practices for LED Street Lighting

The following chart can be used to determine best practices when setting up a SSL system using LED lighting:

<table>
<thead>
<tr>
<th>Watt</th>
<th>Average Lamp Output</th>
<th>Lamp Arrangement</th>
<th>Desired Illumination</th>
<th>Mounting Height</th>
<th>Road Width</th>
<th>Pole Spacing</th>
<th>Uniformity</th>
<th>Tilt Angle (in degrees)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>2000 lumens</td>
<td>Single Sided</td>
<td>8Lux</td>
<td>6m</td>
<td>7m</td>
<td>15 m</td>
<td>0.5</td>
<td>0</td>
</tr>
<tr>
<td>30</td>
<td>3000 lumens</td>
<td>Offset</td>
<td>10Lux</td>
<td>7m</td>
<td>10m</td>
<td>15m</td>
<td>0.7</td>
<td>0</td>
</tr>
<tr>
<td>40</td>
<td>4000 lumens</td>
<td>Offset</td>
<td>15Lux</td>
<td>8m</td>
<td>15m</td>
<td>20m</td>
<td>0.38</td>
<td>0</td>
</tr>
<tr>
<td>50</td>
<td>5000 lumens</td>
<td>Offset</td>
<td>20Lux</td>
<td>9m</td>
<td>20m</td>
<td>20m</td>
<td>0.38</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 8. Best practice chart for LED street lighting

Recommended & Mandatory SSL Features for AECP Compliance

The following minimum technical features must be met for AEPC support:

1. The solar PV module sizing shall be done as per AEPC design guidelines (see Solar Power System Design on page 16), and the selected product must be RETS certified \(^6\).
2. The solar deep cycle battery sizing shall be done as per AEPC design guideline and the selected product must be RETS certified. The solar battery design for the stand-alone SSL systems must be maintenance free (GEL or AGM) type.
3. The Solar charge controller must be of either MPPT or PWM technology. The intelligent controller must have in-built circuit for night-light management.
4. The efficacy of the LED light must be minimum 100 Lumens per Watt.
5. The minimum value of Colour Rendering Index (CRI) of LED light must be 70.
6. The view angle of individual LEDs must be a minimum of 120 degrees.
7. The minimum lifespan of the selected LED must be 50,000 hours.
8. The light fixture shall meet minimum Ingress Protection (IP65) for outdoor use.
9. The LED light colour temperature shall be in the range of 3,000K to 5,000K.
10. The SSL metal pole and all metal hardware must be hot deep galvanized, having a galvanization thickness of a minimum 80 microns.
11. The selected light pole and structures must withstand wind speeds of above 170 km/hr.

SSL Operation & Maintenance

The most common reasons for inefficient street lighting systems in municipalities are:

- The selection of inefficient luminaires
- Poor technical design and installation
- The choosing of poor quality power
- Poor operation & maintenance practices

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\(^6\) Renewable Energy Test Station (RETS) is an autonomous body governed by “RENEWABLE ENERGY TEST STATION RULES 2063” framed under clause 31 of Nepal Academy of Science and Technology (NAST) Act 2048. See www.retsnepal.org.
Proper SSL maintenance can be classified as either **breakdown** maintenance or **preventive** maintenance.

As part of preventive maintenance, the operator should:

- Check and fix the cable connections of individual components of the system
- Look for early signs of cable faults, replace as needed
- Check the controller settings for proper operation
- Replace any defective LED with a new one,
- Check the battery voltage of solar panels, and clean frequently to remove dust and physical particles (hard shading).

The breakdown maintenance of any component shall be carried out immediately after a component fails, and by shutting down the entire unit before damage to the entire system occurs.

In addition to proper maintenance, it is important to have a good instruction manual for your SSL system, for example, an *Operations, Instruction & Maintenance* manual, written in both English and in the local language. This document should be provided by the Contractor, and contain the following minimum details:

- The basic principles of photovoltaic systems and operation
- A detailed block diagram / schematic of the SSL System - its components, PV module, battery, electronics and luminaire and expected performance
- Type, voltage and capacity of the system battery
- Light type, size and technical characteristics of the system LEDs
- Description of any system indicators, for example, lights on a charge controller.
- Clear instructions about the erection of poles and the mounting of PV modules, to include the lamp housing assembly
- Clear instructions for regular maintenance and trouble shooting
- DO’s and DONT’s
- Contact information on the person responsible for repair, especially in case of emergency and during after-hours

**Electrical Safety**

Just as with handling any other electrical system, safety should come first. The operator working with electricity should use hand gloves, helmet, and boots dependant on the type of work being performed (DC, single-phase or triple-phase electrical work).

**Note:** metal items such as watches, rings or necklaces should not be worn near electrical components. The operator should avoid contact with uninsulated power lines and buried electrical conductors. Operators will follow all component manufacturer instructions for safe operation of the SSL system.

**Electrical Protection**

In addition to general electrical safety, specific protections must be taken for SSL systems:

- Adequate no-load protection, for example, when the lamp is removed and the system is switched to ON
- Protection against battery overcharge and deep discharge conditions
- Protection against short circuit conditions (fuse)
Section 2. Technical Guidelines

- Protection for reverse flow of current through PV modules
- Proper temperature compensation when charging batteries throughout the year (electronics)
- Protection against reverse polarity conditions (battery)
- Load reconnect should be provided at 80% of the battery capacity status

Mechanical Components
- A corrosion resistant metallic frame structure should be fixed on the pole to hold the PV module
- The frame structure should be adjustable, for example to adjust the angle of inclination to the horizontal between 0 - 45 degrees, so that a module can be oriented at a specified tilt angle
- The pole should be made of Galvanised Iron (GI) pipe
- The pole should have a provision to hold the luminaire
- The lamp housing should be waterproof and painted with a corrosion-resistant paint
- A vented, acid proof and corrosion-resistant box (locking, for outdoor use) should be used to house the battery

General Diagnostics
Use Table 9 below to troubleshoot problems with any SSL system:

<table>
<thead>
<tr>
<th>Fault</th>
<th>Possible Reason</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light source not lit</td>
<td>The environmental light is brighter than system lighting</td>
<td>The light source will light-up when the brightness of the environmental light falls below a certain illumination</td>
</tr>
<tr>
<td></td>
<td>The light source is dead</td>
<td>Replace with same model light source</td>
</tr>
<tr>
<td></td>
<td>The output circuit is open, short circuited, or earth connected</td>
<td>Check that the output circuit connection is correct</td>
</tr>
<tr>
<td></td>
<td>The storage battery has an open circuit</td>
<td>Check for correct connection of the battery</td>
</tr>
<tr>
<td></td>
<td>The fuse has tripped</td>
<td>Replace with the same model fuse</td>
</tr>
<tr>
<td></td>
<td>The voltage of the storage battery is below 11V</td>
<td>1. The days of overcast and raining day is longer than the design time – will recover automatically in sunny day. 2. The battery is short of voltage caused by an open circuit or short circuit of the solar panel 3. Voltage shortage or damage caused by short circuit of the battery</td>
</tr>
<tr>
<td>Insufficient lighting</td>
<td>Something is wrong with the charge controller</td>
<td>Perform maintenance on the controller or replace with the same model controller</td>
</tr>
</tbody>
</table>

Table 9. Troubleshooting chart for SSL
Advantages of SSL & LED Technology

- Easy installation and very little maintenance required once installed
- No wiring from grid power and no high-voltage electric danger
- Better colour rendition and night-time visibility
- Environmentally friendly (pollution-free, self-contained, reliable, quiet, etc.)
- Low long-term costs (in maintenance, operations, etc.)
- Highly efficient lighting (with newer controllers)
- Uniform light distribution on the road (no hot spots or glare)
- Mercury-free LED construction (safe for landfills)
Section 3. Procurement Guidelines for SSL
The following section defines the process of public procurement per PPA 2063 and PPR 2064.

Preamble from PPA 2063
The PPA 2063 preamble states that the maximum returns of public expenditures should proceed in an economical and rational manner by promoting competition, fairness, honesty, accountability and reliability in the public procurement process.

In addition, the preamble states that we should ensure good governance by enhancing the managerial capacity of procurement of public entities in procuring, or causing to be procured, construction work and procuring goods, consultancy services and other services by such entities and ensure the equal opportunity for producers, sellers, suppliers, construction entrepreneurs or service providers to participate in the public procurement processes without any discrimination.

Public Entity, a Definition
Any entity which is operated by the Government of Nepal and receives loans and/or grants fully or in majority from the Government of Nepal (Constitutional organ or body, Court, Ministry, Secretariat, Commission, Department of the Government of Nepal or any other Governmental Entity or Office there under, Local Bodies, Corporation, Company, Bank, University, College, Development Board etc.)

Procurement Guidelines in Detail
The following types of procurement are described here, and guidelines for each type are made available to help you through the different processes:

- Procurement of Goods, Works, or Service
- Consultancy Service
- Other Service

Procurement Methods (from PPA 8)
For procurement of goods, construction works or other services, use the following guidelines:

<table>
<thead>
<tr>
<th>SN</th>
<th>Procurement Method</th>
<th>Amount of Procurement (Cost Estimate)</th>
<th>Notice Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>By inviting open bids at international level (ICB)</td>
<td>Local Suppliers not available, no bid was submitted in NCB, under an agreement entered into with a donor party, Goods or Construction works, being of complex and special nature, have to be procured through an ICB</td>
<td>45 Days</td>
</tr>
<tr>
<td>2</td>
<td>By inviting open bids at national level (NCB)</td>
<td>Above 1 Million for Goods, Above 2 Million for Works</td>
<td>30 Days</td>
</tr>
<tr>
<td>3</td>
<td>By inviting sealed quotations (SQ)</td>
<td>Below 1 Million for Goods, Below 2 Million for Works</td>
<td>15 Days</td>
</tr>
<tr>
<td>4</td>
<td>By procuring directly (DS)</td>
<td>Below 3 Lakhs (0.30M.) for Goods, Below 5 Lakhs (0.50M.) for Works</td>
<td>7 Days</td>
</tr>
<tr>
<td>5</td>
<td>Users committee or beneficiary group</td>
<td>Below 60 Lakhs (6 Millions)</td>
<td>As needed</td>
</tr>
<tr>
<td>6</td>
<td>Force account (Amanat)</td>
<td>Any construction works to be carried out directly by a public entity</td>
<td>As needed</td>
</tr>
</tbody>
</table>

Table 10. Procurement guidelines per PPA 8

---

The Procurement Process for Goods, Works & Services
The following outline describes the procurement process for goods, works and services and also gives you the order in which tasks are completed. Many of the documents and forms mentioned below can be found on the Public Procurement Monitoring Office (PPMO) website; see www.ppmo.gov.np for more information.

1. Preparation of Annual Procurement Plan (beginning of the Fiscal year, Accumulation of Procurement nature all goods and services from annual Program)
2. Preparation of Technical Specification
3. Preparation of the cost estimate for procurement
4. Preparation of Bidding Documents (Sealed quotation forms, Prequalification forms or Tenders or preparation of documents relating to consultancy service proposals. Sample for Solar (Goods)
5. Publication of notice inviting sealed quotations, prequalification proposals, tenders or consultancy service proposals
6. Notice is the one section of the Bidding Document
7. Opening of sealed quotations, prequalification proposals, tenders or consultancy service proposals.
8. Evaluation of sealed quotations, prequalification proposals, tenders or consultancy service proposals.
9. Opening and Evaluation of Financial Proposals of Consultancy services only
10. Acceptance of sealed quotations, prequalification proposals, tenders or consultancy service proposals-7 days’ notice to selected bidders and CC to non-selected bidders. (After 30 Days for up to 100 Million and 45 Days above 100 Million cost estimate)
11. Notice for Contract – 15 days’ notice to Selected Bidder
12. Entering into contract-Template of Contract is a part of Bidding Document which is also prescribed by PPMO. Contract form is the one section of Bidding Document.
13. Commencement of work- within time frame of Contract (time may be extend as per mentioned in the contract document)
14. Completion of Procurement-Goods Received or Work Completed-invoice received
15. Inspection and Acceptance of goods-Technical verification of Quality and quantity of the goods are received as per Specification or not
16. Store Entry-Confirmation of Goods received or installed
17. Final payment by the Finance Department (After Retention, Advance, TDS (Normally 1.5%) etc.
18. Request for Grants from AEPC/NRREP with Approved Work Completion Report
19. Grants Disbursed by AEPC/NRREP after verification of Technical aspect and Procedure Aspect as per MoU (Agreement) between AEPC and Concerned Body

**The Procurement Process for Consultancy Service**

Below are the methods to be selected:

1. Quality and Cost-based Selection method (QCBS)

2. Quality Based Selection Method (QBS)

   **Note:** use this method when the nature of the consultancy services to be procured are exceptionally complex, or such services are likely to have considerable impact on future projects or the national economy.

3. Budget Ceiling Selection Method (BCS)

4. Least Cost Selection Method (LCS)

**Consultancy Services Procurement Guidelines**

For procurement of consultancy services, use the following guideline:

<table>
<thead>
<tr>
<th>SN</th>
<th>Procurement Method</th>
<th>Amount</th>
<th>Notice Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>By requesting Competitive Proposals</td>
<td>Above 3 Lakhs (0.30 Million)</td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Issue LOI-National Level Newspaper for Shortlisting</td>
<td>Above 10 Lakhs to 30 Millions</td>
<td>15 Days</td>
</tr>
<tr>
<td>1.2</td>
<td>Issue LOI-International Level Newspaper for Shortlisting</td>
<td>Above 30 Million</td>
<td>30 Days</td>
</tr>
<tr>
<td>1.3</td>
<td>Issue RFP to Qualified Shortlisted Firms</td>
<td>Above 1 Million to 30 Million</td>
<td>30 Days for National and 45 Days for ICB</td>
</tr>
</tbody>
</table>
| 1.4 | Issue TOR to Listed (Standing Listing) few firms (3 Firms) | Below 0.30 Million | 7 Days or Provide time to Prepare Proposals (Technical and Financial)

| 2  | Through Direct Negotiations:  
   |   - Special Trainings, symposia and seminars  
   |   - Higher level of expertise is required  
   |   - Consultancy is needed for a short period of time or time is short for the appointment of a consultant  
   |   - Only some consultants are qualified to perform the required task  
   |   - Up to NRS 100,000-Chief of the Public Entity  
   |   - Above NRS 100,000-with the approval of one level higher authority |                  |             |
The Procurement Process for Service

The following outline describes the procurement process for services, and also gives you the order in which tasks are completed:

1. Preparation of TOR for Service Need
2. Preparation of Cost Estimate
3. Shortlist to be prepared by soliciting EOI openly (Above NRS 0.30 Million)-Min. 15 Days for National Level EOI and 30 Days for International-Level EIO:
   i. Call for Proposal : Min 15 Days for Below 1 Million, Min 30 Days for between 1 Million to 30 Million Cost Estimate
   ii. The name and address of the Public Entity
   iii. The nature of the services to be procured, the time and place when and where the services are to be provided, the terms of reference of the services, the task to be completed and expected outputs
   iv. Instructions to proponent to prepare proposal
   v. Matters that the technical and the financial proposals have to be sealed in separate envelopes, each of which has to clearly indicate the type of proposal outside it and that both envelopes have then to be sealed in a separate envelope and that the required services have to be mentioned thereon
   vi. Technical and financial evaluation weightage (80/20 or 70/30 or 90/10 etc.)
   vii. The criteria and weightage marks for the evaluation and comparison of proposal (see Table 12. Criteria and marks for evaluating proposals on page 29)
   viii. Conditions of the procurement contract
   ix. The place, date and time for the submission of proposals
   x. Method for the selection of proposals. Statement that proposals shall not be processed in the event of conflict of interest and information relating to legal action if fraud or corruption is committed
   xi. Provision that a proponent may make an application for review, against any error or decision made by the Public Entity in carrying out proposal proceedings
   xii. Other matters as prescribed
4. Opening of Technical Proposals
5. Evaluation of Technical Proposal
6. Notice to Bidder:
   a. Request for participation for opening Financial Proposal-Min 7 Days
   b. Rejection Letter for non min scorer (Failed) proposals
7. Opening of Financial Proposal
   • If all the received proposals are not substantially responsive to the terms of reference,
   • If the cost offered by the selected proponent is substantially more than the cost estimate and available budget
   • If the consultancy service is no longer required or
   • If it is proved that the proponents have submitted the proposal by mutual collusions
9. Negotiations with the Proponent:- Except remuneration of professional experts
10. Procurement Contract to be concluded
Section 3. Procurement Guidelines

11. Completion of Procurement Contract-work completed-invoice received
12. Inspection and acceptance of reports, approval of Final Report
13. Final payment by the Finance Department (After Retention, Advance, TDS (Normally 1.5%) etc.
14. Monitoring the Service performed and Evaluation

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experience of consultants in the task to be performed by consultants</td>
<td>Max. 10%</td>
</tr>
<tr>
<td>The quality of proposed methodology for the performance of task by the consultants</td>
<td>20-50%</td>
</tr>
<tr>
<td>The qualification of the proposed key human resource</td>
<td>30-60%</td>
</tr>
<tr>
<td>Provision of knowledge and technology transfer</td>
<td>Max. 10%</td>
</tr>
<tr>
<td>The details of key Nepalese human resource proposed for the performance of task (only for ICB)</td>
<td>Max. 10%</td>
</tr>
<tr>
<td>Minimum Pass Park for Technical Proposal</td>
<td>50 to 80</td>
</tr>
</tbody>
</table>

Table 12. Criteria and marks for evaluating proposals

Provision for Direct Procurement: Goods and Service (from PPA 41)

a. Low-value procurement valuing up to the prescribed amount (Below NRS 0.30 Million)
b. If only one supplier or construction entrepreneur or consultant or service provider has the technical efficiency or capacity to fulfil the procurement requirement,
c. If only one supplier has the exclusive right to supply the goods to be procured and no other appropriate alternative is available,
d. If additional goods or services of proprietary nature within the prescribed limit is to be procured from the existing supplier or consultant or service provider after it has been proved that if the existing supplier or consultant or service provider is changed to replace or extend existing goods or services or the spare parts of the installed machine the goods or services existing in the Public Entity cannot be replaced or changed,
e. If the most necessary construction works, goods or consultancy services or other services within the limit as prescribed but not included in the initial contract due to failure to foresee and difficult to be completed by separating from the initial contract due to technical or financial reasons, is to be procured.
f. If the service of a particular consultant with his unique qualifications is immediately needed for the concerned work or where the service of same consultant is indispensable.
g. Similar rate and Quality Goods (Petrol, Diesel, Kerosene, Cooking Gas etc.)
h. Special circumstance has created a situation in which, if a procurement is not made immediately, the Public Entity will sustain further loss, the Public Entity may procure or cause to be procured immediately (PPA 66):

- For (b), (e) and (f) case: as per the decision of the supreme executive body of that entity (For Local Bodies)
- For Constitutional organ or body, Court, Ministry, Secretariat, Commission, Department of the Government of Nepal or any other Governmental Entity or Office thereunder: as per the decision of Government of Nepal, Council of Ministers, on recommendation of the following committee:
  a) Chief Secretary, Government of Nepal -Coordinator
  b) Secretary, Ministry of Finance -Member
  c) Secretary, Concerned Ministry -Member
  d) Financial Comptroller General -Member
  e) Chief, Public Procurement Monitoring Office –Member

Tender Document Fees (from PPR 48)

The following table lays out fees for particular tenders:

<table>
<thead>
<tr>
<th>Tender Amount</th>
<th>Fees in NRS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 10 Lakhs</td>
<td>300</td>
</tr>
<tr>
<td>10 to 60 Lakhs</td>
<td>1,000</td>
</tr>
<tr>
<td>60 Lakhs to 600 Lakhs</td>
<td>3,000</td>
</tr>
<tr>
<td>600 Lakhs to 1000 Lakhs</td>
<td>5,000</td>
</tr>
<tr>
<td>1000 Lakhs to 25,000 Lakhs</td>
<td>6,000</td>
</tr>
<tr>
<td>25,000 Lakhs and Above</td>
<td>10,000</td>
</tr>
<tr>
<td>Prequalification Document (PPR 34)</td>
<td>1000 to 15000</td>
</tr>
<tr>
<td>EOI &amp; RFP for Consultancy Service</td>
<td>None</td>
</tr>
</tbody>
</table>

Table 13. Tender document fees by amount

Validity Period for Tenders & Proposals (from PPR 54)

<table>
<thead>
<tr>
<th>Cost Estimate Range (in NPR)</th>
<th>Validity Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 100 Million</td>
<td>90 days</td>
</tr>
<tr>
<td>Over 100 Million</td>
<td>129 days</td>
</tr>
</tbody>
</table>

Table 14. Validity periods for tenders
Annexes
The following samples and forms are referenced in this document, and are provided here for your convenience:

✓ Annex 1.1: The AEPC Pre-feasibility Form on page 32
✓ Annex 2.1: Sample EOI for a SSL Project on page 36
✓ Annex 2.2: Sample Procurement Report on page 40
✓ Annex 2.3: Sample Working Procedure for the PPP SSL Committee on page 58
✓ Annex 2.4: Sample SSL Project Contract on page 65
✓ Annex 3.1: Sample Call for EOI for Advertising on SSL Poles on page 98
✓ Annex 3.2: Sample Advertising Contract for SSL Project on page 102
Annex 1.1: The AEPC Pre-feasibility Form

**SOLAR STREET LIGHT PRE-FEASIBILITY FORM**

1. Name of the Municipality
2. Total Area of Municipality
3. Total Population of Municipality
4. Total Length of Pitch Road
5. Please name major tourist destinations of the Municipality/VDC
6. Please name major commercial Areas of the Municipality/VDC
7. Please name major public/traffic areas of the Municipality/VDC
8. Please name places with historical/cultural importance of the Municipality/VDC

9. Please name major crime areas of the Municipality/VDC

10. Please mention the intended areas of solar street light installations with their important with respect to above questions? (If other reasons please mention. Proposed sites should be marked in municipality map)

<table>
<thead>
<tr>
<th>Proposed Site Names</th>
<th>Importance</th>
<th>Other benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>e.g. Khumaltar, Lalitpur</td>
<td>e.g tourist area</td>
<td>e.g. offices present</td>
</tr>
</tbody>
</table>

11. Are there any street lights provided in above proposed sites? (If Yes, please mention total nos. of street lights installed so far, nos. of systems working satisfactory, total cost incurred for installing street lights, total energy bill in street lighting per month)

<table>
<thead>
<tr>
<th>Proposed site Names</th>
<th>Present /Working Status</th>
<th>Number of Systems installed</th>
<th>Installation cost (NRs)</th>
<th>Operation Cost (NRs)</th>
</tr>
</thead>
</table>
12. Do you need alternative means of street light to overcome current load shedding problem?

13. Mention the length and width of roads recommended in point 10. Considering solar street lights are placed 25m apart along with special consideration to public areas like temples, chowks and other important places, please estimate the number of solar street lights needed. (Please use a separate sheet)

14. Can your Municipality budget contribute for this solar street light program? Or, will you be looking for external donors?

15. Please mention the amount of budget the Municipality is willing to contribute? (Also attach Commitment letter)

<table>
<thead>
<tr>
<th>Minimum Amount (NRs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Amount (NRs)</td>
</tr>
</tbody>
</table>

16. Are public/ beneficiaries willing to contribute for this program? If Yes, please mention the approximate amount. (Also attach commitment letter from beneficiaries or local people)
17. Do you have any idea about local solar companies at your place willing to contribute for this program? (if any, please mention)


18. Is there any other organization in your contact, who also wants to contribute for this program? (if any, please attach commitment letter)


19. Please mention the amount of contribution the Municipality is expecting from AEPC? (Please use a separate sheet to show contribution proportion between municipality, public people, external donors and AEPC. Pie chart is preferred with brief explanations)


Signature

Date: 


........................................

Executive Officer of the Municipality

Municipality Stamp
Annex 2.1: Sample EOI for a SSL Project

Call for Expressions of Interest (EOIs) for the Installation and Maintenance of Solar Street Lights in Pokhara, Nepal

1) Background

The Nepal Centre for Inclusive Growth (CIG) is a project funded by the UK Department for International Development, which works to find practical solutions to promote economic growth and social inclusion in Nepal. As part of a CIG initiative on tourism in the Pokhara and Annapurna area, the CIG is facilitating the installation of solar street lights in the city of Pokharathrough a Public Private Partnership (PPP) comprising the municipal government, the private sector, and other funders.

2) Procurement Process

The CIG is overseeing a three-stage process:

A. Expressions of Interest from suppliers.
B. Detailed Proposals from the shortlisted suppliers.
C. Installation of lights by the selected supplier.

After receiving the EOIos, 3-5 companies will be shortlisted for the full proposals stage. From this, one supplier will be selected to deliver the lights.

3) Technical Specifications:

- The procurement process shall be for the items with the technical specifications mentioned below: Supplied with own pole
- Pole height 8m minimum
- LED bulb
- Bulb 40 Watts minimum
- Lit area diameter 30 metres minimum
- Solar panel sufficient to charge light for 12hrs operation per day, throughout the year, given aforementioned obstacles to direct sunlight
- Measures for protecting key parts from theft, damage, and weather conditions
- Space for mounting advertisements on each pole
- Estimated quantity: 80-180
- Likely locations: lakeside, new road

Further information on technical specifications and locations can be downloaded from CIG website.
Call for EOI for Solar Street lights: technical Specifications

Based on a feasibility study carried out in collaboration with the CIG and an AEPC engineer, the following specifications are required for the solar street lights.

Location

The intention is to install solar street lights at 2 sites in Pokhara. The precise locations for the installation of the street lights will be determined in due course (dependent partly on raising portions of funding from local businesses along the parts of the street to be lit up); however, the areas designated below mark out the current limit of the ambitions for installation (i.e. the maximum installation given all funding being secured).

Site 1: New Road

Site inspection comments:

- Full length = 1600m
- Small roundabout at North end, markets at North and South end.
- Ample pavement space throughout, although storm drain underneath part of pavement could restrict foundations for poles.
- Light and panel-level obstructions are existing NEA poles and wires, trees outside the municipality office, as well as a number of 3, 4 and 5 storey buildings which may block light at certain times of day.

Site 2: Lakeside
Site inspection comments:
- Full length = 1700m; BarahiChowk to HallanChowk (central portion) = 800m
- Shops only on one side of the road South of BarahiChowk, tree/roundabout in the road at 3 points
- Restricted pavement space due to shops at some points (especially adjacent to trees in road), although pavement widening scheme in course. Storm drain directly under pavement at some points.
- Main challenges at pole height are the trees at various points, and occasional 3-5 storey buildings

Intended light placement
The lights will be placed 30-35m apart on each side of the road, with the lights on one side parallel with the midpoint between 2 lights on the other side of the road, as shown in figure 1 below.

Figure 1: light placement
At many points, at both sites, it may be that the placement has to deviate slightly from this, and/or lamps and panels may need to be placed on buildings or other structures instead of their own poles.

Based on this intended placement, it is estimated that a maximum of 36 lights will be required for New Road, and a maximum of 82 lights will be required for lakeside.

**Technical specifications**

Based on the above requirements, and the assessment of our technical team, the following specifications are required for each solar street light. These are just initial estimates provided for informational purposes: a detailed set of technical specifications will be developed prior to the full proposal stage of the procurement.

- Supplied with own pole
- Pole height 8m minimum
- LED bulb
- 40 Watts minimum
- Lit area diameter 30 metres minimum
- Solar panel sufficient to charge light for 12hrs operation per day, throughout the year, given aforementioned obstacles to direct sunlight
- Measures for protecting key parts from theft, damage, and weather conditions

A number of different options will be requested for the selection of batteries, charge controllers, and for the lifespan of different components. Further details on the options required will be provided at the full tender stage. At this stage, initial estimates for these requirements are

- Panel size: 130Wp
- Battery bank: 90AH (with 2 days autonomy)
- Charge Controller: 10A

**Additional requirements**

The solar street lights will be funded by a public private partnership, specifically space will be sold for advertising on each pole. Therefore, it will be necessary to mount advertisements on poles, or to have space for advertisement display in-built, as well as mechanisms for easy maintenance and changing of adverts.
### Annex 2.2: Sample Procurement Report for a SSL Project

#### About the Project

<table>
<thead>
<tr>
<th><strong>Project Name:</strong></th>
<th>Pokhara Solar Street Lighting (SSL) Project</th>
</tr>
</thead>
</table>
| **Installation Sites:** | Main Street Lines of the Lakeside and New Road  
| | **Lakeside:** from Khahare Chowk to Sahid Chowk  
| | **New Road:** from B.P. Chowk (or Chipledhunga Chowk) to Savagriha Chowk |
| **Managed By:** | SSL Management Committee Pokhara (Lakeside and New Road) |
| **Technical Support By:** | Center for Inclusive Growth (CIG) Nepal, Patan, Lalitpur |
| **Financial Support:** | Alternative Energy Promotion Centre, Khumaltar, Lalitpur  
| | Pokhara Sub-Metropolitan City Office, Kaski, Pokhara  
| | Lakeside and New Road Business Enterprises |
| **Contractor:** | Suryodaya Urja Pvt. Ltd., Dhapasi, Kathmandu |
| **Installation Completion:** | 19- July - 2014 |
| **SSL Inauguration Date:** | 8- August- 2014 |
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1.0 Introduction and Background Situation

Street lights are fixtures found in every city and serve the important purpose of illuminating streets and keeping the roads safe for pedestrians and vehicles. The conventional light fixtures being used in the street lighting are Sodium Vapor Lights and Mercury Vapor Lights. Light Emitting Diodes (LEDs) have been introduced to the streets since the 1990s, when cities throughout the U.S. and Europe began replacing incandescent-based traffic lights with highly energy-efficient solid state fixtures.

In Nepal, there are about 3,000 number of grid powered street lights installed by Nepal Electricity Authority (NEA) alone. No proper record has been maintained of many other similar street lights are installed by municipality offices and the local enterprises. Due to energy shortfall in the country, these streets are normally found dark during evening and night hours, except in some areas where power is available through Diesel Generators (DG) or through other backup power provision. In this context solar photovoltaic powered LED street lighting installation is recently completed in the major business areas of Pokhara Sub-Metropolitan City. The 4 Kilometer long two main streets that carry major economic activities in Pokhara are illuminated by solar powered street lights, under Public Private Partnership (PPP) execution mode.

For the SSL hardware setup and implementation of the project at the site, a contract agreement was signed between “Solar Street Lighting Management Committee Pokhara” and a local private solar company “Suryodaya Urja Pvt. Ltd.”. Accordingly, the solar company has supplied and installed solar street lights in the main street of the Lakeside and New Road areas. This report present about the SSL installation completion, the technology used and its commissioning in the above two sites.

1.1 Background Information of the Project

The Pokhara Solar Street Lighting (SSL) project is executed by the SSL Management Committee Pokhara. The technical support to this project is provided by the Center for Inclusive Growth (CIG) Nepal (UK Government’s Department for International Development- DFID). The financial contribution to this project is shared by the local private sectors of Lakeside and New Road areas, Government of Nepal through Alternative Energy Promotion Centre (AEPC) and Pokhara Sub-metropolitan City Office.

There are total of 180 numbers of solar street lighting systems that are installed in both the proposed sites. The Suryodaya Urja Pvt. Ltd. (Contractor) was supposed to deliver and install 177 numbers of galvanized metal poles along with its accessories
for the solar PV module, LED light set and battery mounting purpose. Out of the 177 number of street lighting poles, there are 174 numbers of single light arm types and 3 numbers of double light arm sets. The Contractor has completed supply, delivery and installation of above solar street lighting systems in July -2014.

The technical committee comprising the representatives from Alternative Energy Promotion Centre, Pokhara Sub-Metropolitan City Office and Center for Inclusive Growth, did carry out the inspections of the SSL equipments and installation quality check before and during the system installation. The installation completion report and outcome of the inspection has been briefly presented in the following section.

1.2 About the Solar Street Lighting Technology
Solar Street Lighting Technology is a Renewable Energy solution used for illuminating road, pathway, parking place or similar outdoor areas. A stand alone SSL system is an outdoor lighting unit used for illuminating a street or an open area having no connection to the local electricity grid.

Solar Panel or Solar Photovoltaic (PV) Module converts Sun’s energy into electricity which is stored in the battery via solar charge controller. The LED light will work during night time automatically by light sensor control and provide light during evening and night hours. In the stand alone SSL system the Direct Current (DC) power is used to operate connected light fixture, unlike the Alternate Current (AC) that is being supplied through the local electricity grid. Hence, the electricity generated by the solar panel charges the battery during the day time which powers the Light or Luminaire from dusk to dawn. The SSL system lights at dusk and switches off at dawn automatically.

The SSL system consists of solar PV module, storage battery, solar charge controller, solar LED Lamp or Luminaire, inter-connecting wires/cables, module mounting pole including hardware and battery box etc.
2.0 Pokhara SSL Installation and Technical Specifications

The Pokhara Solar Street Lighting systems are installed in main streets of Lakeside and Newroad area of the Pokhara Sub-Metropolitan City. In the Lakeside main street, the solar street lights are installed from Khahare Chowk to Sahid Chowk. Likewise, solar street lights are installed from Chipledhunga Chowk to Savagriha Chowk along the Newroad main street. The proposed road characteristics can be classified as secondary road where the typical vehicle speed will be in between 5 Km per hour to 30 Km per hour, and average illumination required for this type of road is 8 to 10 LUX. The stand-alone solar street lighting system having all new item components are installed in the proposed locations as per the technical specifications asked during the procurement process.

2.1 Solar Photovoltaic Module Shading

While installing solar photovoltaic modules or panels for the street lighting units, the shading on solar panel is to be avoided as indicated in the detail technical survey report. As far as possible the solar panels are mounted on the top of the individual metal pole but in the place where there could be shadow on the light poles during day time those solar panels are mounted on the nearby building roof. This has been followed in both project sites. However, around the Ratna Mandir area of the Lakeside main street, the 5 number of solar panels are made to install on the other side of the shops, by the local business houses in that area. The Pokhara SSL Technical Committee has not recommended mounting those 5 poles at the position where they are installed. During the winter season these 5 SSL units will face the problem of battery charging due to shadow coming from the nearby tall trees. Hence, it is advisable to transfer these light poles or solar panels to the places where the technical survey team has recommended before.

2.2 Pole Mounting and Pole Placement

The total length of each galvanized metal pole is 9 meter. Out of the 9 meters, 1.5 meter (1/6 of the pole length) is buried into the ground and 7.5 meter remains above the ground surface.

The placement of light pole is done in such a way that the light poles are installed 40 meters apart along a side of street where there are businesses in both side of the street. In the middle of the two poles there is a light pole in the other side of street. This is called offset arrangement of poles where the luminaires are placed on either side of the road in a zigzag formation. However, where there is business in a single side of the street the light poles are mounted on a single side. In this case, the
distance between two poles is maintained from 25 to 30 meters. In some locations due to the Nepal Electricity Power Line/poles, telecom poles and request of the shop owners to change the pole position, the SSL pole has to move by 1 or 2 meter.

2.3 Electrical Safety Measures
In the electrical system operation and handling, safety measures should always be taken first. The person working with electricity should use insulated hand gloves, helmet, and boots to safely handle either it is DC or AC electrical work. The operator should avoid contact with un-insulated power line and buried electrical conductors. The manufacturer’s instructions shall be followed by the operator for safe operation of solar electrical system.

As per Nepal Electricity Authority (NEA), the minimum distance to be maintained between any metal items that are close to 415 Volt or 11,000 Volt power lines is 1.25 meter. Hence, the Pokhara SSL Technical Committee along with NEA representatives did check the SSL installation work and maintained the distance for the safety reason. After completion of pole mounting job by the Contractor, a site visit was made by the Pokhara SSL technical committee, NEA representatives and the local user committee representatives, to observe the pole placement location. As suggested by the observation team, the total of 21 numbers of light poles (including Lakeside and Newroad streets) were shifted to another location to maintain the minimum clearance as per NEA. Therefore, the Contractor has made correction by redoing the pole mounting of those 21 poles.

2.4 SSL System Design Factors
Solar street lighting system comprises of solar panel, VRLA deep cycle battery, charge controller and light sets as main components. The basic factors that are taken into consideration while designing and sizing the solar street lighting system are: average sunshine hours available per day at the site (5 hours/day), design system voltage (12 volt), number of battery autonomy days (2 days), maximum allowable battery depth of discharge (75%), and all system losses etc.

Similarly, while selecting the solar PV modules, the market available most efficient Mono or poly crystalline silicon solar cells are chosen for the SSL. The VRLA GEL tubular plate batteries are recommended for the longer life cycle and outdoor pole mounting solar lighting purpose. To have natural light output to the human eye, the warm light type LED technology is considered which also reduces the attraction of the insects around the illuminated light bulb.
2.5 Broad Technical Specification of Pokhara SSL System

The summary of technical specification and parameters used in the Pokhara solar street lighting system are tabulated below.

<table>
<thead>
<tr>
<th>Category</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar Panel</td>
<td>150 Wp under STC (Cell Efficiency ≥17%)</td>
</tr>
<tr>
<td>Battery</td>
<td>Tubular GEL 12 Volt, 100AH@C10</td>
</tr>
<tr>
<td>Light Source</td>
<td>40Watt LED (Minimum 100 lumen/watt light output, minimum value of Colour Rendering Index of 70, LED view angle above 120°, and minimum 50,000 hours LED life)</td>
</tr>
<tr>
<td>Charge Controller</td>
<td>20 Ampere, PWM controller</td>
</tr>
<tr>
<td>Light Output</td>
<td>Minimum 15 LUX when measured at the periphery of 5 meter diameter from the height of 7.5 meters.</td>
</tr>
<tr>
<td>Mounting Height</td>
<td>7.5 meter (above ground) and 1.5 meter below ground</td>
</tr>
<tr>
<td>Duty Cycle</td>
<td>Dusk to Dawn (6 hours full power+ 6 hours half power)</td>
</tr>
<tr>
<td>Battery Autonomy</td>
<td>Above 2days</td>
</tr>
<tr>
<td>Light Pole</td>
<td>Hot Deep Galvanized with 100mm diameter and 4mm thickness at bottom. Pole should withstand wind speed of above 170 Km/hr.</td>
</tr>
<tr>
<td>Pole Spacing</td>
<td>40 meter (where light poles exist on both side of the street)</td>
</tr>
<tr>
<td></td>
<td>25 meter (where light poles exist only one side of the street)</td>
</tr>
<tr>
<td>Warranty</td>
<td>Overall system component warranty is 5 years</td>
</tr>
</tbody>
</table>

3.0 Commissioning SSL Systems

3.1 System Installation Quality Check

The final installation checkout of the solar street lights is made by technical committee members, in both the installation sites Lakeside and Newroad streets. Total of 180 numbers of each 40 watt LED lighting units are installed on the
individual galvanized light poles. A 150Wp solar panel is charging 100AH, 12 Volt Tubular GEL batteries in each pole and supplying electricity to LED lamp set during the night time. The 20 ampere Pulse Width Modulated technology controller is controlling charging and lighting operation of the system.

Solar street lights are stand-alone systems that are independent to the local grid power supply. In general, the entire solar street lighting system components of stand-alone system has to be mounted in a single light pole. However, in some locations of the above two streets, there will not be solar radiation at least for 5 hours a day. This will cause problem to fully charge the connected solar battery. Therefore, solar panels are mounted on the nearby building to avoid the shadow on the panel.

3.2 Visual Inspection
The solar street lighting system component inspection is made by visual inspection, physical counting, electrical parameter test and installation quality check. The main observations were focused on material defect checking, material quantity verification, physical and electrical parameter verification and the quality of installation which is found satisfactory to the 180 sets.

The total of 77 single light arms pole and 1 double light arm pole systems are installed in the main street of the New Road area. Similarly, 98 single light arm type systems and 1 double light arm type systems are installed in the main street of the Lakeside area. Hence, total of 101 number of SSL sets (99 poles) are installed in the Lakeside. And 79 number of SSL sets (78 poles) are installed in the New Road.

3.3 Components Used in the SSL Installation
The lists of equipments that are installed in the both sites are presented in the following table.

**Equipments Installed in the Lakeside:**

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Item Descriptions</th>
<th>Specifications</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Komaes Solar Photovoltaic Module Poly-crystalline</td>
<td>150 Watt-Peak</td>
<td>101</td>
</tr>
<tr>
<td>2</td>
<td>Exide 12 Volt Deep Cycle Gel Tubular Plate Battery</td>
<td>100Ah@C10</td>
<td>101</td>
</tr>
<tr>
<td>3</td>
<td>12 Volt LED street light set, Thoe</td>
<td>40 Watt</td>
<td>101</td>
</tr>
<tr>
<td>4</td>
<td>Solar Charge Controller Landstar</td>
<td>20 Ampere, 12 Volt</td>
<td>101</td>
</tr>
</tbody>
</table>
Annexes

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Item Descriptions</th>
<th>Specifications</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Galvanized (GI) pole 9 meter, fibre glass waterproof battery box, GI metal PV frame and light arm</td>
<td>9 meter length, 100 mm diameter and 4mm thickness at the bottom</td>
<td>99</td>
</tr>
<tr>
<td>6</td>
<td>Installation materials required for complete installation</td>
<td></td>
<td>101</td>
</tr>
<tr>
<td>7</td>
<td>Civil Construction and concreting of GI pole</td>
<td></td>
<td>99</td>
</tr>
</tbody>
</table>

Equipments Installed in the New Road:

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Item Descriptions</th>
<th>Specifications</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Komaes Solar Photovoltaic Module Poly-crystalline</td>
<td>150 Watt-Peak</td>
<td>79</td>
</tr>
<tr>
<td>2</td>
<td>Exide 12 Volt Deep Cycle Gel Tubular Plate Battery</td>
<td>100Ah@C10</td>
<td>79</td>
</tr>
<tr>
<td>3</td>
<td>12 Volt LED street light set, Thoe</td>
<td>40 Watt</td>
<td>79</td>
</tr>
<tr>
<td>4</td>
<td>Solar Charge Controller Landstar</td>
<td>20 Ampere, 12 Volt</td>
<td>79</td>
</tr>
<tr>
<td>5</td>
<td>Galvanized (GI) pole 9 meter, fibre glass waterproof battery box, GI metal PV frame and light arms</td>
<td>9 meter length, 100 mm diameter and 4mm thickness at the bottom</td>
<td>78</td>
</tr>
<tr>
<td>6</td>
<td>Installation materials required for complete installation</td>
<td></td>
<td>79</td>
</tr>
<tr>
<td>7</td>
<td>Civil Construction and concreting of GI pole</td>
<td></td>
<td>78</td>
</tr>
</tbody>
</table>

4.0 Expected Benefits from Pokhara SSL Project

(i) The two main business streets of Pokhara will be brightened from dusk to dawn thereby offering better security situation and tourist-friendly image with the improved street light quality.

(ii) Dependency on Diesel Generator powered outdoor lighting will be eliminated thereby avoiding fuel cost, generator noise and air pollution.

(iii) LED street lights offer benefit of more natural colour rendering that can help improve safety and security. This will extend better economic activities in Lakeside and New Road area of Pokhara.

(iv) LED street lights do have cost advantage of operating and maintaining the fixtures. The interval between bulb replacements of conventional lights, which is from 3 to 5 years, to 10 to 15 year LED lamp means less overhead and replacement costs. This in turn accelerates the return on investment.
(v) The LED lighting will provide more uniform light distribution on the road as well as eliminate central hot spots and glares.

(vi) Mercury-free LED construction makes solid state street lamps safe for landfills which is considered as environmental friendly lighting scheme.

To summarize the benefits of Pokhara SSL systems, the solar LED street lights meet standard regulations for luminance level and uniformity, deliver significant energy savings, dramatically extend fixture lifetime, produce more usable light, support municipalities’ efforts to go green, lower the total of ownership, and more.

5.0 Lessons Learned and Future Recommendation

- Micro-processor based street light controller with GSM technology for remote control and monitoring can be adopted in future.
- Coordinate with the mains electricity utility company (Nepal Electricity Authority) is advised while mounting metal poles that are close to the NEA power distribution lines or transformer.
- It is recommended to do detail feasibility study of light pole mounting locations and solar PV module mounting site along the proposed street.
- Community mobilization should be strong so that there is no delay in decision making under the PPP modality projects.
### ANNEXES

#### ANNEX-I: Summary Report of Metal Items and Battery box Inspection

The summary of inspection towards the metal structure and hardware is as follows.

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Item/Component</th>
<th>Parameter</th>
<th>Dimensions and Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Galvanizing Type</td>
<td>Hot Deep</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Galvanizing Coating</td>
<td>Thickness &gt;80 Micron</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Street Light Pole</td>
<td>Height 6 m + 3 m = 9 meter</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diameter 100 mm Bottom &amp; 75 mm Top</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thickness 4 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Base Plate 33 cm * 33 cm * 0.6 cm</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Light Arm (Single)</td>
<td>Length (Pole to Light) 1.2 meter</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Light Arm (Double)</td>
<td>Length (Pole to Light) 1.3 meter</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Battery Box (White)</td>
<td>Fiber Glass 61 cm * 22 cm * 36 cm</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Battery Box Stand or</td>
<td>GI Metal Container 65 cm * 27 cm * 21 cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Casing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Pole Mounting PV</td>
<td>GI Metal Container Angle of Inclination = 33°</td>
<td>Length of Frame Connecting Pipe = 25 cm</td>
</tr>
<tr>
<td></td>
<td>Structures</td>
<td></td>
<td>PV Frame = 68 cm * 76 cm</td>
</tr>
<tr>
<td>9</td>
<td>Roof Mounting PV</td>
<td>GI Metal Container Angle of Inclination</td>
<td>Length = 1.2 meter</td>
</tr>
</tbody>
</table>
ANNEX-II: Summary Report of Solar Electrical/Electronic Items Inspection

Contractor was supposed to deliver the 180 number of 150Wp solar PV modules, 180 number of 100AH-12Volt solar maintenance free batteries, 180 number of 40 Watt LED light sets along with the necessary cables and connectors for complete turn-key project. Following is the brief report of the item inspection and verification.

**Solar PV Module (or Solar Panel):**

<table>
<thead>
<tr>
<th>Brand Name and Model</th>
<th>KOMAES, KM(P) 150 Ningbo Komaes Solar Technology Co. Ltd.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Solar Cell</td>
<td>Poly-Crystalline</td>
</tr>
<tr>
<td>Number of PV Cells per Module</td>
<td>(9 * 4) 36 Cell</td>
</tr>
<tr>
<td>Physical Dimension</td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>148 cm</td>
</tr>
<tr>
<td>Breadth</td>
<td>68 cm</td>
</tr>
<tr>
<td>Thickness</td>
<td>3.5 cm</td>
</tr>
<tr>
<td>Weight</td>
<td>11.22 Kg</td>
</tr>
<tr>
<td>Bypass Diodes</td>
<td>2 Pieces in each PV Module</td>
</tr>
<tr>
<td>Cell Efficiency of KM(P) 150</td>
<td>17.1%</td>
</tr>
</tbody>
</table>

**Solar Deep Cycle Battery:**

| Brand Name and Model          | EXIDE, Solatron, 6SGL100                                   |
| Battery Casing Color          | Yellowish Green Container (Red Cover on Top)               |
| Battery Casing Material       | Plastic Container                                         |
| Physical Dimension            |                                                           |
| Length                       | 55.5 cm                                                   |
| Breadth                      | 17.2 cm                                                   |
| Height                       | 34 cm (up to the cover)                                   |
| Weight                       | 43 Kg                                                     |
| Battery Technology            | VRLA GEL Maintenance Free                                 |
| Battery Type                  | Solar Deep Cycle                                          |
| Number of cycles @80%DoD or 30%DoD | 800 cycle @ 80% Depth of Discharge 3200 cycle @ 30% Depth of Discharge |
| Positive Plate                | Tubular                                                   |
| Remarks, if any:              | 100AH@C10, 12Volt (at 27°C)                               |
| Manufacturer web Link         | www.exidefortyou.com                                     |

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### Solar LED Light Set:

<table>
<thead>
<tr>
<th>Brand Name and Model</th>
<th>THOE, TH-D1040-0140-G1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Name</td>
<td>LED Road Lamp</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>Tenghui Opto-Electronics Technology Co. Ltd.</td>
</tr>
<tr>
<td>Number of LEDs in a Light Set</td>
<td>40 LEDs</td>
</tr>
<tr>
<td>LED Light Casing</td>
<td>Metal</td>
</tr>
<tr>
<td>Physical Dimension</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Length: 52 cm</td>
</tr>
<tr>
<td></td>
<td>Breadth: 30 cm</td>
</tr>
<tr>
<td></td>
<td>Thickness: 7 cm</td>
</tr>
<tr>
<td></td>
<td>Weight: 7 Kg</td>
</tr>
<tr>
<td>Light Output Color of LED</td>
<td>Warm/Yellowish</td>
</tr>
<tr>
<td>IP65 Standard or normal for outdoor application</td>
<td>Yes</td>
</tr>
<tr>
<td>Check Manufacturer Specified Lifetime of the LEDs (50,000 hour)</td>
<td>&gt;50,000 Hours</td>
</tr>
<tr>
<td>Nameplate- CRI value (&gt;70)</td>
<td>&gt;75</td>
</tr>
<tr>
<td>Nameplate- View Angle (&gt;120°)</td>
<td>130° horizontal and 65° vertical</td>
</tr>
<tr>
<td>Ambient Temperature</td>
<td>20°C - 50°C</td>
</tr>
</tbody>
</table>

### Solar Charge Controller/Regulator:

<table>
<thead>
<tr>
<th>Brand Name and Model</th>
<th>EP Solar, Land Star</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar Charge Controller Casing</td>
<td>Plastic</td>
</tr>
<tr>
<td>Does the controller casing seal tight for outdoor?</td>
<td>Yes</td>
</tr>
<tr>
<td>Technology (see nameplate or catalogue)</td>
<td>PWM</td>
</tr>
<tr>
<td>Does the Controller has three stage battery charging (Bulk / absorption / float charging)?</td>
<td>Yes</td>
</tr>
<tr>
<td>Intelligence Controller/Activation</td>
<td>Yes</td>
</tr>
<tr>
<td>Does the casing meets IP65</td>
<td>Yes</td>
</tr>
<tr>
<td>Over charge &amp; discharge protection</td>
<td>Yes</td>
</tr>
<tr>
<td>short circuit, reverse polarity and low voltage disconnect</td>
<td>Yes</td>
</tr>
<tr>
<td>Nameplate Voltage (V)</td>
<td>12 Volt and 24 Volt</td>
</tr>
<tr>
<td>Nameplate Current (I) / 20Amp</td>
<td>20 Ampere</td>
</tr>
</tbody>
</table>
ANNEX-III: Pokhara SSL Installation Photos

Day time aesthetic look of double arm design SSL in the Newroad Street

Single Arm Design SSLs in the Newroad Street
Cables & Connectors:

(i) All the system interconnecting cables stored are found to be Copper.
(ii) Cross-section area of UV cables to be exposed to sun light is 2.5 mm$^2$.
(iii) Cross-section area of the Battery cable: 2.5 mm$^2$. The length of battery cables are 1 meter of each +ve and −ve facilitated with the cable shows for the connection.
(iv) Cross-section of cable connecting charge controller to the LED light is 1.5 mm$^2$. 
Stand-alone solar street light installed in the Lakeside Street

SSL installed in the both side of Lakeside Street
Annexes

Double arm design (40W+40W=80W) SSL at Sahid Chowk

Single side placement of 40W SSLs in the Lakeside Street
Comparison of night time road condition BEFORE and AFTER the SSL Installation in the Lakeside Area

Lakeside Main Street before SSLs Installation

Lakeside Main Street after SSLs Installation
Annex 2.3: Sample Working Procedure for the PPP SSL Committee

सौर्य सडक बिति व्यवस्थापन समिति, पोखराको कार्यविधि:

२०७०

पूर्वमुखी
पोखरामा पर्यटन व्यवस्थापको प्रबृत्ति तथा यस क्षेत्रको निर्माणको साथी सीरियथामा वस् टेबा पुनिए उद्देश्यले पोखरा उपभागनगरपालिका कार्यालय, सरकारी निकाय, पोखरा प्राविधि पर्यटनसङ्ग सम्बन्धित व्यवसायिक संघ सरकारी छहा सरकार पोखरा पर्यटन परिषद, राजापालक सुधार समितिको साफेदारीता एवं सेंटर फर इल्फुसीम ग्राम नेपाल (यस पौड़ा CIG भनिएको) को प्राविधिक सहयोगमा पोखराको लेकराइट र ज्वाराधा मार्वेलिक निजी साफेदारी कार्यक्रमको अवबाहणा अनुसार उल्लिखित संस्थाहरूको सहजातिमा योग्य सडक बिति (solar street light) जेहान कार्य गर्न सागर सहजातिमा लागि साफेदार संस्थाहरू वीच सहभागिता प्रयत्न हस्ताक्षर भएको, वेक्कलिक उर्जा प्रदान केन्द्र र पोखरा उपभागनगरपालिका कार्यालय वीच वैकल्पिक उर्जा केन्द्रबाट उपलब्ध गराउने सम्बन्धित सहभागिता प्रयत्न हस्ताक्षर भएको तथा CIG को प्राविधिक सहयोगमा सौर्य सडक बिति जेहान सम्बन्धमा टेस्टिङ तयार आएको भएको निवासपाल र वस्ती प्रकृतिवाट सौर्य बिति विषय एक व्यावस्था भएको संदर्भमा उल्लिखित सहभागिता एवं निर्णयहरूको कार्यान्वयन गरी सौर्य सडक बिति जेहान तथा व्यवस्थापन कार्यवाही व्यवस्थानुसार राष्ट्रीय एवं विदेशी सम्मान सञ्चालन गर्न कार्यविधिको आवश्यकता भएकोले पोखरा उपभागनगरपालिकाको सबै नगरपरिषदको निर्णय तथा प्रत्यायित आवेदकहरूको योग्य गरी यो सौर्य सडक बिति व्यवस्थापन समिति पोखराको कार्यविधि तयार गरीएको छ।

परिच्छेद ६

१) साक्ष्य नाम र प्रारम्भ

१) यस कार्यविधिको नाम: सौर्य सडक बिति व्यवस्थापन समिति पोखराको कार्यविधि, २०७० रहेको छ।

२) यो कार्यविधि पोखरा उपभागनगरपालिकालाई स्वीकृत भएको मिति देखि लागु हुनेछ।

२) परिप्रेक्ष्यः
 Annexes

6) व्यवस्थापन समितिको काम कर्त्त्य र अधिकार ५) यस समितिको काम कर्त्य र अधिकार देखि बमोजिम हुनेछ ।

१) सौंदर्य बढाउन सही दस्तावेज तथा व्यवस्थापन गणनको निर्देशन निर्णय हुनेछ ।

२) लेखा व्यवस्थापन, लेखा परिक्षण गराउन, अनुगमन तथा निर्माण गर्नु ।

३) योजना सम्पन्न भएको उपभोक्ताहरूलाई मरण संभाषण तथा वस्तुता समितिको गठन सहर गर्नसेको समितिको हस्ताक्षर हुनेछ ।

४) परियोजनालाई प्रतिविधि उपस्थित बाट जारी गराउने, प्रतिविधि टोलीबाट दिएको प्रतिबंधितको आधारमा परियोजनालाई हिसाब वित्तवर्धन फर्काउन ।

५) उपस्थितिहरूको रिपोर्टको आधारमा निर्माण कम्पनीलाई मुक्ताङ्ग दिने सम्बन्धमा अन्तिम निर्णय गर्नु ।

६) योजनालाई सावधानीको परिक्षण, आयामी तथा सावधानीको परिक्षण तथा अन्य पारिस्थितिक सम्बन्धित प्रश्नहरूलाई पताका गर्नका लागि आवश्यक व्यवस्था सिलाउने ।

७) योजनालाई सम्बन्धित कार्यकाल सम्पन्न गर्न संस्थालाई पदाधिकारीलाई भएको वेखि उपलब्ध गराउने दाबित्व समितिको हुनेछ ।
परिच्छेद २

२) सौर बक्स वात व्यवस्थापन समिति गठन : १) यस कार्यविधि अनुसार आवेदक योजना, निर्माण तथा नीतिसम्बन्धी निर्देशावली २०६४ संवर्धन सरकार द्वारा संवर्धन रक्षको देखि वर्तमानको पौराणिक प्रसारणसाहित्यका प्रमुख एवं कार्यकारी अधिकृत संयोजकको मंत्रालय फर इन्तुरिन्थेकै गोष्ठ नेपाल (CIG) पौराणिक संयोजक वात्स्य सांस्कृतिक रहने गरी १५ सदस्यीय सौर बक्स वात व्यवस्थापन समिति गठन हुनेछ।

क) पौराणिक प्रसारणसाहित्यका प्रमुख एवं कार्यकारी अधिकृत — संयोजक

ख) पौराणिक प्रसारणसाहित्यका अधिकृत स्तरको प्रतिनिधिः —— १ जना

ग) पौराणिक परिपथकका आवश्यक विभागहरूमा होटल,रेस्तान,नेपाल ट्रान्सवार्यका / जना

घ) पौराणिक वाणिज्य संकार अधिकृत —— १ जना

ङ) नेपाल परिपथकका वाणिज्यको प्रतिनिधिः —— १ जना
6) समितिको बैठक तथा कार्यरति:
   1) समितिको बैठक कौनिका माहिनामा एक पटक बस्नेछ ।
   2) समितिको बैठक सदस्यहरूको समान्य गरि सयोजनको परामर्शका सदस्यहरूको बोलाउँछे ।
   3) समितिको बैठकमा आवश्यकता व्यावसायिक परियोजना संग सम्बन्धित विशेषज्ञको रूपमा आमंत्रण गर्न सकिने ।
   4) बैठकको अध्यक्ष सयोजनको लाई गिजिको अनुपस्थिततामा आफू मधेल्याउँछे छ र सदस्यहरूले गरेको छ ।
   5) बैठकका दिनको सदस्य सचिवले तयार गरेको छ र बन्ने अध्यक्ष गरेको छ र व्यक्तिको प्रभावित गरेको छ ।
   6) कम्पनीमा ५० प्रतिशत सदस्यको सहयोगले उभारिएको योजना वैज्ञानिक गणनापूर्ण संख्या पुनः समितिको मात्रानुसार ।

परिच्छेद ३

६) उपसमितिको गठन १) व्यवसायक समितिको मात्रहतमा रहनेको गरी देखाउँछ उपसमितिको उपसमितिहरू गठन गरिएको ।
   क) प्राधिक उपसमिति सदस्यको संस्था का प्राधिक विज्ञा हामिल गरेका व्यक्तिहरू समितिको एक प्राधिक उपसमिति गठन हुनेछ ।
   अ) पी.डी.टी.एन. पा कार्यालय
   आ) बैक्रिक्सक उनी प्रबंधन केन्द्र (AEPC) र
   इ) सेंट्रल फर इन्जुस्ट्री ग्रीथ नेपाल (CIG)
 Annexes 

(२) प्राविधिक उपसमितिको सिफारिसको आधारमा व्यवस्थापन समितिले सम्भवित निर्माण कम्पनीलाई भुक्तानी गर्न यो.उ.म.न.पा.लाई सिफारिस गर्न।

(३) अनुगमन तथा सुपरिक्षण उपसमिति : देखायक संस्थाका प्रमुख वा प्रतिनिधि रहेको एक अनुगमन तथा सुपरिक्षण उपसमिति गठन हुनेछ।

(४) पो.उ.म.न.पा.
(५) पो.उ. वा. संघ

(६) पोखरा पपट्टन परिपथ

(७) नयाँ सडक सुधार समिति

(८) वैकोषिक उर्जा प्रवर्धन केन्द्र (AEPC र)

(९) सेंटर फर इन्जुट्युशेम्प्रॉशन नेपाल (CIG)

प्रस्ताव : अनुगमन तथा सुपरिक्षण उपसमितिले परिवोजनको विविध पक्षको अनुगमन तथा सुपरिक्षण गरी समितिलाई जानकारी भराउनौंको साथै सम्भवित निर्माण कम्पनीलाई भुक्तानी लागि सिफारिस गर्नेछ।

पृष्ठभरे ४

(७) व्यवस्थापन समितिको कोष : १) सौभाग्यको वा प्राविधिक भावना ज्ञात तथा व्यवस्थापन सम्बन्धित वार्तालाई प्रभावितको रूपमा सञ्चालन गर्न समितिको नाममा पो.उ.म.न.पा.ले स्वीकृत गरे वमोजिम एक कोष रहनेछ र कोषको श्रेणीहरू देखाय वमोजिम हुनेछ।

(९) पो.उ.म.न.पा.नेपाल सरकार, वैसात्मिक उर्जा प्रवर्धन केन्द्रबाट प्राप्त हुने रकम।

(१०) सामोकार सञ्चालनबाट बस समितिको नाममा प्राप्त हुने रकम।

(११) विज्ञापनबाट प्राप्त रकम।

(१२) अन्य रकम।

(८) समितिको लेखा व्यवस्थापन :

१) कोषको लेखा व्यवस्थापन तथा सञ्चालन समितिको नितीमत निर्णय एवं पोखरा उपमहानगर पालिका कार्यालय तथा CIG को सहयोगमा गरिएक।
१) वैक खाताको सचिवालय, "पॉक्सरा नौसेना सडक वित्त व्यवस्थापन समिति" को नाममा रहने ५।

२) उक्त खाता (बौँचका)को सचिवालय पॉक्सरा उपमहानगरपालिका, पॉक्सरा पर्यटन परिषद, नयाँभाडक मुख्य मुखियत प्रमुख र निजीले सहकार्यकर्ता व्यक्तिजनाका मद्दतका दृष्टिले दुरुस्त प्रश्नहरू प्रकरण २ जनाःको सम्युक्त दस्तखतामा हुनेछ ।

३) वैक खाताको समितिले नियंत्रण गर्ने अनुसारको बैठकमा हुनेछ ।

१०) वस्त्र हार्डवर्कर गर्न सक्ने पॉक्सरा नौसेना सडक वित्त व्यवस्थापन समितिले व्यक्तिगत व्यवस्थापन समितिले सिफारिसा पॉक्सरा उपमहानगरपालिकामा रहनेछ ।

११) विवादको निराकरण पॉक्सरा नौसेना विपमा विद्युत उपयोग भएका सांबद्धक संस्थाहरू बीच छलफल गरी अनिलम्बित निर्णयवर लागि व्यवस्थापन समितिमा पेश गरिनेछ ।

१२) सम्बन्धिता गर्न सक्ने समितिले महत्त्व प्रदान गर्नुहुने वस्त्र वातावरण अन्तरगत सांबद्धक संस्थाहरू बीच वित्त प्रमाणित र व्यवस्थापन सम्बन्धिता पष्टिमा (MoU) गर्न सक्नेछ ।

परिच्छेद ५

निषिद्ध ।

१३) व्यवस्थापन समितिको तर्कबाट निर्माण कम्पनीसमेत कुनै सम्बन्धिता गर्नको लागि समितिको सदस्यहरू सहमद्दम गर्ने सदस्यलाई अधिकार प्रत्यावर्तन गर्न सक्नेछ ।

१४) सीमा शुल्क वित्त जडाइ गर्ने सम्बन्धमा यस अधिनियम निर्णय बालाको पश्चात विचारमा भएका बैठकी लागि संस्थाहरू तथा निर्णय एवं सेंटर फरह इन्जिनियरинг ग्रुप नेपाल (CIG) र ज्रि गरीरको आश्रय पर आधारितको बौझ, सरोजको वालाहरूको सम्बन्धिता भएको निर्दिष्टक तथा अधिक
प्रस्तावको मूल्याङ्कन लगायतका काम कार्यातील यसे कार्यविधि वर्मोजिम भएको मानिने यो साथै तिस पुर्ण कार्य थिइ कार्यविधिको अभिलाषा अंग हुनेछ।
Annex 2.4: Sample SSL Project Contract

सौर्य सडक बन्द्र व्यवस्थापन समिति

तथा

सौर्य उर्जा प्रायिक, काठमाडौं बीच भएको
सौर्यउर्जा सडकबन्द्र जडान निर्माण गर्ने कार्यनिर्देश

प्रस्तावना

पोखरामा पर्यटन व्यवस्थापको प्रश्न तथा यस श्रेणीको सुरक्षा र सार्वजनिक गर्ने सीमावर्तमान अन्तर्गत नियोजन आवश्यक, पोखरामा काठमाडौं बीच सडकनुभागमा तथा बालाकोटमा त्यसको सम्बन्धित व्यवस्थापनको संचार र सुरक्षा हरूलाई संचालन गर्ने छ स्थलमा पर्यटन पर्यावरण केन्द्र र बालाकोटमा त्यसको स्थलमा काठमाडौं बीच सडकबन्द्र जडान निर्माण गर्ने कार्यक्रममा क्षेत्र फर्क इन्क्लुजन ग्रोप (CIG) को प्राथमिक भावनाका अनुसार तथा संचालनका समयमा साध्य र योग्य बृहत (Solar street light) जडान गर्न लागि स्मार्त उपभोक्ताहरूको लागि साभार संस्थाहरू बीच सम्बन्धित प्रक्रिया हस्ताक्षर भएको, सैक्टरीकै उर्जा पर्यटन केन्द्र र पोखरा उपमहानगरपालिका कार्यालय बीच सैक्टरीकै उर्जा केन्द्रबाट बजेट उपलब्ध गराउने सम्बन्धित प्रक्रिया हस्ताक्षर वर्गमा संपन्न र साभार संस्थाहरूको निर्माण र संचालनमा मौजूद सेंटर पर इन्क्लुजन ग्रोप (CIG) ले अधिकार प्राप्त गर्ने बोलपहरू समेत साध्यहरू पर्यायमा प्राप्त भएका बोलपहरू माघेमा स्मार्त उर्जा प्रायिक प्राप्त, प्राप्त, काठमाडौंबाट निर्माण तथा जडान कार्यबाट लागि बद्ध भएका पोखरा उप महानगरपालिका समेतका साभार संस्थाहरूको सम्बन्धित सेंटर पर इन्क्लुजन ग्रोप (CIG) माफित आवेदन निर्माण Letter of Intent प्रेषित गरिएको थियो भने अन्य विवरणका प्राप्त भएका अन्वेषण भएको जानकारी गरेका थियो। तर्फिर, साभार संस्थाहरू गौरव लागि सहभागिता नारो भएको सम्बन्धित व्यवस्थापन तथा कार्यनिर्देश गर्न एवं निर्माण कर्त्य सम्पन्न गर्न भएको सडकबन्द्र जडान निर्माणको स्थायी बिधि २०७० तद्दर्पण गरि पो.०७३ न पा सम्पन्न पेश भएको थियो।
बैठकबाट पास भने सकको सन्दर्भमा छो कार्यविधि वर्मोजिम गठित समितिले सुरूवाट उर्जाले धाराले, काठमाडौंको विशेष योजना वर्मोजिम काम गर्न दिने भन्ने निर्णय भएका ले सौंभालक निर्माण व तत्कालीन व्यवस्थापन समिति पोखराको कार्यविधि २०७० को अधिनमा रहेको प्रवाहित नेपाल कानून वर्मोजिम हुने गरी सौंभालक व्यवस्थापन समिति पोखरा र सुरूवाट उर्जाले धाराले, धाराले, काठमाडौं भित्र थो सौंभालक निर्माण तथा निर्माण करार सम्पन्न गरिएको छ।
लिखितम सीधे सडकवाणै व्यवस्थापन समिति, पेक्षा (वस्तप्रद मसला प्रथम पस्त भनी संबोधन गरिएको ) र सुयोगय उन्जा प्रि., धाराैं काठमाडौं (वस्तप्रद मसला प्रथम पस्त भनी संबोधन गरिएको ) समेत छुट्टा पक्षका सीधे मात्र तर्किपक्त तर्किपक्त लेखिएका शर्लको अधिष्ठानमा रहने गर्न कोटमा सडकवाणै जोडाइन तथा निर्माण कार्य गर्न कार्य एकै, २०५६ तथा अन्तर्भावित नेपाल कानून अन्तर्गत सीधे उन्जा सडक वस्त निर्माण गर्ने कार्यालयमा (सम्मोतितमा संबद्धित गरिएको)

1. निर्मिति तथा योजना
1.1 विश्व वा प्रस्तुत थाइ को अन्य न्यायमा वन र नामामा वसल कार्यालयमा लिम्ब शर्लक निम्नानुसार प्रयोग
गरिएको छ:

(क) "प्रथम पस्त" भनलाई सीधे सडक भनी व्यवस्थापन समिति, पेक्षा सम्मान गर्न ।
(ख) "द्वितीय पस्त" भनलाई सुयोगय उन्जा प्रि. पहाैं, काठमाडौं सम्मान गर्न ।
(ग) "निर्माण कम्पनी" भनलाई स्वयं स्वयं सडक वस्त व्यवस्थापन समिति, पेक्षा निर्माण कार्यको

(घ) "प्रतिनिधि" भनलाई सीधे सडक वस्त व्यवस्थापन समिति, पेक्षा निर्माण कार्यको

(ङ) "संगठन" भनलाई सीधे सडक वस्त व्यवस्थापन समिति, पेक्षा निर्माण कार्यको

(च) "कार्य" भनलाई यस कार्यालयमा उन्मेधित शर्लक, निपटि, स्वयं प्रशिक्षण, सलाम Survey

Report, बोक्स्टर, कार्यालय तोक्को लोङ वा वर निर्माण सवन्नी समस्त सम्मोतितमा

एव मसला कार्यालयमा लोकल भएको अनुसूचीहरु समेतलाई सम्मान गर्न ।

(छ) "कार्य मूल्य" भनलाई पोकलाई भएको अनुसूची प्रति सुनिश्चित जोडाइन गर्न मूलमा ब. प्रतिशताले छुट गर्न अनुसूची २ मा उन्मेधित कामको लागि अनुसूची ४ मा उन्मेधित

गन बस्त २ सेवाको जमा मूलमा र. ९५,५५,३७५ एक करोड पने लाभ एकसहचरी

हजार पन्द्रह स्वयं सम्मान गर्न ।
"Annexes"

SSL PM, Technical & Procurement Guidelines

1.2 एक वर्षनया प्रोग्राम भएका शास्त्रीय व्यवस्थामा र व्यवस्थामा प्रयोग भएका शास्त्रीय एक वर्षनया अथवा प्रयोग व्रोजुन हुने ।

1.3 प्राविधिक शब्द तथा विषयको परिभाषा अनुसार १ मा परिभाषाप्राप्त गरिएको बमोजिम हुने ।
2. कामको कार्यरचना

2.1 कामको कार्यरचना गर्न साबूदाङ्गीपुरक दल जनशक्ति तपाईं द्वारा दिनीय पक्का सम्पत्ति गर्नु परेको भएको हो।

2.2 कामको कार्यरचना नेपाल सरकारको नियमावलीमा जस्तै: वैज्ञानिक उन्नाई प्रवेशको केन्द्र, पीछाताल उप-महानगरपालिकाको पूर्ण समवेत तथा निर्देशनमा समन्वय गर्नु परेको भएको हो।

3. कार्यक्रमको कार्यक्षेत्र (Scope of Work)

3.1 कार्यक्रमको कार्यक्षेत्र (Scope of Work) अनुसार र उल्लेेख भए अनुसारको हुनुको साथ निम्नलिखितको समेट हुनेछ:

(क) पीछाताल उप-महानगरपालिका नं. ६ लेकेलाई थिए शहिद निको देखि खुल्रोकीक सम्म अनुसार २ र ५ भए उल्लेेख भए समोक्षित वा प्रबन्ध पत्रवाट तोङ्गुको प्रारम्भिक सूचना लागाउँछ अनुसारको उपयुक्त दुरीमा ६६ रोजमा ६०० बतासी चर्चा र खुल्रोकीक सम्बन्धित जङ्गल गर्ने।

(ख) स्थापत्य गरीएको मध्य पोलड्रमा सोलोर प्लानल, व्याख्या र संग-लाईट तथा अन्य केन्द्रीय,राष्ट्रिय ग्रामीण सामाजिक ग्राम बनेको छ।

(ग) राखिएको सोलोर प्लानलहरूमा दिउँसो कम्प्युटर ५ पाउँ घन्टा दिनै प्रति लागिक लागिक आवश्यक भएकोले सडकका दुई किनाराको बाहरबी घाम छनौ तथा पोलड्रमा घरमा प्रबन्ध पत्रवाट निजीको घरको छतमा सोलोर प्लानल राखेर व्यवस्था मिलाउनु पने।

(घ) सडकका राखिएको सोलोउजः वि.वृत्तीय पोलड्रमा जमिन मुल्त १.३ देखि १.५ मिटर घराम गरी घाटू पने र जमिन साधन भार्य ७५ फुट उबाईमा हुन परेको। भिली स्थापत्य सेिपार वि.वृत्तीय प्रारम्भिक र दुर स्नातक अनुसारमा पूर्ण बनाउने सडकका राखिएको महत्त्व धारणा दिनै नजर र गरी पोलड्रमा उचाईमा १ मिटर सम्म धारण गर्न सकिनेछ।

(ङ) प्रबन्ध पत्रवाट पश्चिमाञ्चल प्रदेशको भुगतानको सम्म दिनै सम्म आवश्यक पने जङ्गल गर्न व मुनिपुराङ्गा, स्पार्ट प्लास्ट माल भएको र जङ्गलको नुसार सामाजिक रूपमा नवनिर्माण गरिएको गरी (यो समयको वजा मुनिका) द्वितीय पक्का समस्त कार्य पने।

5
३.२ सीय उर्जा संडक्कति जहाँको प्रामाण्यिक पवा अनुसूची ४ मा उल्लेख भए बमोजिम हुनै परेछ ।

४. काम शुरु र समाप्त हुनदै स्वरूपमा

४.१ यो समस्यातमा हस्ताक्षर भए शर्तमिति काम शुरु गरेको एकको अवसरको ६० दिनसम्बन्ध भौतिक रूपमा निर्माण स्थलमा द्वितीय पत्रले (बज्य जङ्ग) पोल गाड्ने श्रुति गरी सक्नु परेछ र विभ जहाँको काम सुचारु रुपमा चालू र राखि परेछ ।

४.२ कार बमोजिम हुनदै काय्र क्षेत्र [Scope of Work] को काम द्वितीय पत्रले २०७३ साल जेठ २० गते भित्र समाप्त गरेको परेछ ।

५. समय चर

५.१ निर्माण कार्य प्राप्तमा वा अन्तर समय अवस्था गरी समय वा पाउनको लागि द्वितीय पत्रले समिति नम्बराको काम समाप्त गरेको अवस्था १ (एक) महिना अगाडि विखिरि अनुरोध गरेको र विज्ञप्ती पर नयाँ समय पाउनु पनि समितिलाई मुनासित राखेको समय वा गरी भविष्यका विश्वास राखेको राखे ।

५.२ द्वितीय पत्रले कामु भन्दा वाहिको वृष्टि परिस्थिति (Force majeure) ले गरी लोकिको समय मिति काम समय गर्न नसक्ने भएमा द्वितीय पत्रले समिति समय वा परिस्थिति देखाई दिन्छ । समिति सो परिस्थितिलो आवश्यक समय वा गरी दिन्छ प्रयाश पस्ने सक्नेछ ।

५.३ समय वा भएमा अवस्थामा कार भन्ना गरी विश्वास छनै छनै ।

६. काम गर्ने तरिका

६.१ निर्माण कार्यका प्रयोग हुने वस्तु, मेधिन, शीर्ष, अथवा काम गर्ने तरिका अनुसूची ५ र ६ तो लोकिक बमोजिम र प्रामाण्य उपसामिति र अनुमान तथा निर्देशन उपसामिति विशेषत गरी श्रमीमा अनुपात पाउँछ । काम हिटों बा सुचारु रुपमा नबाहि रहेको कारणले लोकिको समय अवगत भएका काम गर्न सक्नेछ भने उपसामिति समितिलाई द्वितीय पत्रलाई आवश्यक निर्देशन दिन सक्नेछ ।
Annexes

7.2. Equipment Warranty, System Warranty, Warranty Claim Response, Warranty Exclusion, Repair or Replacement.

7.3. Warranty period 5 years, replacement parts 20 years.

7.4. Warranty of all materials and parts for 20 years.

8. All products are manufactured by the original manufacturer.

8.1. All products are manufactured by the original manufacturer.

8.2. All products are manufactured by the original manufacturer.

8.3. All products are manufactured by the original manufacturer.
9. निर्माणाधिक वस्तु तथा स्थानको सुरुक्षा तथा निरक्षण

9.1 परियोजनाको स्थानावरण गर्नु भन्दा पूर्व निर्माणाधिक वस्तु तथा जडान गरिएको सीधेउज्जम सुदक वस्तुको सुरक्षाको प्रवेद्ध द्वितीय पत्र स्वरूप समाय गरेको भएकोल।

9.2 द्वितीय पत्रले पर्याप्त सुरक्षाको लागि प्रथम क्षणलाई अनुरोध गरिएको प्रथम पत्रले पत्र आवश्यक योजना प्रस्तुत गरेको भएकोल।

9.3 निर्माणस्थल तथा निर्माणाधिक माल वस्तु प्रथम पत्रले वा प्रथम पत्रले क्षेत्रीय व्यक्ति जुनूनले बनेको पत्र वस्तु पत्र द्वितीय पत्रले समाय गरेको भएकोल।

9.4 जडानलाई आवश्यक पत्रले माल वस्तु गरिएको पोल गरिएको स्थानमा (खुसा या बन्द गोदाम) प्रथम पत्रले द्वितीय पत्रलाई उपलब्ध गरेको भएको तर भवनी गरिएको पोलको सुरक्षा आवश्यक गरेको द्वितीय पत्र स्वरूप समाय गरेको भएकोल।

9.5 पोल गरिएको स्थान बाटौका अन्तर सामान्य गरिएको स्थानको सुरक्षा एवं माल वस्तुको श्रेणी क्षेत्रमा भावनाको सम्पूर्ण क्षेत्र द्वितीय पत्रले जाप्लेको गर्नु पर्ने।

10. उप्रामिको समिति वा यसको प्रतिनिधिको अधिकार र कार्यवाच

10.1 कामको सम्पूर्ण रेखाउँछ गरेकोल।

10.2 काममा प्रयोग गरिएको वस्तु गरिएको पत्रले व गर्नु लगाउनु भएकोल।

10.3 स्पेशिफिकेक्षणमा उल्लेखित विवरण अनुसारको सामान्य गरिएको पत्रले व गरिएको सामान्य पात्राको प्रमाणित गरिएको पत्रले समेत सक्छ भएकोल।

10.4 निर्माण समग्र कामको रूपमा द्वितीय पत्रलाई मुख्यालयको लागि योजनापत्र समिति सम्पूर्ण निर्माण शाखालाई जाप्लेको।

11. कार्य सम्पादन

11.1 कार्य सम्पादन अनुसूची ७ मा तालिकाको समय तालिका अनुसूची द्वितीय पत्रले सुधारिएको राशि पत्ता गर्नु पर्ने।
# Financial Proposal for Solar Street Light for Lakeside, Pokhara

<table>
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<tr>
<th>S.N.</th>
<th>Item Description</th>
<th>Qty</th>
<th>Unit</th>
<th>Unit Price, Rs.</th>
<th>Total Amount, Rs.</th>
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<td>1</td>
<td>Supply, Installation &amp; Commissioning of PV street light having solar module 150 Wp, GEL Tubular plate battery 100Ah, WLED lamp 40 watt including 20A charge controller, 8 meter GI pole, Battery box, PV module structure, Arm for light, installation materials etc. all complete as per technical specifications, including packing and forwarding, loading, unloading charge, required civil works and cost of transportation, insurance, training, regular maintenance for 1 year and warranty services for 5 years complete.</td>
<td>101</td>
<td>set</td>
<td>120,490.00</td>
<td>12,169,490.00</td>
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Total (note that VAT is not applicable for Solar PV Systems), Rs. 12,169,490.00

Especial discount, 5% 608,475.00

Net price for New road 11,561,015.00

Net Price in words: Eleven Million Five Hundred Sixty One Thousand Fifteen Rupees only.

**Note:**
As agreed, Suryodaya Urja shall be compensated by Rs. 1,104,233.00 (One Million One Hundred Four Thousand Two Hundred and Thirty Three Rupees only) to cover the increase in cost due to depreciation of NRs. against United States Dollars over the one year period from the date of submission of proposal and signing of contract.

Approved: 
Suryodaya Urja Representative: 
Designation: 
Signature & Date: Jan 4, 2014
14. सम्बंधितका अवधिमा समाप्त हुनु भन्दा ५ दिन अगाडि प्रथम पक्ष र द्वितीय पक्षको प्राथमिकताले संयुक्त रूपमा विवरण लागू र पाठपुजारहरूको अवस्था प्रमाणीकरण गरी परियोजना हस्ताक्षर गरी निरुपित गरिनेछ।

15. प्रमाणीकरणका तथा चेक जाँचका गर्न सर्चना तथा पाठपुजारी विवरणी या काम गर्न नयाँका अवस्थाहरूको पाठभाग द्वितीय पक्षले तुलना मात्र सम्मल गरी दुरुस्त पानु पनेछ।

16. इजाैजत तथा अनुमति

16.१ प्रविष्टि कानून बमोजिम कामको लागि चाहिए नेपाल सरकार, स्थानीय विकास, नियमन निकाय तथा अन्य सरकारी निकायको इजाैजत तथा अनुमति तथा आपूर्ति तथा सम्बन्धितका सम्मूल्य इजाैजत तथा अनुमति योली दुवै पक्षको महत्त्वमा गरिनेछ।

17. विषयपत्र तथा व्यापारिक प्रश्नावर प्रसार

17.१ सौंपर्न देखि पत्रहरूको द्वितीय पक्षले आफ्नो व्यापारिक प्रश्नावर प्रसार तथा विषयपत्र गर्न पाउँदै।

17.२ प्रथम पक्षले सौंपर्न देखि पत्रहरूको विस्तार, व्यापारिक प्रश्नावर प्रसार, लागातारको कार्यक्रम प्रयोग पनेछ र सोंपर्न लागि सुहाई देखि प्रश्नको प्रेम पॉल्या जडाइँ गरु पनेछ।

17.३ वस्तु सम्बन्धित अन्य व्यवस्था प्रचालित नेपाल कानून बमोजिम हुनेछ।

18. विवाद समाधान र आकृष्टि हुने कानून

18.१ प्रथम पक्ष र द्वितीय पक्षको शीर्षक वाक्य चालू रहेको अवस्थामा वस्तृ वर्गनु हो या कामको सक्रियता गर्न गरी भनेला सभूत प्रबन्ध भएप्रे प्रावधा भएको तर्क उल्लेख गरी एक पहाड़ बनी पत्तालाई सुनिश्चित गरिने दुवै पक्षको व्यवस्थापन पसारत बनी ३० विनिमेत्र आफ्नो सम्बन्धितका विवाद दुकाइकोै। विवाद दुबै नलाऎकोम द्वितीय पक्षले वस्तु सुधार रहेले बालू राख्नु पनेछ।

18.२ आप्रैल सम्बन्धित विवादको निपटारा हुन नसकेमा विवाद निपटारको लागि २ सदस्यीय महस्त्र दुस्रौं पाठलाई गठन गरिनेछ। महस्त्रको नियुक्तको लागि एक पहाड़ बनी पत्तालाई
बसको सुचना दिन परिवर्तन गर्ने पश्चात् १५. काख् दिन विशेष महत्त्व निर्दिष्ट विज्ञापन निर्देश गर्ने अन्तर्गत सक्षमता निर्देशकको कार्यालयमा अन्तर्गत सक्षमता विभागको कार्यालयमा अवलोकन गर्ने अधिकार प्राप्त हुनेछ।

१५.३. माध्यमकको विषय स्थलमा र दुवै पश्चाती माध्यम प्राप्त हुनेछ।

१५.४. माध्यमकको काम कार्यक्रम पूर्ण गरिएको हुनेछ।

१५.५. बस कार्यक्रमको विषयक चित्रपत्र संग्रह कार्यालयमा अवलोकन गर्नेछ।

१६. कार्यक्रमको उल्लब्धित तथा समाप्ती:

१६.१. बस कार्यक्रम बुझ्दै पश्चात् आफूले पुरा गर्ने पर्ने शर्त दाखिल पुरा नगरमा कार्यक्रम उल्लब्धित भएको मानिनेछ। कार्य उल्लब्धितको विषयको समेत यस बिचार भएको मानिनेछ।

१६.२. कार्य उल्लब्धित भएको कारण बुझ्दै एक पश्चात् सहभागी पत्रकार सहभागी भएको सुचना दिइने कार्य र गरिएको सुचना दिन तयाःप्रस्तुत हुनेछ।

१६.३. कार्य उल्लब्धित भएको अवस्थामा प्रकाशित कार्य समीक्षकमा उच्चार प्राप्त गर्ने अधिकार दुवै पश्चाती मानिनेछ।

१७. सुचना दिनेको बिचार:

१७.१. एक पश्चात् सहभागी पत्रकार पत्रकार बुझ्दै सुचना जताउँ यस लिखनमा बुझ्दै थप्दै केही निर्देशना वा वाक्यात्मक बुझ्दै वा स्वीकार गर्ने पत्रकार सहभागी बुझ्दै केही निर्देशना यस लिखनमा बुझ्दै थप्दै केही निर्देशना निर्देशना वा बुझ्दै।

१७.२. विषयस्तो बिचार माध्यमक बुझ्दै सुचना प्राप्त गर्ने पश्चात् पत्रकार सहभागी बुझ्दै पत्रकार सहभागी बुझ्दै थप्दै केही निर्देशना यस लिखनमा बुझ्दै थप्दै केही निर्देशना निर्देशना वा बुझ्दै।

१७.३. कुनै पत्रकार पत्रकार वर्तमान स्थानमा थप्दै सुचना पत्रकार सहभागी बुझ्दै पत्रकार सहभागी बुझ्दै सुचना एक पश्चात् सहभागी पत्रकार दिन परिवर्तन।
20. तथा बिमा सम्बन्ध त्यस्ता

20.1 परियोजना क्रममा कामकारोंनले क्रममा प्रथम पक्ष, अर्थात् युद्ध ठायी पक्ष वा द्वितीय पक्षको कामबाट कम्युनिस्टलाई हुन जाने या रूपमा नॉक्फ तथा अन्यत्रमा प्रथम पक्ष विविधतार हुँने छ।

20.2 परियोजना क्रममा काम गर्नेका भएका हानी नॉक्फालाई निम्नता हजारा, भर्ने तिनौ बुकाउनु पनि भएरा। द्वितीय पक्षले यसलाई राख्नु पनि थिए।

20.3 यस कारण वर्मोजिम सम्बन्ध गर्नु पर्ने कामको पत्रको प्रमुख नेपाल कानून वर्मोजिम गर्नु पर्ने सम्पूर्ण बिमा मुख्य द्वितीय पक्षले गर्ने राख्नु पनि थिए।

20.4 वर्मोजिम सम्बन्धका क्रममा नेपाल गर्नु उपलब्ध ख्यानमा राख्नु पनि हुनेछ।

21. नेपाल सरकारको बुकाउनु पनि कर शुल्क तथा दर्जामा

21.1 यस परियोजनाको संदर्भमा तथा परियोजनाको जडाउ भएको वा जडाउ हुने सारल बस्तुको माध्यम सरकारको बुकाउनु पनि कर शुल्क तथा दर्जामा द्वितीय पक्षले गर्नु पनि हुनेछ।

21.2 द्वितीय पक्षले तेजस्वी सरकारको आवश्यक जानकारीको पत्रको तालिका त्यसमा नेपाल सरकारको तिथिक समस्त पेश दाखिल गर्नु पर्ने विवश्यन पेश गर्ने अध्यायाधिक गरि राख्नु पनि हुनेछ।

22. विविध

22.1 यस कारणमा उल्लेख भएको समस्त वा यस कारण वर्मोजिम दिऱ्रेको र यस समाधिक द्वितीय पक्षले काम समाप्त गर्न सामेका कारण मुद्यको ०.५ प्रतिशत प्रतिदिनको दरले जरिपाला तथा हजारा क्रममा द्वितीय पक्षले प्रथम पक्षको बुकाउनु पनि हुनेछ।

22.2 CIG वातावरण गरिएको वोल्परको क्रममा पेश गर्नका प्रतिविधिक तथा अध्यायक प्रस्ताव र लघुमा भएको परिमाणको तथा यस कारणमा सूचनाको रूपमा मानिनेछ।

22.3 सीयं सहकर बित्त व्यवसायको सहभागिता आकारण गरिएको वोल्परको क्रममा द्वितीय पक्षले वोल्परक कम्युनिस्ट सँग एक यस अग्रेको भएको र सीयं अध्यक्ष अमेरिकन इलेक्ट्रो मुद्यको बुकाउनु पनि यसलाई मुद्यको नेपाल राष्ट्रीय विभाग तर क्रममा यसलाई १५ दिन तर प्रतिविधि 15.24 मानिने।
ब्राह्मण भएकोले त्यसलाई समाबोधण गर्दा कार वस्त्रमा एक मुट्ट रु. ११,०६,२७५ एघार लाख बार हजार दुई सवा सय सुप्राकार गर्ने प्रथम पक्ष महत्त्व भएकों सोही यमोतिनको रकम प्रथम पक्षले दितीय पक्षलाई मुख्यार्थ गरेउँ पनि गरेछ।

२२४ बस कार्यालयामा जागरूकता परिवर्तन तहुबमो वर्गमा समृद्धिको कुनै तथ्यर हुँदै पक्षको सहभागिताका आवश्यक सङ्गठन, हरफर बा परिवर्तन गरी साकेतौँ।

२२५ प्रथम पक्षको विशेषता र सहमति बेवर यो कार्य यमोतिन समस्ता सघेन निमाण शायदोको लागि अति कुनै पक्षसंग समृद्धि गरी दितीय पक्षले काम सुमो गराउँ भएको।

२२६ निमाणको संदर्भमा अन्य सरोकारवाला निकायबाट संगको समन्वयको लागी प्रथम पक्षले सहयोग गरेमौँ।

२२७ सीएमजिबिङ्ग कॉन्ट्रोल संचालन गर्ने व्यवस्थाको लागि समावेशमा पटक पटक सङ्गम भौरै यसले परिवर्तन क्षेत्रमा हेमा १३ वटा CCTV संचालन रु.६०,००० हजार लाख बार एकल बजारको सय भएको दितीय पक्षले दितीय पक्षले गर्ने समन्वय सहृदय प्रस्तावना तारार गरी लागि खर्च रकम रु. ६९,६५,००० हजार लाख अभिलाषा हुइँदै।

२२६ बस कार्यालयामा उलेख यस्तो पक्षको खुलेता सीयब बंड व्यवस्थापन समिति पक्षको कार्यकाल २०७० तथा प्रतिकाल नेपाल कानून व्यमोतिन हुँदै।

(यो नेपाल रहेको पुष्प आसपासको खाली छाडी हस्ताक्षरको खान गयसबिङ्ग रहेको?)
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शाखी |
| नाम: पद: प्रबंध निर्देशक संस्था: सु.उर्जा प्रा.प्रि. दस्तखत: |

यो कारार हाम्रो सहभागिता तयार भई हामीहरु (पोखरा उर्जा वाणिज्य संघ, नयाँ सड़क सुदार समिति)को रोहितहरू दुर्गे पाहने हस्ताक्षर गरेको हुन।

पोखरा उर्जा वाणिज्य संघको तर्फबाट |
| 1. नाम: पद: अध्यक्ष दस्तखत: |
| 2. नयाँ सड़क सुदार समिति को तर्फबाट |
| नाम: पद: अध्यक्ष दस्तखत: |
Annexes

अनुसूची - ९

परिभाषा (Definition)

1) Solar Street Lighting System (SSLS):

SSLS shall mean entirety of solar street lighting system including metal GI pole, Solar Photovoltaic (PV) Module, charge controllers, storage battery, LED lamp set, PV meal frame, wires and other elements installed in the nature of the work as further described in “Scope of Work” and in accordance in “Technical Specifications”. A stand-alone solar street light does have all the components mounted in a single pole and that are not connected to the other electrical utility system. In solar street lighting system, solar PV module shall be mounted on the top of the metal pole avoiding shadow, whereas the battery and electronics should be fixed inside the weatherproof box on the same pole.

2) Solar PV Module (or Panel):

Solar PV module is a device that converts sunlight into electricity when it is disposed into the sun light. The form of electricity produced by solar PV module is of Direct Current (DC). The solar PV module capacity is measured in Watt-Peak (Wp).

3) Peak Watt:

A unit used to rate the performance of solar module. Maximum nominal output of a photovoltaic device is measure in watts (Wp) under STC.

4) Standard Test Conditions (STC):

Standard Test Condition is defined as 1,000 W/m² solar radiations in the plane of the array, 1.5 air-mass ratios and 25°C cell temperature.

5) Solar Battery:

A battery is used to stores electrical energy for supplying to electrical appliances when there is a demand. The form of electricity stored and supplied from battery is of DC. Two or more electrochemical cells are enclosed in a container and electrically interconnected in an appropriate series/parallel arrangement to provide the required operating voltage and current levels. The battery capacity is measured in Ampere-hours (AH). The battery type recommended for using in solar PV system is deep cycle battery because a deep cycle battery is specifically designed to be discharged to low energy level and rapid recharged or cycle charged and discharged day after day for years.
6) Ampere-Hour (Ah):
A measure of the flow of current (in amperes) over one hour; used to measure battery capacity.

7) Solar Charge Controller:
A component of a PV system that controls the flow of current to and from the battery to protect it from over-charge and over-discharge is called solar charge controller. Solar charge controllers are rated in Ampere. The commonly available technologies are Pulse Width Modulation (PWM) and Maximum Power Point Tracking (MPPT) controllers.

8) Solar LED Light:
LED stands for Light Emitting Diode, and a solar LED light consists of number of LED units in a single lamp set. The LED lights are rated in Watt at the required voltage level.

9) Color Rendering Index (CRI):
It is measure of degree of color shift that objects undergo when illuminated by the light source as compared with those same objects when illuminated by a reference source of comparable correlated color temperature. In general, a lower CRI indicates that some colors may appear unnatural when illuminated by a lamp. Color rendering is measured on an index from 0-100, with natural daylight equal to 100. The calculated rendered color of an object. The higher the CRI (based upon a 0-100 scale), the more natural the colors appear. Natural outdoor light has a CRI of 100.

10) Lumens per watt (lm/W):
The amount of light a light source produces for each watt of electricity consumed.

11) Pulse Width Modulation (PWM):
It is the most effective means to achieve constant voltage battery charging by switching the controller’s power device. In PMW regulation, the current from the solar array tapers according to the battery's condition and recharging need.

12) Commissioning:
"Commissioning" shall mean the set of tests and procedures performed on the Solar Street Lighting Systems as described in Annex-IV (अनुगृही या Y).

13) Site:
“Site” shall mean that area or areas where the materials and equipment for the Solar Street Lighting System (as described in the Scope of Work) shall be installed and/or used to perform the Work.

14) Scope of Work:
“Scope of Work” shall mean the Work to be performed hereunder by Second Party, and/or, pursuant to the Scope of Work, attached hereto as Annex-II (अनुसूची - II), and in accordance with the terms and conditions of this Contract.

15) Specifications:
“Specifications” shall mean such references, materials, methods, design and engineering requirements, safety requirements and other such standards of workmanship and materials as described in Technical Specification Part.

16) Support Structure:
“Support Structure” shall mean the rooftop, ground-based pole mounting system, elevated structure or tracking system that will hold the solar Photovoltaic (PV) modules and required components of the Solar Energy Generating Facility on the Site, and all supports thereto.
Annexes

कार्यक्षेत्र (Scope of Work)

Turnkey Services:
Second Party will provide electrical, structural or other required engineering drawings, procure all necessary materials and install the photovoltaic modules, electrical wiring and components including battery, LED Lamp set, charge controller, electrical connection to the existing site, and construction of mounting (including GI metal poles) structures on which the photovoltaic modules are installed (in some cases the LED lamp will be installed on the pole but the solar module on the shadow free location as indicated in the site survey report). Second Party shall commission the complete sets of SSLS at the identified feasible locations.

Second Party shall perform the Work, in accordance with practices generally accepted in the solar technology, all applicable laws, government approvals and permitting requirements, and quality control and inspections so that the SSLS is installed in accordance with manufacturer’s specifications and are safe and adequate for their intended purpose and conditions.

Feasibility Inspections and Site Assessment:
Prior to the SSLS installation, Second Party shall do the site verifications and other inspections of the site to determine that the site can support the installation of the SSLS, without further modification to the site itself. The site verification report of roof mounting solar PV systems should be submitted by the second party based on the previous survey and present status.

The preliminary design, drawings and materials shall be based on technical specifications approved by the First Party.

Access to Site:
First Party will work with the Site Host to make available to Second Party access to the Site for the purposes set forth herein; provided however, that Second Party acknowledges that the Second Party’s employees, agents, contractors and representatives shall abide by all requirements of Site Host for the access and security of the Site.
Construction and Installation:
Prior to beginning construction, Second Party shall also provide to its First Party with a copy of Second Party’s safety plan during the construction. First Party will apply for all permits necessary for development, construction, ownership and operation of the Solar Street Lighting Systems (SSLS).

Second Party will assemble, construct, and install with its own forces and/or with subcontractors: (but by the prior approval from the First Party) the following Work:

a) *Prepare the site:* On rooftop mount PV or pole mount PV systems remove excess debris.

b) Second Party will coordinate with First Party and Site Host when earth work is performed for pole foundation, when major shipments are planned, or any other activities that might impact the Site Host’s business operations.

c) Pole mounting, DC Wiring, Junction Boxes, Conduit, trenching etc.

d) PV Modules fixing & mounting, foundation work, elevated structure, etc.

e) Battery and battery boxes attaching to the GI pole, LED light sets with its housing, charge controllers and accompanying supports and/or concrete pads

First Party, at its sole discretion, may randomly select PV modules for quality verification testing. The costs of such verification testing shall be the responsibility of First Party.

Material Purchase:
Second Party will purchase and furnish to the each site the following material without limitation and as appropriate per the Technical Specifications:

a) Components (Nuts, Bolts, Clamps, Conduit, etc.)
b) 150 Wp Solar Photovoltaic Modules, having PV Cell Efficiency ≥ 17%
c) Galvanized (GI) Metal Poles of total length 9 meter, having 100 mm diameter (or 4 inch) at the lower section with minimum 4 mm thickness. Likewise, 75 mm diameter (or 3 inch) at the upper section, as well as the water proof battery box and its support structure
d) LED Lamp Arm(s) and PV module mounting frames those are galvanized
e) Necessary DC wiring
f) Necessary protection mechanism
g) 100AH@12V Solar Deep cycle VRLA Positive Tubular Plate GEL Batteries
h) 40 Watt, 12Volt LED Light sets with its complete housing, waterproof
i) Integrate the 20 Ampere Solar charge controllers with intelligence controllers capable of operating solar LED lamp for 6 hours with full capacity and another 6 hours with 50% of its rated capacity.

j) All materials related to the drainage system on both sides of the street

k) All other Balance of System (BOS) components, parts, products and materials to complete the construction of the SSLS in accordance with the Contract.

The material will arrive on to the Site as to not delay the completion of the project. Second Party will provide flash test data for all modules to First Party upon procurement of modules.

If the SSLS is in whole or in part pole mounted, or materials shall be stored on-site during construction, prior to the arrival of equipment and materials at the Site, the Second Party shall take responsibility of storing goods and its security.

Commissioning:

a) Commission the completed system in accordance with the Commissioning Tests and Procedures in Annex-V (जानकारी - 5) to verify that the system is functioning as expected within acceptable parameters and as designed at a nameplate capacity.

Final Completion:

Prior to final completion, Second Party will perform the following tasks without limitation

a) Train First Party (or First Party’s selected personals) in the operation, and recommended O&M, of the Solar Street Lighting Systems

b) Provide First Party with copies of all O&M manuals and warranties for System. Any and all O&M manuals for the System shall include warranty cards for all System equipment signed by Second Party.

c) Train First Party for regular operation and maintenance of solar street lighting systems.

Spare Parts:

The company shall make arrangement to maintain a sufficient stock of essential spares and consumable spare parts to ensure proper maintenance of the system promptly within warranty period and beyond. Advance notice should be given by Second Party in the event of hardware components ceasing production. The Second Party shall also provide at least one set of necessary tools for proper operation and maintenance of SSLS after installation.
I. General Technical Details

a) Design/Engineering Requirement:

Second Party is responsible for all project engineering jobs. The Second Party is required to produce the design requirements (pole mount single arm, pole mount double arm and roof mount), engineering drawing of each types systems before erection. Other design requirements are as follows:

- Proposed systems will have a shade free window of at least 5 sunshine hours during peak solar time of the day, throughout the year.
- A final site assessment is required to confirm/verify the locations of street lighting poles and existing rooftop or ground mount systems which shall be in line with the previous site survey carried out by first and second party. The Second Party will consult First Party in case of any community mobilization requirements before or during the system installation at the site.
- 15 degree minimum light arm tilt (as required by the surface to be illuminated), unless otherwise approved by the First Party.
- 30 - 45 degree PV module Tilt Angle (tilted towards south direction), unless otherwise approved by the First Party.
- The exact layout and drawing of the number of PV Panels, batteries, charge controllers and LED lamps must be shown clearly for each SSLS type.
- Unless located in the waterproof enclosure of well Aluminium Spray painted or fibre glass box for solar batteries & all electronic components shall be protected by an enclosure structure from direct sun, rain and the elements.
- No signs or nameplates will be posted by Second Party on the Solar Street Lighting System (SSLSS) poles until approved by First Party.
- The solar street lighting systems will be stand-alone systems having energy storage in the individual batteries. The system will be of 12 Volt DC (Direct Current) with the minimum power losses in the system cables. The voltage drop within the cable shall not exceed 3%.
Annexes

- All conduits shall enter enclosures from below and provision for oxygen circulation as well as box should be waterproof.
- All junction boxes and portion containing electronics are to be sealed and made watertight for the outdoor installation.
- The street lighting GI pole going below the ground level should be minimum 1.3 to 1.5 meter of the total length and to strengthen the vertical pole necessary concreting has to be done.
- The LED light Arm attached to the GI Pole should be moveable (provision of tightening nut and bolt) to the horizontal directions so that it could be focused on the area required to be illuminated on either side of road or pavement.
- For the Pole mounted system, the solar PV module shall be mounted on the top of the erected GI pole structure and the battery enclosure mounting height will be about 5 meters from the ground level for the security/safety reason.

b) General Drawing Requirements:

- The Engineering Design Package shall be included complete system package design with 9 meter GI pole with concreting, PV module, battery and battery box, combiner box if any, LED Lamp and charge controller layout using a structured naming system.
- A list of those changes made from the original proposal with the reasons thereof (either it is due the requested from First Party side or due to the Second Party's equipment manufacturer side).

c) The Second Party should install Solar Street lights according to the survey made by both First & Secondary Party, which is depicted in the Annex-8 (लक्षात्मक ओ ७)

d) The solar street light poles will be mounted on both side of the street where there are shops and business houses on both sides. Alternate poles will be erected at the opposite side of the street. At each side of the street distance between two poles will be around 40 meters but this may be large or shorter depending on the installation location (as per the site survey report in the Annex-8). In this case, in between the two poles at one side there shall be another pole on the other side of the street. In case of Lakeside, where the shops are located only on one side the lamps will be installed only to that side in which case the distance between two poles shall be around 30 meters.

e) The orientation of the lights should be in such a way that there shouldn't be shadow in between the two lights falling on the street.
f) The pole mounting shall be done by taking care of the drainage system underlying in the both side of the street or road. The Second Party will take consent from First Party for each pole mounting; this may be done at one time for all the poles or for an individual pole basis.

g) In general, the solar street lighting system should be stand-alone type, with the solar PV module (or array), solar battery, solar charge controller and LED light set mounted on each pole. However, as per the site survey result there will be two types of solar street lighting system installations. The first one is for the location where there is no shadow on the proposed PV mounting GI Pole head, at least for 5 peak sun shine hours of a day. In this case the PV module will be mounted on the same GI Pole. As indicated in the site survey report, there are some poles having double arm and require double amount of energy production for the two lights operation. The second one is for the locations where shadow is identified on the proposed PV mounting GI pole head. In this case, the PV module shall be fixed on the adjacent building roof where there will not be shadow for at least 5 hours a day. However, for both type of system installation, solar LED light set and a water proof box (containing battery and electronics) will be mounted on the GI pole itself. In certain case at Lakeside, the PV modules will be mounted on the adjacent poles rather than roof to avoid shading and wire loss.

h) For PV roof mounting type installations, Second Party is to note that structural blocking, if required, and any additional costs of cables, connections and PV module metal structures are included in the project cost.

i) The solar street lights should operate with full illumination (@full power consumption) for the first 6 hours during evening and it should operate with reduced illumination (@50% power consumption of the rated power) for the remaining 6 hours of the night.

j) The Solar LED light colour delivered to the streets should be of natural warm (yellowish/orange) colour, as requested by the end users and the First Party.

k) The Second Party shall submit a system layout detailing the tilt and azimuth of at least one pole mount and one roof mount type system, the location of light Pole, PV modules, solar battery(s), and other major electrical or mechanical sections of each pole and roof mount systems.

l) Any equipment – such as Battery, LED Lamp and Controller that is required to be factory tested shall be accompanied by the results of those factory tests, and further those results will be submitted as a part of the close out documents.
m) The Second Party shall submit preliminary bill of materials detailing solar module, solar charge controller, solar LED Light set, solar battery, and all other major components make and model number as indicated in the Annex-IV (अनुसूची - V).

II. Technical Specifications of Equipments

1) Solar Photovoltaic (PV) Module
   a. The rated power of the solar PV module should be 150 watt-peak (Wp)
   b. The solar PV module should be of Poly-Crystalline Silicon
   c. The PV Cell Efficiency should not be less than 17% at STC
   d. The Vmp of the solar power output shall be at least 18 Volt
   e. PV Module should be certified by IEC 61215

2) Solar LED Lamp Sets
   a. The LED light set should be of size 40/Watt
   b. The street light set should be compatible to the 12 Volt battery system
   c. Light output should be of minimum 100 Lumens per watt
   d. View angle of individual LEDs shall be greater than 120 Degrees
   e. The CRI of the lamp should be more than 70
   f. The light fixture should be water proof or of IP65 standard
   g. The lifespan of the LED should be minimum 50,000 hours
   h. All the LED Lamp housing shall be of weather proof and provision for the ease repair and maintenance.

3) Solar Deep Cycle Batteries
   a. The nominal battery voltage of each battery should be 12V
   b. The energy storage capacity of each battery should be 100 Ah@C10
   c. The battery should be of Tubular Plate Gel (maintenance free) type deep cycle

4) Solar Charge Controller
   a. The solar charge controller should be of 20Amper capacity at 12 volt system
   b. The charge controller should be of Microprocessor controller type
   c. The rated power of the charge controller should be matched with System input and the solar battery.
d. The charge controller should be of Pulse Width Modulation (PWM) technology.
e. The intelligence controllers should operate each LED light set for 6 hours with full capacity and remaining 6 hours with 50% of its rated capacity.
f. The controller should have in-built circuit for the night light management.
g. The solar controller may be fitted either inside the LED lamp housing set or installed separately inside the water proof battery/controller box.
h. The controller should have three-stage battery charging including bulk, absorption and float charging.
i. The charge controller should protect battery from over charge and over discharge.
j. The controller should have safety features for short circuit, reverse polarity and low voltage disconnect.

5) Galvanized (GI) Metal Pole
   a. The total length of the light pole should be at least 9 meters.
b. The solar street light pole should be hot dip galvanized (GI) for the corrosion resistance standard.
c. The diameter of the pole should be minimum 100mm (4 inch) and thickness 4 mm (at the bottom) and 75mm (3 inch) at the upper section.
d. All other metal parts of the system, such as battery box, should also be rust free or corrosion free painted or protected from environmental corrosion.
e. There should be space for advertising on the pole.
f. The GI metal pole should withstand wind speed of 170 Km/hr.
g. Detail fabrication drawing of GI Pole with support structure shall be submitted by the Second Party.

6) Other BOS Materials
   a) Second Party shall use UV protected cables wherever need to be exposed to sun light. For underground cabling requirement, armoured cables shall be used.
b) All connectors and DC conductors will be rated for 12 Volts system, and cable loss of no greater than 3%.
c) Materials for the electrical system safety
### List of Equipments and Services

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Item Descriptions</th>
<th>Size</th>
<th>Make/Model</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Solar Photovoltaic Module, Polycrystalline</td>
<td>150 Watt-Peak</td>
<td>Komaes</td>
<td>101</td>
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<tr>
<td>2</td>
<td>12 Volt Gel Tubular Plate Battery</td>
<td>100Ah@C10</td>
<td>Exide</td>
<td>101</td>
</tr>
<tr>
<td>3</td>
<td>12 Volt LED street light set</td>
<td>40 Watt</td>
<td>THOE</td>
<td>101</td>
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<tr>
<td>4</td>
<td>Solar Charge Controller (can be fitted with lamp housing)</td>
<td>20 Ampere, 12 Volt</td>
<td>Landstar</td>
<td>101</td>
</tr>
<tr>
<td>5</td>
<td>Galvanized (GI) pole 9 meter, waterproof or rust free painted battery box, GI or AL module frame and GI Arm for lights</td>
<td>9 meter length, 100 mm diameter and 4mm thickness at the bottom</td>
<td>Locally Fabricated GI Pole</td>
<td>99</td>
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<tr>
<td>6</td>
<td>Other Balance of System (BOG) required for complete installation</td>
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<td>101</td>
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<tr>
<td>7</td>
<td>Civil Construction and concreting of GI pole</td>
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<td>99</td>
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</table>
Overview:
Second Party's Engineer/technical team will perform a complete commissioning of the solar street lighting systems, following the Commissioning procedures as well as other standard tests, inspections, safety and quality checks, and documented on the form below. All testing and commissioning will be conducted in accordance with the manufacturer's specifications.

These commissioning testing procedures for PV systems and major components are intended to determine system performance to the specification. The tests are designed to verify that the system, as installed, is safe for personnel as well as equipment, and to establish or verify system operation. The tests shall be used to determine actual post-construction operational, performance, and safety characteristics.

SOLAR STREET LIGHTING SYSTEM TEST RESULTS

Host Customer Name __________________________ Site Name________________________

SSLS Address (Municipality, Street Name, Ward No) ______________________________

SSLS Size (Watt @DC-STC);____________________________________________________

Commissioning report submitted by:____________________________________________

Second Party Name:____________________________________________________________

Time and date of commissioning________________________________________________

Weather at time of commissioning______________________________________________

Record and document battery serial number and battery location____________________

Record and document PV Module serial number and module location________________
Record and document LED Lamp serial number and LED Lamp location__________________________________________

This checklist is a guide to establish post construction SSLS operation, performance and safety. The local authority having jurisdiction or inspector has the final say on what is or is not acceptable.

PV MODULE/ARRAY

Complete each item on the checklist below, check the box to the left of the item when it is complete

☐ all debris has been removed from roof or ground
☐ Photos of Sample PV Modules and the street lighting GI Poles
☐ Inspect all roof penetrations and pole mounted structure (ensure conduits and structural brackets are properly sealed/waterproofed)
☐ DC Electrical Safety signs specified in the plans are in place
☐ Check that the junction boxes are properly labeled
☐ Check that the solar modules are secured to the mounting system
☐ Visually inspect the module or array for cracked modules
☐ Check to see that all wiring is neat and well supported

WIRING TESTS

☐ Check the polarity at each section of the system: solar PV module, solar battery, solar charge controller and the LED lamp set.

BATTERY TEST

☐ Individual battery voltage checking and recording, to identify the state of charge of the batteries.
☐ Be sure that the power source (PV module) is connected to the battery after doing all other connections with the LED Lamp and controllers.
LED LAMP TEST

- Make sure that all the LEDs are glowing inside the Lamp housing.
- Test the total LUX delivered by the LED lamp on the road, with the help of LUX meter.
- Check the current (Ampere) consumption of the LED lamp set at the normal operating voltage.
- Make sure that the power consumption of the LED lamp will be reduced by 50% after the operation of certain time (in this case, after 6 hours of operation).

ONSITE MONITORING SYSTEM COMMISSIONING
(Visit to the individual solar street lighting units installed in both sites of Lakeside Street for this section)

- Check PV Module connection with the controller and thereby the battery.
- Check the LED Lamp set connection with the charge controller and the battery storage unit.
- Analyze the PV module orientation and tilt angle. Likewise the LED light arm orientation and tilt angle.
- Visualize any shadows in between the two lamps illuminated surface on the ground level. Also test the illumination level on the pavement area as well as on the main street/road using LUX meter.
Warranty/Limitation of Liability

Equipment Warranty:
- The solar LED light set should cover 5 years warranty against defects in material and workmanship.
- The Solar PV module warranty should cover 10 years operation at 90% power output and 80% power output for 25 years. It should also cover 5 years performance warranty against defects in material and workmanship.
- The solar Deep Cycle Tubular GEL battery should cover 5 years warranty against defects in material and workmanship.
- The solar charge controller/regulator should cover 5 years warranty against defects in material and workmanship.
- The GI pole should be able to withstand resistance to 20 years to environmental conditions such as wind and rain.

System Warranty:
Second Party warrants and guarantees to First Party that, for the duration of the period commencing on the date of the Commissioning and continuing for a period of 1 years from such date (the “System Warranty Period”), all Work will be substantially free from defects in design, workmanship, materials and equipment shall be in accordance with Manufacturer’s Warranty.

Warranty Claim:
First Party may request inspection of the Solar Street Lighting System by making a claim under this warranty. To make a claim, First Party must:
- Identify a performance threshold warning or a fault condition in the SSLS.
- Conduct preliminary troubleshooting in accordance with the Operations and Maintenance Manual.
- Contact Second Party’s Service Manager or designated support person.
- Perform reasonable troubleshooting of the SSLS requested by the Second Party Service Manager or designated support person.
- Notify Second Party Company in writing, through paper or electronic correspondence, including electronic mail, that service is requested in response to a claim under this warranty.
Second Party's Response:
Second Party will respond to a claim under this warranty by acknowledging receipt of a written service request within twenty-four (24) hours following receipt of a service request and providing First Party with an action plan to remedy the defect within three days following receipt of the service request. Second Party will complete repair or replacement of the defect in accordance with the action plan no later than the 10 days following receipt of the written service request subject to the availability of replacement parts from Second Party's supplier. If it is determined that the First Party's written service request is out of warranty period, First Party will be liable for any reasonable labour and material expenses incurred by Second Party. In this case, Second Party will invoice First Party for any reasonable labour or material expenses incurred.

Warranty Exclusions:
The warranty provided herein does not cover damage, malfunctions or service failures caused by:
- Failure to follow Second Party's operation or maintenance instructions as defined in the Operations and Maintenance Manual.
- Repair, modification, or movement of the SSLS or components thereof by someone other than a service technician approved by Second Party.
- Abuse, misuse, or negligent acts.
- Damage or deteriorated performance of the SSLS caused by lightning, fire, flood, extreme weather, pest damage, actions of third parties and other events or accidents outside First Party's reasonable control and not arising under normal operating conditions.

Repair or Replacement:
The sole and exclusive remedy for proven defects under the warranty period of one year shall be replacement of the defective Work at Second Party's sole cost and expense. At Second Party's option, an alternative remedy shall be prompt rework or repair of the equipment and/or component to remove any defect at Second Party's sole cost and expense. First Party shall give Second Party prompt written notice as soon as practicable following discovery of any defects.
## Work Schedule

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<th>Tasks</th>
<th>Week 1</th>
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<td>Installation of Street Lamp pole with panel recording structure, battery box and art</td>
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<td>Commissioning of solar street lamp setup</td>
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<td>Commissioning &amp; handover</td>
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Annexes
अनुसूची - ५
सर्वेक्षण प्रतिवेदन (Site Survey Report)
Annex 3.1: Sample Call for EOI for Advertising on SSL Poles

Call for Expressions of Interest for Renting Advertising Space on

Solar Street Light Poles in Pokhara

1. Background

The Nepal Centre for Inclusive Growth (CIG) is a project funded by the UK Department for International Development, which works to find practical solutions to promote economic growth and social inclusion in Nepal. As part of a CIG initiative on tourism in the Pokhara and Annapurna area, the CIG is facilitating the installation of solar street lights in the city of Pokhara through a Public Private Partnership (PPP) comprising the municipal government, the private sector, and other funding agencies.

2. Details of lighting area

The Partnership through its coordination committee (comprising of representatives from the Pokhara Sub-Metropolitan Office, Private sector representatives from New Road and Lakeside, Pokhara Tourism Council, and the CIG) is implementing the installation of solar street lights in Pokhara’s Lakeside and New Road.

Lakeside is the main tourism hub of the city and sees over 300,000 foreign tourists every year. Its street festival over the New Year is said to attract over 400,000 visitors (the majority of whom are Nepali), while New Road is a central hub of the city with over 25 banks, the municipal government office, 2 major supermarkets and 2 street markets in the vicinity.

New Road from Sabha Griha Chowk to ChipleDhunga Chowk (distance of 1,530m) will have 78 Poles (39 poles each side). Similarly in Lakeside, 98 poles will cover the distance of 2280m from Khahare Chowk to Fishtail Lodge (there will be poles on both sides Khahare Chowk to Barahi Chowk, and then just on one side of the road Barahi Chowk to Fishtail Lodge). A map of the intended placement is provided at the end of this document.

Contract negotiations are currently being finalized with the preferred bidder for the lights. It is expected that the lights will be fully installed and operational by 19th August 2013 at the latest.
3. Technical Details

To provide for a part of the funding for the installation and maintenance of the solar street lights, the committee plans to rent out advertising space on the poles. As well as the value given by the areas in which the lights are placed, the advertisement will have the added benefit due to the nature of the project: the lights will be a highly visible symbol of the modernization of Pokhara, and of the achievements of locally owned efforts.

Each of the 181 lights will be a standalone system with 40-watt capacity LED, and its own solar panel and battery box. Each pole will be 6m high with sufficient clearance for posting advert frames beneath the battery box. The advertisement board will be a 2 feet by 4 feet, however the committee will also consider other ways of placing advertisements (e.g. hanging flags, painting the poles), in negotiation with the winning bidder(s).

As well as paying a portion of the installation costs, the local businesses and communities will be contributing money towards maintenance and upkeep of the poles, which will be overseen by the coordination committee outlined above.

4. Call for Expressions of Interest

Advertising agencies and individual firms that are interested to buy advertising space in the above mentioned areas are requested to submit an expression of interest and offer with clear details on the number and location of poles you intend to take, and a bid for the price you will pay for them.

As a guide, suggested prices are provided. Lights for the premium area (88 poles) are NPR 2,200 per month, while normal area poles (88) will be 1,100 per month. The minimum amount of time to take a light for will be 12 months, the maximum will be 24 months. Companies must buy the lights in blocks of 10 minimum, and for every 20 bought 1 will be given for free. The street lights committee will re-tender for the advertisements on a yearly basis.

<table>
<thead>
<tr>
<th>Titles</th>
<th>Expected Price (for posting adverts per street light pole at designated space) per month, NPR.</th>
<th>Nos. (qty) of Solar Street Light</th>
<th>Total amount per year, NPR.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premium Area</td>
<td>2,200</td>
<td>88</td>
<td>2,323,200</td>
</tr>
<tr>
<td>Normal Area</td>
<td>1,100</td>
<td>88</td>
<td>1,161,600</td>
</tr>
</tbody>
</table>

1 Premium Area refers to the most central and busy parts of the streets mentioned, e.g. between Barahichowk and Hallanchowk on lakeside. The final decision on which are ‘premium’ poles and which are normal ones will be made once the detailed site survey has been completed.
To allocate the advertising, this submission of EOI will function as a competitive bidding process, with the highest bidder winning. The CIG reserves the right to cancel the auction in the event of unforeseen circumstances meaning that the lights will not be operational.

The company funding the advertisements will have a seat on the street lights management committee, to help ensure that their value is maximized and the lights are kept in good condition. Since this funding will contribute towards the installation of the lights, the advertiser’s names will be permanently listed on plaques in lakeside showing the various stakeholders who have contributed to the project.

You can email your expression of interest, including the number of lights you would like and the price you will pay, to info@cignepal.org.np or post it to the following address by 3rd June 2013.

Communications Officer,
The Centre for Inclusive Growth,
1st Floor, Oasis Complex, 49 Dhara, Patan Dhoka,
Lalitpur, Nepal
Ph: +977 1 500 4525/24/23

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*In the event of the highest (per pole) bidder not requiring all lights, a solution will be found with a combination of bidders so as to maximise the value obtained.*
Figure 1: Intended placement in New Road, Pokhara

Figure 2: Intended placement in Lakeside, Pokhara
Annex 3.2: Sample Advertising Contract for SSL Project

पोखरा उप-महानगरपालिका कार्यालय पोखरा,
सौर्य सडक वत्ति व्यवस्थापन समिति पोखरा
तथा
विचित्र एड्मार्टीजिङ्क कम्पनी प्रा.लि.जावलखेल,ललितपुर, काठमाडौं बीच भएको
करानामा

प्रस्तावना:
पोखरामा पर्यटन व्यवसायको प्रवर्धन तथा यस क्षेत्रको सुरक्षा र साथी सोन्दर्घतामा यस टेस्ट पुस्तुका उद्धेश्यले पोखरा उपमहानगरपालिका कार्यालय, सरकारी निकाय, पोखरामा कार्यरत पर्यटन संग सम्बन्धित व्यवसायिक संघ संस्थाको छाता संस्था पोखरा पर्यटन परिषद्, तथा सडक सुरक्षासमितिको सामाजिकला एवं सेन्टर फॉर इन्फ्रेंजिंग ग्रुप (CIG) को प्रारम्भिक सहयोगमा सौर्य उर्जा सडक वत्तिको जडान तथा निर्माण कार्य भूमिका र सन्तानमा सौर्य सडकवत्तिको व्यवस्थापन तथा मरम्मत गर्न आधिकारिक अधिकृत तथा उद्देश्यतयात भए मुताविक व्यापारिक मार्ग गरिएको भए विचित्र एड्मार्टीजिङ्क कम्पनी प्रा.लि. ले पेश गरेको व्यापार स्वीकृत गर्न पोखरा उप-महानगरपालिका कार्यालय, पोखरा र विचित्र एड्मार्टीजिङ्क कम्पनी प्रा.लि बीच यो करानामा गरिएको छ।
 Annexes

ливित्रेसु पोऱ्यारा उप-महानगरपालिका कार्यालय, पोऱ्यारा (यसपठित यस कऱारनामामा प्रथम पत्र भनी संस्थगण गरिएको छ) र विचित्र एडभर्टैंडजिंग कम्पनी प्रा.प्र.जावलिंकेल, जलि पुर (यसपठित यस कऱारनामामा द्वितीय पत्र) भनी संस्थगण गरिएको छ। समेत दुई पत्रका बीचमा आज्ञा भएको केहिथिमा तपाईंले दिनेको जानकारी शोधिएका जानकारीमा राख्ने परिप्रेक्ष्यमा यसको सहूलीतत्त्वात उचित बनाउन गरिएको छ।

२। परिभाषा : विषय बा प्रस्राघणमा अल्पको अर्थ तलामोका यस कऱारनामामा लिखित बहुत निम्नानुसार प्रयोग गरिएको छ।

२.१। "प्रथम पत्र" भन्नले पोऱ्यारा उप-महानगरपालिका कार्यालय, पोऱ्यारा सम्भन्तो पार्छ।

२.२। "द्वितीय पत्र" भन्नले विचित्र एडभर्टैंडजिंग कम्पनी प्रा.प्र.जावलिंकेल, जलि पुर सम्भन्तो पार्छ।

२.३। "एडभर्टैंडजिंग कम्पनी" भन्नले द्वितीय पत्रलाई सम्भन्तो पार्छ।

२.४। "सामग्री" भन्नले सौंभर क्षेत्र व्यवस्थापन सामग्री पोऱ्यारालाई सम्भन्तो पार्छ।

२.५। "कॉर्ट" भन्नले सम कऱारनामामा उल्लेखित शतावदीत्तमेत्तलाई सम्भन्तो पार्छ।

२.६। "कॉर्ट मूल्य" भन्नले र०२५,९०,४१० (पेत्रिसलाख) नधे हजार चार यो रुपियाँ) सम्भन्तो पार्छ। कॉर्ट मूल्यको भुक्तानी द्वितीय पत्रलाई प्रथम पत्रलाई यो कऱारनामाको लागू न. ३ मा तोङिएको समय अनुसार वुपकाँउन पार्छ।

२.७। "साम" भन्नले सौंभर उजऱा सङ्कर सतीको पोऱ्यारा व्यापारिक विज्ञापन तथा प्रचार, प्रसार एवं तत्समावेशी सामाग्री र कार्यलाई सम्भन्तो पार्छ।

२.८। "रणनीतिका क्षेत्र" भन्नले पोऱ्यारा ६ स्थित लेक-साइड र पोऱ्यारा ७ र ९ स्थित नयाँ सङ्कका सौंभर उजऱा सङ्कर बर्ती ज्ञान भएको पोऱ्यारा राखिने विज्ञापन बोर्डलाई सम्भन्तो पार्छ।

२.९। "कार्यालय" भन्नले पोऱ्यारा उप-महानगरपालिका कार्यालयलाई सम्भन्तो पार्छ।

२। एक वचनमा प्रयोग भएका सङ्क्रामक बहुवचनमा र बहुवचनमा प्रयोग भएका सङ्क्रामक एक वचनको अथ नय रमणीय सम्बन्धको लिचे छन्।

३। पोऱ्यारा ६ स्थित लेक-साइड र पोऱ्यारा ७ र ९ स्थित नयाँ सङ्कका सौंभर उजऱा सङ्कर बर्ती ज्ञान भएको पोऱ्यारा विज्ञापन तथा व्यापारिक प्रचार प्रसारका सामाग्री पोऱ्यारा रोड़बोर्ड
Annexes

SSL PM, Technical & Procurement Guidelines

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### प्रथम पक्ष

| पोखरा उपमहानगरपालिका तथा सौर्य सडकवरति व्यवस्थापन समितिको तर्फबाट
| अधिकार प्राप्त : |

1) **नाम:** भलकराम अधिकारी  
   **पद:** कामकारी अधिकारी तथा संयोजक  
   **संस्था:** पोखरा उपमहानगरपालिका कार्यालय  
   **तथा सौर्य सडक वर्तमान व्यवस्थापन समिति, पोखरा  

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### द्वितीय पक्ष

| विचित्र एड्सराइजिङ्र फ.सि.को तर्फबाट अधिकार प्राप्त : |

1) **नाम:**  
   **पद:** निदेशक  
   **संस्था:** विचित्र एड्सराइजिङ्र फ.सि.  

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### साखी

1) **नाम:** सुर्यवहादुर सुनेल  
   **पद:** अधिकारी  
   **संस्था:** पोखरा पर्यटन परिपद  

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### साक्षी का निर्धारित छौट दिनौँ

1) **नाम:**  
   **पद:** प्रबन्ध निदेशक  
   **संस्था:** विचित्र एड्सराइजिङ्र फ.सि.  

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विपरित विवाहन बोर्ड राखेको पाइएमा तुरून्त हटाउन प्रश्न पनि द्वितीय पक्षलाई लिखित आदेश दिन सक्ने।

६.२ राखिने विवाहन तथा संचालनमुखक बोर्ड तथा प्रधान सामाजिक शाही हरियाली, सामाजिक मूल्य मात्रता र सामाजिक सद्भाव तथा शास्त्रौति सुरक्षाको दृष्टिकोणवाट उपयुक्त भएको नपाईएमा यो बोर्ड तथा सामाजिक हटाउन भनी कार्यालयले दिने लिखित आदेशको ५५ दिन भिन्न हटाउनु पनि।

६.३ हटाउने आदेशको पालना गन्तू पनि दाखिला द्वितीय पक्षमा रहने।

६.४ प्रश्न पनि विवाहन बोर्ड प्रचारप्रसार सामाजिक हटाउन दिन्दै आदेश द्वितीय पक्षले पालना नगरी अंतर गरेमा प्रश्न पस आफ्नो हटाउन सक्ने। हटाउन लागेको खर्च द्वितीय पक्षबाट अनुसूच गरि लिन पाउने।

७ इम्योर बा संयोजन

यस करारनामा आधारभूमि परिवर्तन नहुनेको करारनामाको कुनै शर्तहरू दुवै पक्षको महत्त्वपूर्ण आवश्यक संयोजन, इम्योर बा परिवर्तन गर्न सकिनेछ।

८ यस करारको बा कामको समचित्रमा कुनै मत भिन्नता उत्पन्न भएमा विवाद भएको त्यसका उल्लेख गरि एक पक्षले अर्को पक्षलाई सुचित गरेका दुवै पक्षको व्यवस्थापन पक्षहरू गरी ३० दिन लागि आपनी सम्बन्धित विवाद तुल्याइनेछ।

९ आपनी सम्बन्धित विवादको निपटारा हुनसकेमा मध्यस्थ तीनको विवाद निपटारको लागि मध्यस्थ नियुक्तीको लागि एक पक्षले अर्को पक्षलाई सुचिन दिनु पनि। यसको लागि प्राप्त गर्न पस्त ६५ कार्य दिन भिन्न लिखित महत्त्वपूर्ण निर्देश नेपाल अञ्चलको तालिका यसका अन्तर्गत मध्यस्थता नियुक्तिको काममा आपको अवलम्बन गर्ने अधिकार पक्षहरूमा रहने।

१० मध्यस्थताको निर्णय अल्पको र दुवै पक्षलाई मात्र हुनेछ।

११ आकर्षित हुने काठौँ: यस सम्बन्धितको विवाद वस्तुमा नेपाल अञ्चलको आकर्षित हुनेछ।

१२ सम्बन्धित रहुँ बा समाप्त गर्न सकिने:
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<td>2) नाम:</td>
<td>सम्भालबाहुलय सुरुचि</td>
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<td>पद:</td>
<td>अध्यक्ष</td>
</tr>
<tr>
<td>संस्था:</td>
<td>नयां यडक सुधार समिति, पोखरा</td>
</tr>
<tr>
<td>दस्तखात:</td>
<td></td>
</tr>
</tbody>
</table>