Jharkhand Renewable Energy Development Agency
Plot No. 328/B, Road No. 4, Ashok Nagar, Ranchi 834002
Phone No. 0651-2246970, FAX: 0651-2240665,
Web-site: www.jreda.com, Email: info@jreda.com

NOTICE INVITING TENDER

NIT No: JREDA/SLEP-04/2007-08 **Date: 28/01 /2008**

TENDER

FOR

SUPPLY, INSTALLATION, TESTING, COMMISSIONING & 10 YRS COMPREHENSIVE MAINTENANCE CONTRACT (CMC) OF VARIOUS EXHIBITS OF THE STATE LEVEL ENERGY PARK AT SIDDU-KANU UDYAN RANCHI, JHARKHAND ON TURNKEY BASIS

1. To be submitted by 12.30 hrs. of 15/02/2008
2. Tenders shall be opened in presence of the intending tenderness at 14-30 Hrs. on the same day in the Office of The Director, Jharkhand Renewable Energy Development Agency, 328/B Road No.4, Ashok Nagar, Ranchi – 834 002.

Detailed N.I.T. issued to M/s.
……
……..against Bank Draft No. dated. Receipt No. dated for Rs. 10,000.00 (Rupees ten thousand) only.

Dated, Ranchi
The

Issued by.

DIRECTOR
JHARKHAND RENEWABLE ENERGY DEVELOPMENT AGENCY

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NOTICE INVITING TENDER

NIT No: JREDA/SLEP-04/2007-08 **Date: 28 /01 /2008**

Sealed **TWO PART re-tenders** are invited by JREDA from resourceful, reputed and experienced contractors and having experience in setting up of at least one State Level Energy Park and maintenance of the same for atleast two years.

Name of Work:	Supply, Installation, Testing , Commissioning & 10 yrs Comprehensive Maintenance Contract (CMC) of Various Exhibits of The State Level Energy Park at Siddu-Kanu Udyan, Ranchi, Jharkhand on Turnkey basis.
Time of completion	120 days.

The salient features of the Tender Document are as follows:

1.0 TENDER DOCUMENTS

The tender documents shall comprise of all the documents mentioned in table of Contents of this document. In addition to these any other document(s) /amendment(s) or revisions issued by JREDA from time to time to the bidders till the due date of opening of the offers, shall also be deemed to be integral part of the tender document. Failure to furnish all information as per bid document in every respect will be at bidder's risk.

2.0 COST OF TENDER DOCUMENT

2.1 The Tender Document can be purchased from the office of the JREDA against payment by Demand Draft drawn in favour of "The Director, Jharkhand Renewable Energy Development Agency" on any nationalized bank/ scheduled bank payable at Ranchi of requisite value and within the time and period as specified in the NIT.

2.2 The bidders may download the tender Document from the web site www.jreda.com and submit the cost of Tender Document as specified along with Part – I of the offer, in a separate envelope failing which the bid will be summarily rejected.

3.0 EARNEST MONEY

3.1 Tender must be accompanied with 2% of the tendered value as earnest money by a Demand Draft drawn in favour of "The Director, Jharkhand Renewable Energy Development Agency" on any nationalized bank/ scheduled bank payable at Ranchi. This shall be enclosed with Part -1, of the tender, i.e. The Techno-commercial bid

3.2 A Bank Guarantee drawn in favour of "The Director, Jharkhand Renewable Energy Development Agency" on any nationalized bank/ scheduled bank payable at Ranchi and valid for a period of 240 days may be submitted against earnest money in lieu of Demand Draft.

3.3 The request for adjustment of earlier dues against earnest money shall not be entertained.

3.4 Earnest money shall be returned to the unsuccessful bidders within 60 (sixty) days from the date of issue of Letter of Intent/Firm order on the successful bidder.

3.5 In case the tender of any party is rejected during scrutiny of the 'Technical bid' the earnest money will be returned to such bidder(s).

3.6 The earnest money will be forfeited if any bidder withdraws his offer during the validity period and if the successful bidder fails to furnish his acceptance of order letter within specified time or fails to start the work and execute it within specified time frame.

4.0 SUBMISSION OF OFFER

4.1 After procurement of tender documents the bidders must go through carefully all the terms and conditions and technical specification, seek clarification wherever necessary, before submission of tender. The intending bidders should also visit the site before submission of the Tender.

4.2 The offer shall be prepared by typing or printing in English language with black ink on white paper or printed 'letter head' of the contractor in consecutively numbered pages duly signed by the authorized signatory of the contractor with seal of the firm affixed on each page.

4.3 Original copy of the Tender Document, amendments/ revisions to Tender Documents issued by JREDA, (if any) shall be signed and submitted along with the bid.

4.4 The Tender Document shall comprise of all documents/drawings/information as stated in the offer. The checklist shall be duly filled up and signed by the contractor to specify and confirm submission of documents with the offer.

4.5 The offer shall be free from overwriting but if any corrections are made, the same should be initialed by the person signing the offer

5.0 MODE OF TENDER SUBMISSION

5.1 The Part – I : The Techno-commercial Bid shall be submitted complete with the following:

5.1.1 Complete Tender Documents as purchased from JREDA or unloaded in full from www.jreda.com duly filled in and signed; except the price part of the tender.

5.1.2 Cost of Tender Document (non-refundable), if unloaded from website:www.jreda.com by Demand Draft drawn in favour of Director, JREDA on a scheduled/nationalized bank of India.

5.1.3 Earnest Money deposit in one of the acceptable forms as specified.

5.1.4 Documentary evidence showing that the Bidder has completed atleast one State Level Energy Park and maintenance of the same for atleast two years.

5.1.5 Any other supplementary details required for the evaluation of the tenders such as drawings, technical literature/catalogues and data etc.

5.1.6 A Bar Chart indicating completion schedule for various items involved in the work within the stipulated completion period.

5.1.7 Deviations, if any from tender specifications and or tender conditions, with reasons therefore. It is open to JREDA whether or not to accept them.

5.1.8 Duly filled up Check List shall be enclosed.

5.2 Each tender will have to be submitted in a sealed envelope addressed to The Director, Jharkhand Renewable Energy Development Agency, Plot No. 328B, Road No. 4, Ashok Nagar, Ranchi – 834 002 duly marked on the envelope as "PART – 1, TECHNO-COMMERCIAL BID: SUPPLY, INSTALLATION, TESTING, COMMISSIONING & 10 YRS COMPREHENSIVE MAINTENANCE (CMC) OF VARIOUS EXHIBITS OF STATE LEVEL ENERGY PARK AT SIDDU-KANU UDYAN, RANCHI, JHARKHAND" Due on 15/02/2008

5.3 The Part – II : The Price Bid shall be submitted complete with the following: -

5.3.1 Part – II: PRICE BID. SUPPLY, INSTALLATION, TESTING, COMMISSIONING & 10 YRS COMPREHENSIVE MAINTENANCE (CMC) OF VARIOUS EXHIBITS OF STATE LEVEL ENERGY PARK AT SIDDU-KANU UDYAN, RANCHI, JHARKHAND ON TURNKEY BASIS" .

5.3.2 The price schedule should be duly filled up both in figures and in words. Each page to be duly signed by authorized person with seal of the firm.

5.3.3 In case of any discrepancy between the price mentioned in figures and words, the price mentioned in words will be considered as final.

5.3.4 The price bid should not contain any technical matter or other matter except those related to price.

5.4 The envelopes containing Technical Bid and the Price Bid shall be put inside a third envelope along with a forwarding letter. The Cover should be duly marked as SUPPLY, INSTALLATION, TESTING, COMMISSIONING & 10 YRS COMPREHENSIVE MAINTENANCE (CMC) OF VARIOUS EXHIBITS OF STATE LEVEL ENERGY PARK AT SIDDU-KANU UDYAN, RANCHI, JHARKHAND ON TURNKEY BASIS" Due on 15/02/2008

6.0 ELIGIBILITY AND QUALIFICATION CRITERIA FOR BIDDERS

The bidder is required to submit the supporting documents for the following:

6.1 Confirmation of meeting Basic Eligibility Criteria as per format enclosed in Annexure I.

6.1.1 The bidder must have set up atleast one Energy Park, which is being maintained by the tenderer for not less than two years.

6.1.2 Ability and experience to undertake Comprehensive Maintenance Contract after commissioning at least for ten years directly or by a competent authorized agent.

6.1.3 List of works completed in the last 3 (three) financial years giving description of work, name of client, value of contract, date of award, schedule of completion, actual date of starting and actual date of completion should also be given.

6.1.4 List of works on hand indicating description of work, contract value, approximate value of balance work yet to be done and the date of award of contract.

6.1.5 The average annual turnover during the last three years as per ITCC should be minimum of Rs.1.0 crores.

6.1.7. Registration certificate of the firm.

6.1.8 Certificate of conduct from main/lead Banker certifying status of operation of account.

6.1.9 Photocopy of Partnership Deed in case of Partnership firm.

6.1.10 Power of Attorney for Authorized Signatory in case of companies.

7.0 SCOPE OF WORK

7.1 The scope of works shall be as indicated in Technical Specification, General Conditions of Contract and Schedule of Items of Work

7.2 The Director, JREDA reserves the right amend the scope of work, accept or reject any or all offers, in full or in part or in full or cancel or withdraw the NIT for bids without assigning any reason whatsoever and in such case the bidder or intending bidder shall have no claim arising out of such action.

7.3 The tenderer shall carefully study the technical specification, general conditions of contract and the schedule of items of work and shall satisfy him regarding technical and all other aspects of the work before submitting his offer.

8.0 PRICE

8.1 The tenderer shall quote his price as per 'Schedule of Items of Work'. The price shall be firm and binding and shall not be subject to any variation except for statutory variation of taxes and duties during the contractual completion period.

8.2 The price shall be inclusive of all taxes, duties and levies etc. as on the date of opening of tender.

9.0 PAYMENT TERMS

Payments for execution shall be made as per terms and conditions mentioned in Sec.G.15 of the General Terms and Conditions of contract subject to any deductions related to work, which the purchaser may be authorized to make as per terms and conditions of the contract and Income Tax or any other tax deductions as per prevailing rules and acts applicable at the time of payment.

10.0 AUTHORIZATION FOR SIGNING THE OFFER AND ATTENDING BID OPENING.

10.1 The person signing the offer shall have authority to sign the offer on behalf of the firm/company.

10.2 In case the authorized signatory of the contract is not in a position to attend the bid opening, he may authorize another person to attend the bid opening on his behalf by issuing an authority letter on the printed letterhead of the firm as per proforma enclosed in Annexure – II. This will be valid only for attending the bid opening.

11.0 NO CLAIM OR COMPENSATION FOR SUBMISSION OF TENDER

The tenderer, whose offer is not accepted shall not be entitled to claim any costs, charges, expenses of and incidental to or incurred by him through or in connection with his submission of Bid, even though JREDA may elect to withdraw the Invitation to Bid.

12.0 VALIDITY OF OFFER

Unless otherwise specified, the Tenderer shall keep his tender valid initially for a period of 120 days from the due date of submission of the offer.

13.0 OTHER TERMS & CONDITIONS

13.1 Insertion, post-script, addition and alteration shall not be recognized unless confirmed by tenderer's signature and stamp. Incomplete tender or tenders not submitted as per requirement of the NIT may be rejected.

13.2 In case of any deviation in design, the tenderer must submit a statement of devastation indicating technical and commercial implications. The decisions of the Director, JREDA shall be final and binding regarding acceptance or rejection of such items.

13.3 If at any time any of the documents/ information submitted by the bidder is found to be incorrect, false or untruthful, the bid and/ or the resultant order may be summarily rejected/ cancelled at the risk of the bidder.

13.4 Failure to furnish all information and documentary evidence as stipulated in the bid document or submission of an offer that is not substantially responsive to the bid document in all respects shall be summarily rejected.

13.5 All bids will be received in duly Sealed Cover within the due date and time. Bids received after the due date and time shall be rejected outright.

13.6 If the scheduled date of final submission and opening of the bid happens to be holiday on then the bids shall be submitted/ opened on next working day at the same time & at the same venue.

13.7 No request for extra time for delay in obtaining or submission of tender Documents shall be entertained.

13.8 Issuance of bid documents shall not construe that the bidders would be automatically considered qualified.

13.9 The Director, JREDA reserves the right to postpone the date of receipt and opening of the bids or cancel the bid without bearing any liability, whatsoever, consequent upon such decision.

13.10 The undersigned reserves the right not to accept the lowest tender and may reject any or all the tenders without assigning any reason whatsoever.

DIRECTOR,
JHARKHAND RENEWABLE ENERGY DEVELOPMENT AGENCY

CHECK LIST OF DOCUMENTS TO BE ENCLOSED WITH OFFER DOCUMENT

C.1 Envelope – I: Containing Part – 1 of the offer. Any offer submitted without the following mandatory documents will be liable for rejection:

C.1.1 Photocopy of receipt issued by JREDA for purchase of offer document or Demand Draft (non-refundable) for Rs.10,000.00 (Rupees ten thousand) only in favour of Director, JREDA ob a nationalized/scheduled bank of India for those who have downloaded the offer document from JREDA website.

C.1.2 Covering letter on Company's letterhead duly signed by authorized signatory giving details of name and designation of authorized signatory.

C.1.3 Certificate in support of meeting Eligibility Criteria along with following supporting documents:

a) The bidder must have set up atleast one Energy Park, which is being maintained by the tenderer for not less than two years

b) Ability and experience to undertake Comprehensive Maintenance Contract (CMC) after commissioning at least for ten years directly or through a competent authorized agent.

c) List of works completed in the last 3 (three) financial years giving description of work, name of client, value of contract, date of award, schedule of completion, actual date of starting and actual date of completion should also be given.

d) List of works on hand indicating description of work, contract value, approximate value of balance work yet to be done and the date of award of contract.

e) The average annual turnover during the last three years as per ITCC should be minimum of Rs.1.0 crores.

f) Registration certificate of the firm.

g) Certificate of conduct from main/lead Banker certifying status of operation of account.

h) Photocopy of Partnership Deed in case of Partnership firm.

i) Power of Attorney for Authorized Signatory in case of companies.

C.2 Envelope – II: Containing Part – II of the offer document.

C.2.1 Covering letter on Company's letterhead duly signed by authorized signatory giving details of name and designation of authorized signatory.

C.2.2 Schedule of Items indicating rates quoted.

NOTICE INVITING TENDER

NIT No: JREDA/SLEP-04/2007-08 **Date: 28 /01 /2008**

Sealed **re- tenders** are invited from reputed and experienced Indian firms for the followings works:

Sl. No.	Description	Details
1.	Tender No.	JREDA/SLEP-04/2007-08, Dt. 28 /01 /2008
2.	Name of Work	Supply, Installation, Testing, Commissioning & 10 Yrs Comprehensive Maintenance Contract (CMC) of various exhibits of the State Level Energy Park at Sidhu-Kanu Udyan, Ranchi, Jharkhand on Turnkey Basis.
3.	Period of sale of Tender Documents	Date: 29/01/2008 to 14/02/2008 Time : 10-30 hrs. to 16-30 hrs. on all working days.
4.	Last date & time of submission of tender.	15/02/2008 upto 12.30 hours.
5.	Date of opening of Part -1, the Techno-commercial bid.	15/02/2008 at 14-30 hrs.
6.	Cost of Tender Document (Non-refundable)	Rs. 10,000.00 (Rupees ten thousand) only
7.	Place of issue & submission of Tender Documents and address for communication.	Jharkhand Renewable Energy Development Agency Plot No. 328/B, Road No. 4, Ashok Nagar, Ranchi 834002 Phone No. 0651-2246970, FAX: 0651-2240665, Web-site: www.jreda.com, Email: info@jreda.com

Interested parties may download the Tender Documents from our website:www.jreda.com

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Director
JREDA, Ranchi

GENERAL TERMS & CONDITIONS OF CONTRACT

G1.0 DEFINITIONS OF TERMS

In the contract the following expression shall, unless the context otherwise requires have the meanings thereby respectively assigned to them.

G1.1 The ***"Government"*** shall mean the Government of Jharkhand or the Government of India, as may be the case.

G1.2 ***"JREDA"*** means Jharkhand Renewable Energy Development Agency with its head office located at present at 328/B, Road No.4, Ashok Nagar, Ranchi, PIN : 834 002.

G1.3 ***"Contract"*** means the document forming the tender, acceptance thereof and the formal agreement executed between the JREDA and the Contractor, together with documents referred to therein otherwise it shall mean the Notice Inviting Tender, information and instructions to bidder. Accepted tender (including the warranty "schedule of quantities and prices" and other schedule attached thereto) general conditions of contract, special conditions, if any, specifications, designs, drawings and letter of award thereof will form the agreement.

G1.4 ***"Contract Price"*** Means the price payable to the Contractor under the contract for full and proper performance of its contractual obligations.

G1.5 The ***"Contractor"*** shall mean the person or corporation or firm who's tender for the work has been accepted and his/its executors, administrations, or permitted assigns.

G1.6 ***"Works"*** Means the materials to be supplied and the work to be executed as defined and set out in the specifications and includes all extra work, additions, deletions, substitutions and variations ordered by the Director, JREDA in accordance with the provisions of the contract.

G1.7 ***"Project-in-Charge"*** Means the Director, JREDA to sign or cause to sign, the contract agreement on behalf of the JREDA and the Engineering officer duly authorized by the Director, JREDA to direct, supervise and be in-charge of the works for the purpose of the contract.

The work will be supervised by the Consultant on behalf of the Director, JREDA. All drawings and technical proposals will be scrutinized by the Consultant. Measurement of works, quality verification etc. will be carried out and certified by the Consultant for payment. However, final decision regarding all such matters rests with the Director, JREDA.

G1.8 ***"The Consultant"*** means the firm or person as may be duly appointed by the Purchaser to act as Consulting Engineer for the purpose of work covered in the contract. *Cross Informatics (P) Ltd*., Kolkata has been appointed as Technical Consultant on behalf of JREDA for this work.

G1.9 ***"Specifications"*** Means collectively all the terms and stipulations contained in this document including the conditions of contract, technical provisions, drawings and attachments thereto and list of corrections and amendments.

G1.10 ***"Site"*** Means the land on, under in or through which the works are to be executed or carried out and in this the work will be carried out in Siddu-Kanu Udyan, located near Kanke Road in the heart of Ranchi City.

G1.11 ***"Tests on Completion"*** means all such tests as are prescribed by the specification of the exhibits to be supplied, installed, tested and commissioned by the contractor to the satisfaction of JREDA before the building, plant and equipment are taken over by the JREDA and this also includes those tests not specifically mentioned in the specification but required under various BIS codes, relevant Acts and rules.

G1.12 ***"Commissioning"*** means the satisfactory, continuous and uninterrupted operation of the equipment/ work as specified after all necessary initial tests, checks and adjustments required at site for a period of at least 30 days to the satisfaction of the Director, JREDA.

G1.13 ***"Approval"*** means the written approval of the Director, JREDA and of the statutory authorities, wherever such authorities are specified by any codes or otherwise.

G1.14 ***"Drawings"*** means collectively all the accompanying general drawings as well as all detailed drawings, which may be used from time to time.

G1.15 ***"Tender drawings"*** to be furnished by the Consultant/JREDA/Contractor for execution of the work and they will form part of the contract.

G1.16 ***"Detailed drawings"*** to be furnished by Consultant/ JREDA/ Contractor for execution of the work and they will fill the part of the contract.

G1.17 ***"Labourer"*** means all categories of labour engaged by the contractor, his sub-contractors and his piece workers for work in connection with the execution of the worked covered by the specifications. All these labourers will be deemed to be employed primarily by the contractor.

G1.18 ***"Fiscal year"*** means year beginning on the first day of April and ending on 31st March in the succeeding year.

G1.19 ***"Day"*** means a calendar day beginning and ending midnight.

G1.20 ***"Month or Calendar month"*** means not only the period from the first of a particular month, but also any period between a date in a particular month, and the date previous to the corresponding date in subsequent month unless specifically stated otherwise.

G1.21 ***"Week"*** means seven consecutive calendar days.

G1.22 ***"JREDA Stores"*** means the stores owned by the JREDA.

G1.23 ***"Security Deposit"*** means all deposits whether in Government Securities, Fixed deposit receipts or Bank Guarantee from a Nationalized Bank of India, amounts deducted from interim payments or in any other form pledged to JREDA for due performance of the contract and shall be adjusted in case of compensations, or penalties and which may stand either in part or whole as the situation demands.

G1.24 ***"Urgent Works"*** means any urgent measures, which in opinion of the Director, JREDA, become necessary at the time of execution and/or during the progress of work to obviate any risk of damage to the structure, or required to accelerate the progress of work or which become necessary for security or for any other/reason the Director, JREDA may deem expedient.

G1.25 ***"Project"*** refers to supply, installation, testing and commissioning of exhibits for the State Level Energy Park located at Siddu-Kanu Udyan, Ranchi under JREDA.

G1.26 ***"Manufacturer"*** refers to the party proposing to Design and construct as specified complete or in part.

G1.27 ***"Plant, Equipment, Stores"*** mean and include plant and materials to be provided under the contract.

G1.28 ***"Delivery of Plant/ Equipment"*** shall be deemed to take place on delivery of the plant/ equipment in accordance with the terms of contract complete in all respects after approval by the Director, JREDA on report of the Project-in-charge.

G1.29 ***"Letter of intent" (LOI)*** means the letter from the Director, JREDA conveying his acceptance of the tender subject to such reservations as may have been stated therein.

G1.30 ***"Sub-Contractors"*** refers to a party or parties having direct contact with the contractor and to whom any part of the contract has been sublet by the contractor with the consent in writing of the Project-in-charge.

G1.31 ***"Tonne (M.T)"*** Where used in these specifications shall mean metric tonne of 1000 Kg.

G1.32 The terms and expressions not herein defined shall have the same meaning as assigned to them in the Indian Sale of Goods Act, 1977 or any such Act as the case may be.

G2.0 SCOPE OF WORK

The scope of work against the tender include all related works required for supply, installation, testing and commissioning of exhibits of the State level Energy Park at Siddu-kanu Udyan, Ranchi under JREDA.

G3.0 ELIGIBILTY AND QUALIFICATION CRITERIA FOR BIDDERS

The eligibility and qualification criterion for the bidder has been specified in Sec.6.0 of the Notice Inviting Tender. Information of meeting eligibility criteria to be furnished as per format given in Annexure III.

G4.0 TECHNICAL SPECIFICATION

The Technical Specification for the work has been furnished in detail in the 'Technical Specification' section.

G5.0 EARNEST MONEY DEPOSIT (EMD)

The tenderer shall submit the EMD in the form of a Demand Draft drawn in favour of "Director, JREDA" payable at Ranchi from any Indian Nationalized Bank/ Scheduled Bank or as a Bank Guarantee as per prescribed format given in Annexure - IV along with Part –I, The Technical Bid.

G6.0 VALIDITY OF OFFER

The offer and the prices quoted therein shall remain valid for the period as 120 days from the scheduled date of opening of the Tender.

G7.0 OPENING AND EVALUATION OF OFFER

G7.1 Part-I : The Technical Part will be opened on the date and time mentioned in NIT at the office of Director, JREDA at Plot No. 328/B, Road No. 4, Ashok Nagar, Ranchi in the presence of bidders, or their authorized representative. The authorized representative should produce letter of authorization to attend the bid opening meeting as given at Annexure - II. The representative who does not produce such authorization will not be allowed to attend the bid opening.

G7.2 The bidder's name, prices, discounts and the presence or absence of the requisite bid security and such other details as the Purchaser, at its discretion, may consider appropriate will be announced at the opening.

G7.3 To assist in the examination, evaluation and comparison of the offers, the Purchaser may at its discretion, may ask the tenderer for clarification of his offer prior to price bid opening. The request for clarification and the response shall be in writing and no change in price or substance of the offer shall be sought, offered or permitted.

G7.4 Any effort by a Bidder to influence the purchaser in the Purchaser's bid evaluation or contract award decisions may result in rejection of his bid.

G7.5 The tender evaluation will take into account the bidder's technical, financial, past experience and capability. It will be based upon the examination of documentary evidence of Bidder's qualification submitted by the bidder in Techno-commercial Part (Part – 1) of the offer.

G7.6 Part–II of the tender, i.e. the Price Bid only of those bidders, whose offers are technically and commercially found to be acceptable after evaluation of the Technical and Commercial Part, will be opened and evaluated. The date & time for opening of Part-II: The Price Bid will be intimated in JREDA web site. Bidders are requested to visit the web site **www.jreda.com** regularly and keep themselves informed. The Price Part will be opened at the office of Director, JREDA at 328/B, Road No. 4, Ashok Nagar, Ranchi 834002 as intimated, in the presence of eligible bidders or their authorized representative(s). The authorized representative will be allowed to attend the price bid opening on production of authorization letter from the Bidder.

G7.7 The Director, JREDA, if required, may at his own discretion extend the scheduled date of opening of Price Bid.

G7.8 The intending tenderers should have all relevant licenses and permits etc. from competent Government authorities as required for executing the contract.

G7.9 The Director, JREDA, reserves the right to cancel any or all tenders without assigning any reasons thereof and not bound to accept the lowest tender.

G8.0 AWARD OF CONTRACT/ LETTER OF INTENT

G8.1 The successful tenderer shall be required to enter into a contract agreement for execution of the work under the terms and conditions stipulated in the tender document and also any other special terms & conditions that may be mutually settled before awarding the contract.

G8.2 After the issue of the Letter of Intent, the Purchaser shall prepare the agreement based on accepted offer, rates, specification, terms and conditions and the same shall be executed by the contractor.

G9.0 TIME PERIOD FOR SIGNING THE AGREEMENT

The suppliers have to enter into an agreement within two weeks, in the office of the Director, JREDA in prescribed format before commencement of supply, construction and services.

G10.0 PERFORMANCE GUARANTEE

G10.1 Within 30 days from the of issue of Letter of Intent, the contractor shall furnish a Bank Guarantee from a Nationalized Bank /Scheduled Bank on the format given in enclosed as Annexure No. V for an amount equal to ten percent (10%) of the order value by way of Bank Guarantee for the due and faithful performance of the agreement and for the due and faithful performance of the Letter of Intent along with other terms and conditions.

G10.2 Such agreement shall be valid and binding, not withstanding such variations, alterations or agreed under these general conditions during the entire warranty period as per Clause No.G.24 of the General Conditions of Contract. The contractor shall, at his own cost, get the validity period of the Bank Guarantee furnished by him, extended from time to time till completion of warranty period, as per provisions of the contract and shall furnish the extended Bank Guarantee to the Purchaser before expiry date of original Bank Guarantee or any extension thereof. In case the extended Bank Guarantee is not received by the Purchaser 15 days before the expiry date, the purchaser, entirely at his discretion shall be at liberty to encash the aforesaid Bank Guarantee.

G10.3 On due completion of work in all respects and on expiry of the Guarantee Period as per relevant clause the earnest Money and all payments due to him will be returned to the contractor without any interest on presentation of an absolute 'NO DEMAND CERTIFICATE' from JREDA and up on return, in good condition, of any specifications, drawings, technical literature, samples, tools and tackles or any property belonging to the purchaser which may have been issued to the contractor. Provided always that JREDA shall be entitled to retain, set off, deduct or adjust any claim against the contractor from the money deposited with or becoming payable to JREDA.

G12.0 EFFECTIVE DATE OF CONTRACT

The effective date of commencement of execution of the order by the Contractor shall be the date of issue of the Letter of Intent or Work Order whichever is earlier.

G.13 CONTRACT PRICE

G13.1 Contract Price and unit rates shall remain firm and binding and shall not be subject to any variation, whatsoever, on any account except for statutory variation on taxes & duties during contractual completion period.

G13.2 The Contract price & unit rates includes and covers the cost of all royalty & fees for all articles & processes, protected by letters, patent or otherwise incorporated in or used in connection with the work, also all royalties, rents and other payments in connection with obtaining all the materials for the work and the supplier shall indemnify and keep indemnified the JREDA, which indemnity, the contractor hereby gives against all actions, proceedings, claims, damages, costs and expenses arising from the incorporation in or use of work of any such articles, processes or supplies.

G13.3 During the period of the contract, JREDA may order addition / deletion in quantities which supplier shall comply. The adjustment in Contract Price shall be made at the same unit rate as per Price Schedule.

G13.4 All applicable charges for taking statutory clearances, wherever necessary, are included in the contract price.

G14.0 MOBILIZATION ADVANCE

No Mobilization advance will be made.

G15.0 TERMS & CONDITIONS OF PAYMENT

The terms of payment for the contract shall be as given below:

Subject to any deduction which the Purchaser may be authorized to make under this contract, and or to any additions or deductions provided for in this contract, the contractor shall be entitled to payment as follows:

G15.1 All payments shall be made in Indian Rupees, unless otherwise specified in the contract.

G15.2 **80% of the contract price for each system shall be paid against delivery of goods in full and in good condition, installation, testing, commissioning and completion of electrical, mechanical and civil works and also after verification by JREDA representative. The following documents in duly bound report in the form of booklet for each system separately shall be furnished indicating system details etc.**

G15.2.1 Commercial invoice in triplicate.

G15.2.2 Copy of receipted Delivery Challan/ Transportation Challan /Lorry Receipt.

G15.2.3 Certificate of delivery of the system and delivery of Use's Instruction-cum-Maintenance Manual both in English and Hindi.

G15.2.4 Certificate of installation, testing and commissioning of systems, civil works as per terms and conditions of contract.

G15.2.5 Proof of full compliance certificate.

G15.2.6 Utilization Certificate.

G15.2.7 Systems Serial No. along with Manufacturer's Test Certificate.

G15.2.8 Geographical Co-ordinates and altitude of project location along with digital photographs of each installation.

G15.3 10% of the contract price shall be paid on third party verification at site, completion of training & awareness programme and on submission of following documents.

G15.3.1 Commercial Invoice in Triplicate.

G15.3.2 Proof of training of User's personnel.

G15.4 1% of the contract value shall be paid on completion of every one-year period of the 10 year Comprehensive Maintenance Period after submission of the following documents:

G15.4.1 Commercial Invoice in triplicate.

G15.4.2 Certificate for satisfactory service provided for the previous year duly verified by JREDA's authorized representative.

G15.4.3 Photocopy of Logbook.

G15.5 All payments shall be released by JREDA within 30 days from the date of receipt of claim along with complete supporting documents stipulated against each payment. Only mere submission of Delivery Challan/ Transportation Challan/ Lorry receipt will not be considered for payment.

G15.6 All payments shall be made by JREDA through 'Account Payee' cheque issued in favour of the supplier and payable at any Indian Nationalized / Scheduled Bank.

G16.0 INCOME TAX

Without prejudice to the obligations of the Supplier under law, any Income Tax, which JREDA may be required to deduct by law/statute, shall be deducted at source and shall be paid to the Income Tax authorities on account of the Supplier. JREDA shall provide the Supplier a certificate for such deduction of tax.

G17.0 STATUTORY VARIATION IN TAXES AND DUTIES

G17.1 The adjustment in the Contract Price towards imposition of new taxes or abrogation of existing taxes due to statutory variation shall be applicable only if the new tax is enacted or existing tax is abrogated within Contractual delivery/execution period.

G17.2 The Supplier shall bear and pay all liabilities in respect of statutory variations in taxes and duties and imposition of new taxes and duties that may be imposed after the execution of the particular item(s) of work though new tax may be imposed during the currency of the contract.

G18.0 INSPECTION OF THE FACTORY AND TESTS

G18.1 JREDA reserves the right to inspect the exhibit manufacturer's works/factory to ascertain the capability/availability of necessary equipment & infrastructure required for manufacture of the item offered before opening of the price offers of the bidders.

G18.2 JREDA shall have access and right to inspect the work or any part thereof at any stage.

G18.3 JREDA shall have the right to inspect and test the goods to confirm their conformity to the technical specifications after delivery of goods to consignee.

G18.4 Successful bidder shall inform JREDA at least 10 days in advance of schedule dispatch materials required for installing the exhibits.

G19.0 DESPATCH INSTRUCTIONS

The manufacturer's test report will be submitted for equipment dispatched to site atleast 10 days before dispatch.

G20.0 ROAD PERMIT

Road permits shall be issued from the bidders Registered Office or Manufacturing Unit (as indicated by the bidder in the bid) to Ranchi in Jharkhand. Request for road permit from the place other than above will not be entertained.

G21.0 INSURANCE

G21.1 Insurance for Materials

The contractor shall arrange for transit and erection insurance of the materials required for the works and other materials required for civil, mechanical and electrical works at his own cost. JREDA shall, in no case be held responsible for any loss, damage or theft of materials/ equipment so long the site continues to remain under the custody of the contractor.

G21.2 Insurance for Workmen

The contractor should arrange for providing insurance cover to his workmen under Workmen's Compensation Act or similar Rules/Acts as applicable during the pendency of the contract for covering risk against any mishap to his workmen. JREDA will not be responsible for any such loss or mishap.

G22.0 TRAINING PROGRAMME, AFTER-SALES SERVICE AND AVAILABILITY OF SPARES

The contractor will organize training programme for JREDA and other persons engaged for operation and maintenance of the whole Energy Park in consultation with JREDA. The training programme will focus on operation and maintenance of the Solar PV power plant. Printed leaflet/ literature shall be made available in English and Hindi by the contractor regarding the operation and maintenance of Solar PV power plant.

G23.0 COMPLETION SCHEDULE

The contractor shall submit a Completion Schedule of Work along with a **BAR CHART** as per the terms and conditions of the contract/order within 180 days as specified from the date of issue of the Letter of Intent or Work Order, whichever is earlier.

G.24. GUARANTEE PERIOD AND COMPREHENSIVE MAINTENANCE CONTRACT

G24.1 Guarantee Period

G24.1.1 The contractor shall provide guarantee, which include servicing & replacement guarantee for parts and components of the Solar PV power plant; such as Battery, Charge Controller, Inverter and PCU etc. for Solar PV power plant for five years. For PV modules, the replacement guarantee is for ten years from the date of commissioning the Solar PV power plant at site & demonstration of performance to JREDA.

G24.1.2 The manufacturers shall provide additional information about the system and condition of guarantee as necessary.

G24.1.3 Supplier shall without prejudice to any other clauses of the order repair/replace the defective parts and restore the system to satisfactory working/performance within 10 days of intimation of fault without any additional cost to JREDA within the period of guarantee.

G.24.2 Comprehensive Maintenance Contract (CMC)

G24.2.1 The comprehensive Maintenance Contract (CMC) shall be comprehensive which shall include servicing and replacement of all system components for specified period of 10 (ten) years, which may be extended by another 5 years after the completion of the contract period. The maintenance service shall not only include SPV power plant but also all other functions including maintenance of building and other services in the building. All preventive, routine, breakdown and corrective services are to be provided. The CMC shall have the following components as described below:

i) During Warranty Period, all replacement of defective components will be replaced by manufacturer free of cost. So, this factor will be taken into account while quoting the price for CMC.

ii) The contractor will depute atleast one staff on regular basis on duty for normal operation and maintenance of the plant, machineries and the building.

iii) **Preventive/Routine Maintenance**: This shall be carried out by the contractor atleast once every six months and shall include activities like cleaning & checking the health of the exhibits, topping up of batteries, tightening of all electrical connections, cleaning & greasing of battery terminals and any other activity that may be required for proper functioning of the exhibits.

iv) **Breakdown / Corrective Maintenance:**: Whenever a complaint is lodged by the user, the contractor shall attend within reasonable period of time and in case of any major breakdown, it will be corrected within a period not exceeding seven days.

v) The contractor shall maintain trained manpower for carrying out the CMC services.

vi) The contractor shall maintain Logbook of event related to CMC in bound register with recordings of time and date.

vii) The contractor will maintain a separate Logbook in proper format for all major exhibits.

viii) The starting date of CMC maintenance period will be the date of commissioning of the power plant.

25.0 ASSIGNMENT/ SUB-LETTING

G25.1 The contractor shall not without the prior consent in writing of the Purchaser, assign or sublet or transfer his contract, or a substantial part thereof other than raw materials, or for any part of the work of which makers are named in the contract, provided that any such consent shall not relieve the Contractor from any obligation, duty or responsibility under the contract.

G25.2 JREDA reserves the right to reject the equipment/Work sub-contracted and procure the same from elsewhere at Contractor's Risk and Cost. The Vendor shall be solely liable for any loss or damage which JREDA may sustain in consequence or arising out of such replacing of the contract work.

G26.0 TIME OF COMPLETION

The contractor shall provide full programme of the execution of work. Strict adherence to schedule mentioned in contract conditions shall be the essence of the contract and must be maintained. The work must be completed, within 6 (six) months from the date of acceptance of order or date of handing over of site, whichever is earlier.

G.27 DELAY IN EXECUTION OR FAILURE TO SUPPLY

G27.1 If the work is delayed on account of: -

a) Increase in quantity of work.

b) Suspension of work as ordered by the JREDA.

c) Force Majeure conditions.

d) Any other causes which, in absolute discretion of the Director, JREDA are beyond the contractor's control.

The contractor shall appeal to JREDA in the form of a written application before expiry of the contract period, bringing out the causes responsible for the delay, for granting suitable time extension.

G27.2 The Director, JREDA, if satisfied, that the delay is not attributable to the fault of the Contractor, may grant suitable time extension. However if the contractor is found responsible for any delay completion of the work, formal time extension shall also be granted by the JREDA but reserving its right to recover a sum towards liquidated damage, for late completion of this contract.

G27.3 However, if the contractor fails to execute the work or fails to start the work within specified time frame after the receipt of work order or leave the work site after partial execution of the work, JREDA may without prejudice to the right of the purchaser to recover damages for breach of trust of the contract may impose the following penalties:

G.28 LIQUIDATED DAMAGE

Scheduled date of completion shall be treated as the essence of the contract. Liquidated damage shall be imposed at the rate of 0.5% of the unexecuted value per week of delay up to a maximum of 5% at the sole discretion of the Director, JREDA. If there is any valid and acceptable reason for delayed execution supported with details of hindrances, the Director, JREDA may, at his discretion consider lowering down the penalty rate or even waiving off the penalty on having written application from the contractor.

G29.0 BREACH & CANCELLATION OF THE CONTRACT

G.29.1 In case of non-performance in any form or change of the covenants and conditions in this contract by the contractor, Director, JREDA shall have the power to annul, rescind, cancel or terminate the contract and upon its notifying in writing to the contractor that it has so done, this contract shall absolutely determine. The decision of Director, JREDA in this regard shall be final and binding.

G.29.2 JREDA may cancel the contract or a portion thereof and if so purchase or authorized purchase of the plant/ equipment not so delivered or order exhibit/ equipment of similar description (opinion of the Director, JREDA shall be final) at the risk and cost of the contractor. If the contractor had defaulted in the performance of the original contract, the purchaser shall have the right to ignore his tender for risk purchase even though lowest.

G.30 FORCE MAJEURE CONDITIONS

G.30.1 In the event of either party being rendered unable by Force Majeure to perform any obligation required to be performed by them under this agreement, relative obligation of the party affected by such force majeure shall be treated as suspended during which the force majeure clause last.

G.30.2 The term "Force Majeure" shall have herein mean riots (other than among the contractor's employee), Civil commotion, War (whether declared or not), invasion, act of foreign enemies hostilities, civil war, rebellion, revolution, insurrection, insurrection, military coup to usurp power, damage from aircraft, nuclear fission, acts of god such as earthquake (above 7.0 magnitude on Richter scales), lightning, unprecedented floods, fires not caused by contractors negligence and other causes which the contractor has no control and accepted as such by the Director, JREDA whose decision shall be final and binding.

G30.3 Time for performance of the relative obligation suspended by the force majeure shall stand extended by the period for which such clause lasts.

G.30.4 If works are suspended by force majeure conditions lasting for more than two months, the Purchaser shall have the option of canceling this contract in whole or part thereof, at its discretion.

G30.5 The Contractor shall not claim or compensation for 'Force Majeure conditions' and shall take appropriate steps to insure men and materials utilized by him under the contract well in time.

G31.0 PROGRESS REPORT OF WORK

The Contractor shall submit weekly and monthly progress report on execution of works conforming to bar chart. Incase of any slippage(s) or the contractor along with modified Bar Chart will submit delay in execution of work reasons for such delay along with details of hindrances.

G32.0 CONTRACTOR TO INFORM HIMSELF FULLY

G32.1 The contractor shall be deemed to have carefully examined the general conditions, specifications and schedules and also to have satisfied himself as to the nature and character of the plant and equipment to be supplied and installed and the architectural aspects of the BIPV building under the contract, the site conditions and all relevant matters & details.

G32.2 If he shall have any doubt as to the meaning of any portion of the contract/work order, he shall, before signing/accepting it, set forth the particulars thereof and submit them to the Director, JREDA/Engineer-in Charge in writing in order to remove such doubts.

G33.0 COMPLETENESS OF TENDER

All sundry fittings, assemblies, accessories, hardware items, foundation bolts, termination lugs for electrical connection etc. and for civil works, all necessary fittings, assemblies, accessories, hardware items, shuttering utilities and safety devices as required shall be deemed to have been included in the tender, whether such items are specially mentioned in the BOQ or not.

G34.0 WORKS TO BE DONE BY THE CONTRACTOR

Unless otherwise mentioned in the tender document, the following works shall be deemed to be done by the contractor, and therefore their cost shall be deemed to be included in their tendered cost: -

a) Foundation for exhibits/equipments and components where required including foundation bolts.

b) Cutting of walls and floors and making good all damages caused during installation and restoring the same to their original finish.

c) Sealing of all floor openings provided for pipes and cables from fire safety and water leakage point of view, after installation of the same.

d) Painting at site of all exposed metal surfaces of the installation other than pre-painted items, if any. Damages to the finished surfaces of pre-painted items while handling and erection shall, however be rectified to the satisfaction of Director, JREDA.

e) Temporary shed, if required over the storage space and locking arrangements thereof, watch and ward of materials and installations till completion of work.

f) Water and power as may be required for installation, curing and testing.

g) Supply, Installation, Testing and commissioning of the exhibits as required.and all related works.

G35.0 TOOLS AND PLANTS REQUIRED FOR CONSTRUCTION.

All tools and plants required for the work shall be the responsibility of the contractor.

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G.36 CONTRACT DRAWINGS

G36.1 The drawings enclosed with the tender document shall form a part off the agreement. The bidder, in case his bid is accepted, will submit detailed construction drawings for approval before starting construction work. The construction/ installation work will be carried out as per approved drawings. The contractor may also submit drawings with the tender giving details about his equipment, layout, control circuit and diagrams etc. with reasons. These drawings will also form part of agreement, if accepted by JREDA.

G36.2 In case, contractor wants some modifications or change in layout or drawings, the same should be clearly indicated in a drawing showing sufficient overall dimensions, clearances and space requirements of all apparatus to be furnished, to enable the consultant/JREDA to take a final decision in the matter.

G36.3 No extension of time shall be allowed on account of the time consumed in submission and examination of defective drawings and resubmission of corrected drawings.

G36.4 Any drawing suggesting modification or change in original drawings, technical data or correspondence which form the basis of an order or contract, as aforesaid, or which may be furnished by the contractor for JREDA's approval, or information, as provided under the said order or contract, shall be in English and if it is in any other language, a complete translation in English should be duly furnished.

G36.5 The contractor shall be responsible for and shall pay for any alterations of the work due to any discrepancies, errors and omissions in the drawings or other particulars supplied by him whether such drawings or particulars have been approved by the purchaser or not, provided that such discrepancies, errors or omission are due to inaccurate information or particulars furnished to the contractor by the Purchaser. The Purchaser shall pay for any alterations, in the work necessitated by reasons of such inaccurate information of particulars.

G.37 PATENT RIGHTS

In the event of any claim or demand being made or action being brought against the purchaser for infringement or alleged infringement of patent rights in respect of any exhibit, machine, work or things used or supplied by the contractor in respect of using or working by JREDA, such exhibit, machine, work or thing, the contractor shall indemnify JREDA from and against such claims whatsoever or demand and costs and expenses arising from or incurred by reasons of such claim or demand. JREDA shall notify the contractor immediately on receipt of any claim and that contractor shall be at liberty, if he desires with the assistance of JREDA, if required, but at the contractor's own expense to conduct all negotiations for the settlement of the same/or any litigation that may arise there from provided that no such machine, plant, work or things shall be used by JREDA for any purpose in any manner other than that for which have been supplied by the contractor and specified under the contract.

G.38 MATERIALS AND WORKMANSHIP

G.38.1 All materials shall be of the best quality and workmanship capable of satisfactory operation under the operating and climatic conditions as may be specified. Unless otherwise specified, they shall conform in all respect to the latest edition of the relevant BIS specification wherever Indian specifications apply.

G38.2 The Contractor at site shall supply all materials required for construction. The contractor shall also arrange for transportation, loading/unloading and safe storage of materials at site.

G38.3 If the contractor offers equipments manufactured in accordance with other international well recognized standards, he shall, in case, supply a copy in English of the Standard specification adopted and shall clearly mention in what respect such standard differs from Indian Standard Specification.

G39.0 PACKING AND MARKING

G39.1 The Contractor shall be responsible for security protecting and packing the plant and equipment as per prescribed standards in force to withstand the journey and ensuring safety of materials and also arrival of materials at destination in original conditions and good for contemplated use. Packing case size and weight shall take into consideration the remoteness of the goods final destination and absence of heavy material handling facilities at all points in transit.

Each bundle or the package shall have the following markings on it:

a) The name and address of the consignee

b) Destination

c) Relevant marks, reference numbers etc. for identification

G39.2 Packing lists of materials shall be provided in each package to facilitate checking up of the contents at the destination.

G.40 POWER TO VARY/OMIT WORK

G40.1 No alterations, amendments, omissions, additions, subtractions or variations of the work (hereinafter referred to as 'variation') under the contract shall be made by the contractor except as directed by the Director, JREDA. The Director, JREDA shall have full power, subject to provisions hereinafter contained from time to time during execution of the contract by notice in writing to instruct the contractor to make such variations up to ± 10% of the scheduled quantity and be bound by the same conditions though the said variations occurred in the contract.

G40.2 If any suggested variations would, in the opinion of the contractor, if carried out, prevent him from fulfilling any of his obligations or guarantees, under the contract, he shall notify the Director, JREDA thereof in writing, and the Director, JREDA shall decide forthwith whether or not the same shall be carried out, and if Director, JREDA confirms his instruction, the contractor shall carryout the work as per instruction.

G40.3 The differences in cost, if any, occasioned by such variations, shall be added to or deducted from the contract price, as the case may be.

G40.4 In the event of Director, JREDA requiring any variations, reasonable and proper notice shall be given to the contractor as well to enable him to make arrangements accordingly, and in case where goods or materials are already prepared or procured, or any designs, drawings or patterns made or work done that required to be altered, a reasonable sum in respect thereof shall be allowed by the Director, JREDA.

G40.5 In every cases in which the contractor shall receive instructions from the Director, JREDA for carrying out any work, which either then or later, will in the opinion of the contractor involve a claim for additional payment, the contractor shall as soon as reasonably possible after the receipt of such instructions, inform in writing the Director, JREDA of such claim for additional payment.

G.41 NEGLIGENCE

G41.1 If the contractor shall neglect to carry out the work or shall refuse or neglect to comply with any reasonable order given to him in writing by the Director, JREDA or shall contravene any provisions of the contract, the purchaser may give seven days notice in writing to the contractor, to make good the failure, neglect or contravention complained of any if the contractor shall fail to comply with the notice within reasonable time from the date of serving thereof in the event of failure, neglect or contravention capable of being made good within that time, then is such case if the Purchaser shall think fit, it shall be lawful for him to take the work wholly or in part, out of the contractor's hand and give it to another person on contract at a reasonable price and the Purchaser shall be entitled to retain and supply any balance which may be otherwise due on the contract by him to the contractor or such part thereof as may be necessary, to the payment of the cost of manufacture or supply of such plant as aforesaid.

G41.2 If the cost of executing the work as aforesaid shall exceed the balance due to the contractor and the contractor fails to make good such deficiency, the Purchaser shall take action in the manner it may consider deem fit in terms of the contract.

G41.0 COMPLIANCE WITH REGULATIONS

G41.1 The Contractor shall comply with all applicable laws or ordinances, codes, approved standards, rules and regulations and shall procure all necessary Municipal, other statutory bodies and Government permits & licenses etc. at his own cost. The contract shall leave the Purchaser and the Director, JREDA harmless as a result of any infractions thereof.

G.42 DEATH, INSOLVENCY AND BREACH OF CONTRACT

The Purchaser may at anytime by notice in writing summarily determine the Contract without compensation to the contractor in any of the following events:

G42.1 If the contractor being an individual or if a firm, any partner thereof shall at any time, be adjudged insolvent of shall have a receiving order or order from administration of his estate made against him or shall take any proceeding for composition under any Insolvency Act for the time being in force or make any conveyance or assignment with his creditors or suspend payment or if the firm be dissolved under Partnership Act, or

G42.2 If the contractor being a Company is wound up voluntarily or by the order of a court or a Receiver, Liquidator or manager on behalf of the Debenture holder is appointed or circumstances have arisen which entitle the Court or debenture holder to appoint a Receiver, Liquidator or Manager, or

G42.3 If the contractor commits any breach of the contract not herein specifically provided for provided always that such determination shall not prejudice any right of action or remedy which shall have accrued or shall accrue thereafter to the Purchaser and provided also that the contractor shall be liable to pay to the Purchaser. The contractor shall under no circumstances be entitled to pay again or repurchase.

G43.0 PROGRESS REPORT OF WORK

The Contractor shall submit weekly and monthly progress report on execution of works conforming to bar chart. Incase of any slippage(s) or the contractor along with modified Bar Chart will submit delay in execution of work reasons for such delay along with details of hindrances.

G44.0 STATUTORY ACTS, RULES AND STANDARDS

The work shall be executed in conformity with the relevant standard of Bureau of Indian Specification (or equivalent International standards), National Building code of India, Indian Electricity rules 1956 (as amended up to date), Indian Electricity Act and relevant Rules in vogue at the time of execution.

G45.0 SAFETY MEASURES

The contractor shall have to provide necessary measures for providing adequate safety measures and precautions to avoid any accident, which may cause damage to any equipment/material or injury to workmen. JREDA, shall not be responsible for any such accidents.

G46.0 STOPPAGE OF WORK

JREDA shall not be responsible for any damage or loss caused due to 'force majeure' conditions. The contractor should make provisions for adequate insurance cover against such loss or damages. JREDA shall not be responsible and not liable to pay any compensation due to stoppage of work as a reaction from local public due to any undue action on the part of the contractor causing annoyance to local people.

G47.0 HINDRANCE REGISTER

The contractor may also maintain a Hindrance Register where reasons for delay may be recorded from time to time and at the time of occurrence of the hindrance and get it duly certified by the Director, JREDA or his authorized representative.

G48.0 RESPONSIBILITY OF THE CONTRACTOR

The contractor shall guarantee and be entirely responsible for the execution of the contract in accordance with the specification, schedules and appendices. He shall further guarantee and be responsible for the quality and workmanship of all materials and completed works, correct designs and drawings, correct delivery of material, civil construction, plant erection, testing and commissioning: within the guaranteed completion and warranty period of 60(sixty) months from the date of commissioning.

G49.0 RIGHT OF JREDA TO MAKE CHANGE (S) IN DESIGN

JREDA shall have the right to require the contractor to make any change in the design, which may be necessary in the opinion of the Director, JREDA to make the plant and materials conform to the provisions and contents of the specification without extra cost to the purchaser.

G50.0 DRAWINGS AND MANUALS

The contractor shall supply all necessary erection/ construction, drawings, erection, testing and commissioning of manuals etc. as and when required. The contractor on commissioning of the exhibits shall submit six sets of drawings and manuals etc.

G51.0 INSPECTION AND TESTING

G51.1 The Director, JREDA and his duly authorized representative shall have, at all reasonable time access to the Contractor's premises, and shall have the power, at all reasonable times, to inspect and examine the materials and workmanship during execution of the work during its manufacture, shop assembly and test and if part of the plant is being manufactured in another premises, the contractor shall obtain for the Director, JREDA or his duly authorized representative, necessary permission to inspect it as if the plant was manufactured at Contractor's own premises.

G51.2 The Director, JREDA shall, on giving seven days' notice in writing to the Contractor, setting out any grounds of objections which he may have in respect of the work, be at liberty to reject all or in part or workmanship connected with such work, which, in his opinion defective for any reason whatsoever; provided that, if such notice be not sent to the Contractor within reasonable time after the grounds on which notice is based have come to reject the said plant or workmanship on such grounds. Unless specifically provided otherwise, all tests shall be made at the Contractor's works before shipment.

G51.3 The contractor shall, if required, give the Director, JREDA notice of any equipment being ready for testing, and the Director, JREDA or his authorized representative, if so desired, shall on giving twenty four hour's previous notice in writing to the contractor attend at Contractor's premises within 15 days of the date on which the material is notified as being ready failing which or alternatively if JREDA at its own discretion waives the inspection and testing, the contractor may proceed with the tests which shall be deemed to have been made in the presence of Director, JREDA and he shall forthwith forward six sets of duly certified copies of test results and certificated to the Director, JREDA for the approval of JREDA. The contractor shall dispatch the equipment only after receiving the test certificates in writing by JREDA.

G51.4 In all cases where the contract provides for tests whether the premises of the Contractor or any sub-contractor, the contractor except where otherwise specified, shall provide free of charge such labour, materials, electricity, fuel, water, stores, apparatus and instruments as may reasonably be demanded to carry out efficiently such tests in accordance with the contract, and shall give facilities to the Director, JREDA or his authorized representative, to accomplish such testing.

G51.5 If the inspection is done through an independent authority, at the option of JREDA, the purchaser shall pay the inspection fee, if any.

G51.6 When the inspection and tests have been satisfactorily completed at the contractor's work, the Director, JREDA or his authorized representative shall issue a certificate to that effect.

G51.7 Neither the waiving inspection nor acceptance after inspection by JREDA shall, in any way, relieve the contractor of responsibility of supplying the plant and equipment strictly in accordance with specification and drawings etc.

G52.0 DELIVERY OF EQUIPMENTS

G52.1 The Contractor shall deliver the materials in accordance with the terms and conditions of the contract at the time/times at the place/places and in the manner specified in the contract. The contractor shall comply with instructions that may be given by the purchaser from time to time regarding the transit of the plant and material.

G52.2 Notification of delivery or dispatch in regard to each and every consignment shall be made to JREDA immediately after dispatch or delivery. The supplier shall supply the consignee Invoice in triplicate and packing account of all stores delivered or dispatched by him.

G52.3 In case of any occurrence of loss or damage in transit up to destination, it shall be liability of the contractor to initiate or pursue the claim with insurance company. He should take immediate steps to repair the damaged apparatus or replacement thereto. JREDA on merit will consider any time limit extension in such contingency.

G53.0 DIRECTOR'S DECISION

In respect of all matters which are left to the decision of the Director, JREDA, including the granting or withholding certificates, the Director, JREDA shall if required to do so by the contractor, give in writing a decision there on. If the decision is not accepted by the contractor the matter will, at the request of the contractor be referred to arbitration under the provision for arbitration hereinafter contained but, subject to the right of reference to arbitration; such decision shall be final and binding on the contractor.

G54.0 LIABILITIES FOR ACCIDENTS AND DAMAGES DURING TRANSIT

The Contractor shall be responsible for loss, damages or depreciation to goods or of plant/equipment up to delivery at site.

G55.0 DEDUCTION FROM CONTRACT PRICE

G55.1 All costs, claims, damages or expenses which the JREDA. may have paid for, which under the contract the contractor is liable, may be deducted by the JREDA. from the running bill or earnest Money /or from any money due or which become due by him to the contractor under this contract.

G55.1 Any sum of money due and payable to the contractor under this contract may be appropriated by the JREDA. and set off against any claim of the JREDA, for the payment of a sum of money arising out of or under any other contract made by the Contractor with JREDA.

G55.2 It is an agreed term of the contract that the sum of money withheld or obtained under this clause by JREDA. will be kept withhold or retained as such by JREDA. or till this claim arising out of in the same contract is either mutually settled or determined by the arbitrator, or by competent court, as the case may be, and that the contractor shall have no claim for interest or damages whatsoever on this account or any other account in respect of any sum of money withheld or retained under this clause and duly notified as such to the contractor.

G56.0 TEST ON COMPLETION

It will be necessary for the final tests as to performance and guarantees to be held over until the exhibits are installed at site. The test shall be carried out in the presence of purchaser's representatives within reasonable time of completion of erection. If the results of these tests are not within the margin specified, the tests shall, if required be repeated after re-tests, and the contractor shall bear all reasonable expenses to which he may be put by such tests.

G57.0 REJECTION OF DEFECTIVE WORK

If the completed work or any portion thereof, before it is taken over, be found to be defective, or fail to fulfill the requirements of the contract, the Director, JREDA shall give to the contractor notice stating the particulars of such defects or failure and the contractor shall forthwith make the defect good, or alter the same to make it comply with the requirements of the contract. If the contractor fails to do so within a reasonable time, the Purchaser may reject and replace, at the cost of the contractor, the whole or any portion of the wall, as the requirement of the contract. Such replacement shall be carried out by the Purchaser within a reasonable time and a reasonable price and where possible to the same specifications under competitive conditions. In cases of such replacement by JREDA, the contractor shall be liable to pay to the Purchaser the extra cost, if any of such replacement, be delivered and /or erected as provided for in the contract agreement. The extra cost may be ascertained as the difference between the prices paid by the Purchaser for such replacement and the contract price of the plant/equipment so replaced as also any sum paid by JREDA to the contractor in respect of defective plant. If JREDA does not so replace the defective plant within a reasonable time, the contractor shall be liable only to repay to JREDA all money paid by JREDA to him in respect of such plant.

G58.0 GUARANTEE

G58.1 The contractor must ensure that the goods supplied are new, unused and have most recent or current models and incorporate all recent improvements in design and materials unless provided otherwise in contract.

G58.2 The guarantee period of the exhibits will be 60 (sixty) calendar months from the date of commissioning. The contractor shall remain liable to replace any defective parts that may develop in his own manufacture or that of his sub-contractors under the conditions provided by the contract under proper use, and arising solely from faulty design, materials or workmanship, provided always that such defective parts are not, repairable at site and are not essential in the meantime to the maintenance in commercial use of the park are promptly returned to the contractor's works at the expense of the contractor unless otherwise arranged.

G58.2 If it becomes necessary for the contractor to replace or renew any defective parts of the power plant or other equipment under this clause, the provisions of the first paragraph of this clause shall apply to the parts of the power plant and other equipment supplied by the contractor. So he will replace or renew the defective parts until the expiration of six months from the date of such replacement or renewal or until the end of the above-mentioned period of 60 months whichever is later.

G58.3 If any defects not remedied within a reasonable time, JREDA may proceed to do work at the contractor's risk and expense, but without prejudice to other rights, which JREDA may have against the contractor in respect of such defects.

G58.4 At the end of guarantee period, the contractor's liability shall cease. In respect of goods not covered by the first paragraph of this clause, JREDA shall be entitled to the benefit of such guarantee given to the contractor by the original supplier or manufacturer of such goods.

G59.0 MAINTENANCE OF THE EXHIBITS

The contractor will be responsible for maintenance of the exhibits and other equipments supplied by him.

G60.0 ARBITRATION

G60.1 Except where otherwise provided, if at any time, any question, dispute or difference, whatever shall arise between the contractor and JREDA upon or in the relation to or in connection with this contract with either of the parties may give to other notice in writing of the existence of such a question on rejection of the matter, the dispute or difference shall be referred to the sole arbitrator appointed by JREDA at the time of dispute after ascertaining the terms of reference mutually.

G60.2 The arbitrator will preferably be a member of Arbitration Council and arbitration proceedings will take place as per provisions of Arbitration Act, 1940 or any statutory modifications or re-enactment thereof, and the rules made there under and for the time being in force shall apply.

G60.3 The contractor will ensure that the work under this contract shall continue during arbitration proceedings and dispute and no payments due from or payment by the purchaser shall be withhold on account of such proceedings except to the extent which may be in dispute.

G61.0 COURT OF COMPETENT JURISDICTION

Only the Judicial Courts of Ranchi have jurisdiction in case of dispute between JREDA and the contractor.

G62.0 CONSTRUCTION OF CONTRACT

The contract shall in all respect be construed and operated as a contract as defined in the Indian Contracts Act, 1972, and all the payments hereunder shall be made in Indian Rupees unless otherwise specified.

G63.0 ADDRESS OF THE CONTRACTOR AND NOTICES AND COMMUNICATIONS ON BEHALF OF THE PURCHASER

G63.1 For all purpose of the contract, including arbitration hereunder, the address of the contractor mentioned in the tender shall be the address to which all communications addressed to the contractor shall be sent, unless the contractor has notified a change by a separate letter containing no other communication and sent by registered post acknowledged by JREDA. The contractor shall be solely responsible for the consequence of an omission to notify a change of address in the manner aforesaid.

G63.2 Any communication or notice on behalf of the Purchaser in relation to the contract may be issued to the contractor by engineer and all such communication and notice may be served on the contractor either by registered post or under certificate of posting or by ordinary post or by hand delivery at the option of the officer.

G64.0 CONTRACT DOCUMENTS & MATTERS TO BE TREATED AS CONFIDENTIAL

All documents, correspondence, the contractor shall consider decision and other matters concerning the contract as confidential and restricted nature and he shall not divulge or allow access thereto un-authorized person of any kind.

G65.0 FINAL BILL

The final bill relating to the contract shall be prepared only when the equipment have been installed and tested for final acceptance and it will include the adjustments of all claims against the contractor by Director, JREDA and awarded in his favour by the arbitrator up to the date of preparation of the final bill.

STATE LEVEL ENERGY PARK
AT SIDDU-KANU UDYAN, RANCHI
TECHNICAL SPECIFICATION OF THE EXHIBITS

Electricity plays a dominant role in our lives by enhancing our productivity, comfort, safety, health, and economic prosperity. Various inventions and development of electronics has brought rapid technological evolution in the recent years, and its applications are fast expanding in industrial, commercial, residential, military, aerospace and utility environments. Many innovations in power semiconductor devices, converter topologies, analytical and simulation techniques, electrical machine drives, and control and estimation methods have contributed to this advancement. The frontier of this complex and interdisciplinary technology has been further advanced by the artificial intelligence. The survival and further development of human civilization is unthinkable without electricity.

Though we cannot think of living without electricity today but most people give little thought to where electricity comes from, how it is generated and its impact on our lives, environment and future of civilization. There are many different ways of generating electricity - including coal, oil, gas, hydroelectric, nuclear, biomass, waste and solar etc. Each option inherits certain advantages that merit consideration whenever there is a need for a new power plant.

T1. ENVIRONMENTAL IMPACT OF FOSSIL FUEL BASED POWER GENERATION

The environmental impact of any power generating station is very important because fossil fuel based power plants constitute one of the biggest source of pollution and green house gas emission. The use of renewable energy has many unique qualities that provide environmental benefits. It can help mitigate climate change, reduce acid rain, soil erosion, water pollution and pressure on landfills, provide wildlife habitat, and help maintain forest health through better management.

The burning of biomass results in release of CO_2 into the atmosphere as a result of the combustion but it is not more than that absorbed by the biomass during its growth. So, the CO_2 released during combustion is neutralized if the same amount of biomass is grown again.

T2. THE OBJECTIVE OF SETTING UP ENERGY PARK

The main objective of setting up the Energy Park is to create public awareness, especially amongst students and younger generation about both the positive and negative impacts of energy generation and utilization. By careful planning and utilization of energy in future the environment has to be saved for the safety of our future development and prosperity. The State Level Energy Park is being set at Ranchi to serve the people of Jharkhand in their quest for future development by creating awareness about energy and its uses.

T3. LOCATION/SITE DETAILS

The project envisages setting up of A State Level Energy Park by modifying the existing Siddu Kanu Park located near Kanke Road in a prominent area of Ranchi city. The existing park will be modified for installation of renewable energy based exhibits inside the park. The total area of the Park is 34,946.14 Sqm.

T3.1 GEOGRAPHICAL DETAILS

Geographical Co-ordinates	
Latitude:	23.23N
Longitude	85º23E
Height above sea level	about 654 m above MSL
Soil Condition:	Red soil.

T3.2 GENERAL WEATHER CONDITION

Ranchi receives an average annual rainfall of 1544 mm in 75 rainy days. The rainy season normally starts during 3rd week of June and ends in 1st week of November with duration of about 20 weeks. The average monsoon seasonal rainfall (June to September) is 1295 mm and can vary from 978 mm to 1769 mm. Peak rainfall occurs during 3rd week of June.

Daytime temperature varies from 21.5° C (1st week of January) to 37.0° C (3rd week of May), while the nighttime temperature varies from 6.4° C (1st week of January) to 24.0° C (3rd week of May).

T.3.3 AVERAGE ANNUAL WEATHER DATA

The average annual weather data of Ranchi are furnished below:

Week	Max^{im} Temp.	Min^{m} Temp	Relative Humidity – I	Relative Humidity - II	Wind Speed (m/s)	Rainfall mm/week	Sun Shine Hours
1	21.5	6.4	86	41	0.53	1.4	7.6
2	22.2	7.9	85	41	0.58	3.7	7.1
3	22.7	7.1	82	38	0.67	4.5	8.3
4	22.9	6.8	81	34	0.69	6.2	9.0
5	24.5	8.5	82	34	0.69	2.3	8.6
6	25.1	9.7	81	35	0.72	6.1	8.6
7	26.0	11.0	82	37	0.78	7.2	8.7
8	26.0	10.7	81	34	0.75	6.1	9.0
9	27.8	12.0	82	34	0.83	11.1	8.5
10	28.5	12.3	76	31	0.81	5.6	8.3
11	30.3	14.4	79	31	0.86	6.1	8.2
12	32.0	15.3	75	28	1.02	4.3	8.6
13	31.9	16.1	74	29	0.91	7.0	7.9
14	33.4	17.3	68	26	0.99	2.6	8.5
15	34.8	18.6	67	27	1.03	5.7	8.0
16	35.6	19.3	64	28	1.06	5.6	8.6
17	35.9	20.6	66	29	1.19	7.4	8.7
18	36.0	21.5	65	33	1.31	8.7	8.5
19	36.8	22.3	65	34	1.31	10.5	8.4
20	36.6	22.9	68	39	1.33	12.9	8.3

21	36.5	23.3	68	38	1.28	15.9	7.9
22	37.0	24.0	68	35	1.44	14.2	7.4
23	35.8	23.9	76	45	1.64	27.0	6.9
24	32.7	23.5	80	60	1.75	51.7	5.3
25	30.5	22.8	85	68	1.50	107.2	3.6
26	30.4	23.2	85	68	1.47	98.8	3.7
27	30.4	23.0	86	70	1.22	79.8	3.4
28	29.4	23.0	89	74	1.19	103.8	3.3
29	28.9	23.0	90	77	1.44	84.8	4.1
30	28.8	22.8	91	76	1.36	88.3	3.5
31	29.0	22.8	91	76	1.25	87.0	3.1
32	29.0	22.8	91	75	1.22	69.5	4.1
33	28.7	22.7	92	78	1.19	74.1	3.6
34	28.8	22.7	91	76	1.39	67.6	3.6
35	28.6	22.5	91	77	1.39	82.2	4.0
36	28.6	22.2	91	78	0.94	98.7	3.3
37	28.6	21.9	91	75	1.03	68.5	4.2
38	29.5	21.6	89	71	1.17	54.3	6.0
39	39.2	20.9	90	69	0.86	41.4	5.3
40	29.3	20.1	89	64	0.81	26.2	6.5
41	28.7	18.8	88	60	0.61	19.3	6.8
42	28.4	17.0	88	56	0.61	17.5	7.7
43	27.9	15.0	87	50	0.61	1.9	8.3
44	27.2	14.6	87	50	0.56	5.7	7.4
45	26.8	13.2	86	48	0.64	8.0	7.9
46	26.3	12.2	86	48	0.61	5.5	7.8
47	25.3	10.9	85	43	0.50	5.0	8.2
48	24.6	9.1	85	41	0.70	2.5	8.5
49	23.8	8.0	87	41	0.42	0.1	8.5
50	23.3	7.3	85	40	0.58	1.5	8.5
51	23.0	7.1	85	40	0.53	3.7	8.3
52	22.5	7.5	87	46	0.53	6.2	7.5

T3.4 NORMAL RAINY DAYS IN A YEAR

Parameter	SW Monsoon (June-Sept.)	NE Monsoon (Oct. – Dec.)	Winter (Jan. – Feb.)	Hot Weather (March – May)	Annual (Jan. – Dec.)
Average	56	6	3.9	8	75
Lowest	47	0	0	4	62
Highest	67	15	8	14	99

T3.5 SOLAR INSOLATION LEVEL

The average annual solar insolation is about 1794.74 kWh/m^2. The month wise 10 year-average solar insolation data for project site are furnished hereunder.

MONTHLY SOLAR INSOLATION DATA

Month	10 Year Average daily solar Radiation* kWh/ m^2	10 Year Average Monthly Solar Radiation kWh/ m^2	Equivalent Number of NO-SUN days
January	4.34	134.54	3.42
February	5.03	140,84	1.83
March	5.85	181.35	3.02
April	6.47	194.10	1.66
May	6.41	198.71	1.74
June	5.20	156.00	7.09
July	4.18	129.58	5.11
August	4.04	125.24	4.45
September	4.38	131.40	3.55
October	4.96	153.76	3.68
November	4.49	134.70	3.80
December	4.09	126.79	4.09
Average	4.95	{ 1807.01/12 =150.58}	

*Source:: NASA Surface Meteorology and Solar Energy Tables

Annual solar radiation ≈ 1800 kW/Sq.m

VARIOUS EXHIBITS

T4. SOLAR POWER CENTRE

T4.1 PHYSICS OF SOLAR PHOTOVOLTAIC POWER

T4.1.1 OBJECTIVE

Solar Energy can be directly converted to electricity through photovoltaic cell. The output of the Photovoltaic cell depends on the intensity of the incident radiation and active area of the cell. This phenomenon has to be explained through this exhibit.

T4.1.2 TECHNICAL SPECIFICATION

The exhibit shall comprise of a table, a light source consisting of 4 Nos. 230 V, 50 Hz, 500 W Halogen lamps with reflector type fittings, suitable Solar Photovoltaic module of rating 12 V nominal, 70 Wp to 120 Wp with shutter to close part of the module and some low power consuming electrical home appliance as follows:

- ❖ Car Fan
- ❖ FM Radio
- ❖ 10-15 W, 12 V Incandescent filament lamp with holder
- ❖ Suitable size Current Controlling variable resistance
- ❖ A small heating element.

The exhibit shall have provision to tilt the Photovoltaic module in order to vary the light input from the light source. The light beam of light incident to module surface can be varied from 0^0 to $90^{0.}$ The output of the Photovoltaic module shall be brought to a source terminal through the following devices purpose of protecting, controlling and measuring the Photovoltaic power:

- A fuse with fuse holder
- 5A, 220 V single pole switch
- Suitable size current controlling potentiometer
- 5A analogue type Moving Iron DC ammeter
- 25 V analogue type Moving Iron DC voltmeter.

The electrical appliances shall be suitably fitted on a wooden table. The table shall be well decorated and made of good quality ply board of minimum thickness 1" pasted with good quality sun mica. The light source shall have to be suitably placed on the table. The module shall be fixed in between tabletop surface & light source in such a way the module can be tilted freely. The frame of the light source should have adequate openings for natural cooling and also shall have forced cooling system so designed that the light would not be affected for continuous 10 minuets glow. Inputs of individual appliances shall be brought to different load terminals and all the load terminals shall be marked individually. A pair of connecting cord shall be arranged in such a way that each load terminal would be connected with source terminal to operate from the Photovoltaic source.

The shuttering arrangement shall be such that the incident radiation can be changed linearly. There shall be cooling arrangement for the Photovoltaic module. The light source shall also have fuse protection and controlling arrangement.

The tabletop size will be 750mm X 1500mm & height 36". The light source and the module mounting arrangement shall also be introduced with the table. A flexible cord of at least 120" length, appropriate size 3-pin male plug has to be provided with the exhibit for powering the exhibit

T4.2 FLAT SCREEN TV WITH AUDIO VISUAL

The system will consist of a Flat Screen TV with DVD Player for showing films, videos and games related to solar energy, solar system, astronomy, astrophysics, green house effect and photosynthesis etc. The TV and the DVD will be of well-reputed brands like Videocon, LG, Sony, Samsung and Philips etc.

T4.3 SOLAR COOKER (outdoor)

T4.3.1 Solar Parabolic Cooker

The capacity of solar parabolic cooker shall be 12 liter and 14 kg. by weight and shall be suitable for cocking rice, dal (pulses), vegetarian & non-vegetarian dishes, roasting chapattis and boiling eggs. The cooker shall conform to latest Ministry of New & Renewable Energy (MNRE)'s specifications. The heat output shall be equivalent to 600 watt nominal power.

T4.3.2 Solar Box Type Cooker

The solar box type cooker shall have advanced glazing system for high heat retention. Wheels shall be provided for easy movement. The body of the cooker shall be climate friendly FRP with one touch center locking system. Optional electrical backup facility will be provided for cooking in absence of solar radiation.

T4.4 REFRIGERATOR

Refrigerator of capacity 80 liter shall be one of the following make: Godrej,/Videocon/ Electrolux/L.G.,Whirlpool, Voltas or similar good make. The Refrigerator should operate at 230 V, 50 Hz supply. One stand made of super quality PVC shall have to be supplied along with the refrigerator. Before supply of this item all technical catalogs are to be produced for obtaining approval for make and model. There shall be an authorized dealer and servicing center for this supplied item in Ranchi city.

T4.5 WEIGHING MACHINE

The weighing machine shall be suitable to measure height & weight of a visitor on insertion of five-rupee coin. The machine shall provide instant printed token showing both height & weight of the rider in cm & kg respectively. The machine shall be suitable to measure 10 kg to 150 kg. Salient features of the weighing machine shall be as follows:

- Weighing System: Strain Gauge Load Cell
- Weighing Range: 10 kg to 150 kg in steps of 100 gm
- Least count: 100 gms.
- Pan size: 295 mm x 295 mm
- Base: Rugged casting
- Display Type: Large & clear LCD
- Printer Type: Line Thermal Printer, Graphics Capability, High Speed (4 lines/sec)
- Ticket Cutter: Automatic Guillotine with motor
- Coin Accepter Type: Twin Mechanical
- Language: English
- Measuring System: Kg & Cm
- Operating Voltage: 240 V, 50 Hz, AC
- Power Consumption: 200 VA

Necessary software and hardware are to be supplied with the weighing machine. Detailed technical literature of manufacturer containing specification along with name of manufacture etc. is to be submitted along with the offer.

T4.6 COMPUTER FOR QUIZ & GAMES

The Computer based quiz and game is an interactive audio-visual exhibit designed to impart knowledge related to solar energy and solar system. The visitor can participate by inserting a *'five rupee'* coin. The computer system will be turned on immediately on insertion of the coin and remain active for 15 minutes. The Computer system will consist of PC wide wide flat screen assembled in a suitable wooden cabinet. The Computer can be operated in two modes; namely 'information mode' and 'quiz mode'. In the information mode, it will supply information about different aspects of solar energy. In the 'quiz mode' the Computer will give both questions and answers in an interactive way. The system will automatically switch off after 15 minutes and there will be time counting display on the screen.

T4.7 SOLAR REPLICA

A solar replica model shall be installed inside the exhibition hall suitable for explaining the solar system to the children. Detailed drawings showing the details of the solar system replica to be submitted along with the tender.

T4.8 PANELS & BLOW UPS

The panels and blow ups for depicting drawings, diagrams and pictures related to solar energy will be made with 3 mm thick aluminum plates fixed with digitally printed material on it. Size 1200 mm x 910 mm (4'x3') each.

T4.9 SOLAR EDUCATIONAL KIT FOR SCHOOL CHILDREN

The kit will be designed to educate students on the application of Solar Power and shall be provided with easy to understand study notes. The solar educational kit will consist of solar cell with voltmeter, ammeter and other components as per standard product manufactured by TATA BP or equivalent by other reputed manufacturers.

T4.10 SOLAR PV MODULE 12 VOLT, 10 Wp FOR DEMONSTRATION

The declared output of the module should be 10 Wp. Module shall conform to IEC 61215 or IEE 1662 or CCEC 503 or equivalent International Standard. This module is meant only for physically showing it to the students/ children.

Cell Technology – Mono/poly crystalline Silicon/amorphous silicon.
Efficiency – 13 – 14% or more.

T4.11 SOLAR WATER DISTILLATION UNIT (Outdoor)

Approved quality Solar Distillation Plant of 1000 mm x 1000 mm shall be installed on suitable GI structure. Supply of Solar Distillation Plant includes construction of suitable foundation for the distillation plant. At least two numbers of plastic pots and one funnel are to be supplied along with the Solar Water Distillation Plants.

T5. WIND POWER CENTRE

T5.1 WIND BLOWER & WIND ELECTRIC GENERATOR MODELS

This exhibit will be indoor type. The exhibit will display different types of windmills both vertical & horizontal. All the windmills should be operational through artificially created wind from a WIND BLOWER. The blower should not be visible. All windmills shall be fitted on a table made of good quality wood of appropriate size.

Specification

Tabletop should be at least 96" X 48" (LXB). Height of the table shall be 36". The table shall be well decorated and made of good quality ply board of minimum thickness 1" pasted with good quality sun mica. Different types of windmills as follows are to be demonstrated in working condition.

Horizontal axis – two-blade system

Horizontal axis – three-blade system

Horizontal axis – multi blade system

Vertical axis – Darrieus type system

Vertical Axis – Savonius type system

The small power, which will be obtained from the wind power generating models, shall be utilized for glowing of LED's, Voltmeter etc. On the table a model depicting a village located near the seashore should be developed. Some hutments should be shown which would be lighted through windmill power. The models are to be made of aluminum, polystyrene, acrylic whichever is suitable and applicable. All rotating parts are to be attached with suitable size ball bearings. The seashore and wind farm shall be demonstrated with proper landscaping. Proper write-up explaining the exhibit should also be provided.

The exhibit will be placed on a table & also be enclosed with 8mm size glass cover. Dimension of the enclosure shall be at least 96" X 48" X 36".

The backside of the enclosure shall be made of 1" thickness ply board & a suitable brief write-up on wind power generation shall have to be provided. Opening of the hidden blower shall be located in the back side of the enclosure in such a way that all the wind power models would run while the blower will be activated by pressing a single pushbutton switch. The push button switch will be located in front of the exhibit for demonstration purpose. The capacity of blower will be adequate to run all the wind power models & to be operated at 230 V AC, 50Hz.

T5.2 FLAT SCREEN TV WITH AUDIO VISUAL

The system will consist of a Flat Screen TV with DVD Player for showing films, videos and games related to wind energy, basic meteorology and different types wind power producing plants etc. The TV and the DVD will be of well-reputed brands like Videocon, LG, Sony, Samsung and Philips etc.

T5.3 COMPUTER BASED QUIZ & GAMES

The Computer based quiz and game is an interactive audio-visual exhibit designed to impart knowledge related to wind and wind energy systems. The visitor can participate by inserting a '*five rupee'* coin. The computer system will be turned on immediately on insertion of the coin and remain active for 15 minutes. The Computer system will consist of PC wide wide flat screen assembled in a suitable wooden cabinet. The Computer can be operated in two modes; namely 'information mode' and 'quiz mode'. In the information mode, it will supply information about different aspects of solar energy. In the 'quiz mode' the Computer will give both questions and answers in an interactive way. The system will automatically switch off after 15 minutes and there will be time counting display on the screen.

T5.4 PANELS & BLOW UPS

The panels and blow ups for depicting drawings, diagrams and pictures related to wind power will be made with 3 mm thick aluminum plates fixed with digitally printed material on it. Size 1200 mm x 910 mm (4'x3') each.

T6. HYDEL POWER CENTRE

T6.1 WATER FALL ANIMATION (artificial waterfall – outdoor)

An artificial water fall will be created from a suitable point in the existing hillock to be modified to accommodate it of about 1 meter width and it will be illuminated with coloured LED lamps. Water will be allowed fall from the top of the existing rocky hillock by making necessary modification with cement concrete and rock. The water will be pumped up with a 2 HP centrifugal surface pump from a water reservoir created at the base of artificial hillock. The waterfall shall be 1000 mm wide and the existing water tank on the hillock will be modified for this purpose.

T6.2. WORKING MODEL OF PELTON TURBINE (Outdoor)

Normally Pelton turbines are very high head turbines with a heads of more than 100 meters... It is not possible to have high head in the Energy Park so a model similar to Pelton known as "Harris Pelton" Turbine will be installed for demonstration purpose, which can operate at comparatively lower head. The machine output is 1.5 kW and it can operate at a low head of 8 meters. The system should be complete with a small pump with required pipe length, which will supply water at the top level for feeding the turbine.

T6.3 WORKING MODEL OF FRANCIS TURBINE (Outdoor)

Normally Francis turbines are medium head turbines where head of water lies between 30 to 100 meters. It is not possible to have 30-meter head in the Energy Park so a model similar to Francis known as "Nautilus" Turbine may be installed for demonstration purpose, which can operate at comparatively lower head of about 3.1 meters and generate power. The system should be complete with a small pump with required pipe length, which will supply water at the top level for feeding the turbine.

T6.4 MODEL OF KAPLAN TURBINE (Outdoor)

Kaplan turbines are low head turbines but require huge flow of water for running the machine. It is not possible to have such flow in the Energy park so a model similar to Kaplan known as "Niade": turbine may be installed for demonstration purpose which can operate at a head between 2 to 4 ft with a flow of about 60 to 100 liters of water and generate 125 watt of power. The system should be complete with a small pump with required pipe length, which will supply water at the top level for feeding the turbine.

T6.5 WORKING MODEL OF UNDER WATER BULB TURBINE (Outdoor)

A small model of under water Bulb Turbine known as "AQUW – Aquair 12 V under Water Turbine Generator" may be installed. This machine can generate 8 amps at 12 volt with a flow velocity of 10 kmph through a suitable pipe. The system should be complete with a small pump with required pipe length, which will supply water at the top level for feeding the turbine.

T6.6 WATER SUPPLY SYSTEM FOR EXHIBITS

In order to facilitate smooth and uninterrupted operation of Hydroelectric energy related exhibits, it is essential to ensure a proper water management system feeding all the main water supply lines connected to the exhibits.

i) This work will involve installation of a small water reservoir on the top of existing rocky hillock inside the park.
ii) Repair and capacity expansion of water reservoir at the base of the hillock.
iii) Repair and reconditioning/replacement of existing deep tube well pumps for ensuring water supply.
iv) Provision for storing water available from the new solar water pump unit for demonstration purpose in the lower level reservoir.
v) Providing necessary pipes, valves and fittings for the whole system.
vi) Water will be recycled and the system will be designed in such a way that it should be complimentary to the 'Rain water Harvesting system' being taken up separately.

T6.7 MUSICAL FOUNTAIN

T6.7.1 DESCRIPTION

The Musical fountain shall have array of individually articulated nozzles to create highly impressive effect. The water will jump, twist, sway and swirl in beautiful movements synchronized with recorded music. The waltzing waters shall be custom designed and manufactured to dance (work) according to tine of Indian music (selected classical and Hindi film music).

T6.7.2 SPECIFICATION

Length:	10 meters
Spray Height:	7 to 10 meters
Pump:	Minimum 37 stainless steel submersible.
Light:	100 Nos. (Minimum) with 500 watt halogen lamps with Diachronic filters.
Nozzles:	As required to give a proper show along with music.

In addition to the above, the following accessories shall be provided:

i) **Pool Filter** – The Pool Filter will maintain the water quality. The filter size shall be based on pool capacity and the shall be calculated to ensure clear water by the manufacturer/supplier.

ii) **Fountain Effect** – Spray jets should be properly selected to give the pattern and effect desired.

iii) **Lighting** –The size, wattage and height of water effect and colour lenses are to be properly designed to an impressive show.

iv) **Pumps** – Pumps of proper size and capacity to be used as per requirement. Both dry and submersible pumps may be used depending on requirement.

v) **Junction Boxes** – Waterproof junction boxes complete with watertight cord shall be used. The type of junction boxes shall be determined by number of lights and electrical circuits.

vi) **Control Panel** – Control Panel shall be designed to incorporate the controls for pumps, lights, water level and music playing equipment of the complete system.

vii) **Wind Controller** – A sensing head mounted up-win from the fountain with control mechanism.

viii) **Suction Drains & Debris Screen** – Suction drains with debris screen shall be provided to prevent damage to pumps and clogging of spray jets.

ix) **Overflow Drains** – Overflow drains shall drain out excess water brought by rainfall or accidental overflowing of the fountain.

x) **Water level Controller** – Water level sensors monitoring water make up valve and low water shutdown will replenish the water lost due to evaporation.

T6.8 FLAT SCREEN TV WITH AUDIO VISUAL

The system will consist of a Flat Screen TV with DVD Player for showing films, videos and games related to hydroelectric power and power plants etc. The TV and the DVD will be of well-reputed brands like Videocon, LG, Sony, Samsung and Philips etc.

T6.9 COMPUTER BASED QUIZ & GAMES

The Computer based quiz and game is an interactive audio-visual exhibit designed to impart knowledge related to hydroelectric energy systems. The visitor can participate by inserting a '*five rupee'* coin. The computer system will be turned on immediately on insertion of the coin and remain active for 15 minutes. The Computer system will consist of PC wide flat screen assembled in a suitable wooden cabinet. The Computer can be operated in two modes; namely 'information mode' and 'quiz mode'. In the information mode, it will supply information about different aspects of solar energy. In the 'quiz mode' the Computer will give both questions and answers in an interactive way.

The system will automatically switch off after 15 minutes and there will be time counting display on the screen.

T6.10 PANELS & BLOW UPS

The panels and blow ups for depicting drawings, diagrams and pictures related to Tidal power, Ocean Thermal power, Wave power, Rain water harvesting and cross sections of three types of hydro turbines will be made with 3 mm thick aluminum plates fixed with digitally printed material on it. Size 1200 mm x 910 mm (4'x3') each.

T7. BIO ENERGY CENTRE

T7.1 BIOMASS GASIFIERS

Two non-working models will be displayed, the first one will be a 'Cross section of a Down Draft Type Biomass Gasifier and the Second Model will show how Producer gas generated by the gasifier can be used for generating electric power or produce heat energy.

T7.2 BIOGAS PLANT (Cut Models)

One of the two cut models will be that of a Gobar Gas Plant used in rural areas and the other will be Biomethanation plant for Municippal Waste.

T7.3 DIFFERENT MODELS OF CHULHAS

Different types non-working models of different types of smokeless chulhas will be displayed.

T7.4 FLAT SCREEN TV WITH AUDIO VISUAL

The system will consist of a Flat Screen TV with DVD Player for showing films, videos and games related to different types of biomass, bio-diesel and biomass power and power plants etc. The TV and the DVD will be of well-reputed brands like Videocon, LG, Sony, Samsung and Philips etc.

T7.5 COMPUTER BASED QUIZ & GAMES

The Computer based quiz and game is an interactive audio-visual exhibit designed to impart knowledge related to hydroelectric energy systems. The visitor can participate by inserting a '*five rupee'* coin. The computer system will be turned on immediately on insertion of the coin and remain active for 15 minutes. The Computer system will consist of PC wide flat screen assembled in a suitable wooden cabinet. The Computer can be operated in two modes; namely 'information mode' and 'quiz mode'. In the information mode, it will supply information about different aspects of biomass fuel; bio-diesel and biomass based power plants. In the 'quiz mode' the Computer will give both questions and answers in an interactive way. The system will automatically switch off after 15 minutes and there will be time counting display on the screen.

T7.6 PANELS & BLOW UPS

The panels and blow-ups for depicting drawings, diagrams and pictures related to photosynthesis, biomass gasifier based power plant, biomethanation plant, biomass combustion based power plant and bio-diesel technology. The panels will be made with 3 mm thick aluminum plates fixed with digitally printed material on it. Size 1200 mm x 910 mm (4'x3') each.

T7.7 ILLUSTRATIVE DISPLAY CHART

The illustrative display chart depicting drawings, diagrams and pictures related to Jatropha oil, Karanj oil and comparison with mineral Diesel oil. The panels will be made with 3 mm thick aluminum plates fixed with digitally printed material on it. Size 1200 mm x 600 mm (4'x2') each.

T8. ENERGY INFORMATION CENTRE

The Energy Information Centre will function as reception, library, guidance, shop and information center to visitors. On entering the visitor will first come to this center and then proceed to see other exhibits. Important books, periodicals and other items may be sold from this centre. This will also act as Control and Monitoring Cell of the Park. The Music-cum-Public Address system (considered separately) will be operated from here.

Three Computers, CD Banks, Books, Magazines on Energy, IREDA Publications, Government of Jharkhand publications/Circulars and MNES Publications/Circulars will be available from this centre either free of cost or on payment including soft and hard copies other publications. The Computers shall be connected to Internet.

T8.1 COMPUTERS WITH RELEVANT SOFTWARE

The Computer shall be Desk Top type shall consist of the following:

PROCESSOR	Intel Core 2 Duo Processor 2.4GHz
CACHE	2MB
CHIPSET	Intel 945 chipset
FSB	1066MHz
SYSTEM MEMORY/MAX SUPPORT	256MB DDR2 Up to 2GB
DIMM Slots	2
DEVICE TYPE	ULTRA ATA IDE HDD, CD ROM Serial ATA HDD Supported
HARD DISK DRIVE	80GB Serial ATA HDD
MULTIMEDIA (OPTIONAL)	52X CD ROM DRIVE or DVD DRIVE/ COMBO DRIVE /SPEAKERS / MIC
PORTS	1 x RS-232C SERIAL 1 x Parallel 4 USB ports
SLOTS	4 PCI Express slots
GRAPHICS/MEMORY	Intel Graphics Media Accelerator 950
GRAPHICS PORTS	1 No (16X PCI Express Slot)
FLOPPY DRIVE	1.44MB FDD
DISPLAY	15 NON INTERLACED DIGITAL COLOR MONITOR
KEYBOARD	104 KEYS WINDOWS KEYBOARD
MOUSE	PS/2 MOUSE
CABINET WITH SMPS	P4 ATX TOWER CHASSIS
CERTIFICATION	Designed for Windows XP, DMI 2.0 compliant, NSTL Certified, ISO Certified

The PC shall have to be HCL/ Wipro/Compaq/Samsung/Dell or similar reputed make.

T8.2 LCD PROJECTORS

The projectors resolution will be SVGA 600x800 with high contrast ratio of minimum 400:1 or higher and capable of providing crystal clear images and digital sound quality. This will be a high definition projector with brightness of more than 1500 lumens and suitable for technical presentation in a 50 seat hall. The listed lamp life should be atleast 2000 hours.

The projector will have high connection flexibility and connects to PCs, DVDs, Camcorders etc. This will be complete with wall-mounted screen. This equipment will be used in the Seminar Hall.

T8.2.1 INTERNET ENABLED COMPUTERS, ETC.

The Computers will be Internet connected and visitors may see energy related sites through the Internet. A list of web site addresses of a number of web sites from which information regarding renewable energy may be obtained will be displayed. In addition to these, a number of CDs, books, literature, MNRE publications and other energy related books & publications would be available here including the softwares mentioned below

T8.2.2 COMPUTER INTERACTIVE SOFTWARE-I

Computer Interactive software on (i) How electricity is made, electrical distribution basics, AC & DC electricity and other basic knowledge about electricity for school level students.

T8.2.3 COMPUTER INTERACTIVE SOFTWARE-II

Computer Interactive software about earth, moon, planets, solar radiation and space etc.

T8.3 MUSIC-CUM-PUBLIC ADDRESS SYSTEM

T8.31 OBJECTIVE

The Public address system will be operated for making announcement to visitors and staff of the Energy Park also for running musical cassettes at low db level for entertainment of visitors.

T8.3.2 DESCRIPTION

One Microphones of the system will be located at the office near the Main gate and the other will be located in the Energy Information Centre table. The main amplifier and control system shall be installed in Energy information center and 8 (eight) Nos. of Speakers shall be located in the different areas of the Park.

T8.3.3 SPECIFICATION

The Music-cum-Public Address System shall consist of 75 watt public address amplifier with auto-reverse cassette player with replaceable module, 6 pre-set AM/FM tuner, 2 Mic, 1 Aux/CD & Telephone inputs, built in switch able monitor speaker & headphone output, line output to a booster amplifier for more system power, speaker matching: 4 Ω, 8 Ω, 16 Ω and 100 V. suitable for 230 volt, 50 Hz supply. The equipment should be Ahuja radio or Philips make.

The system shall be complete with 4 (four) Nos. of speakers located at 4 different locations, microphone with table stand.

T8.3.4 ILLUSTRATIVE DISPLAY CHART - I

The illustrative display chart depicting drawings, diagrams and pictures related to basic electricity, current, voltage, kW, kWh, MW, GW, kV, KVA, MVA and KVAr etc. made with 3 mm thick aluminum plates fixed with digitally printed material on it. Size 1200 mm x 600 mm (4'x2') each.

T8.3.5 ILLUSTRATIVE DISPLAY CHART - II

The illustrative display chart depicting drawings, diagrams and pictures related to Nuclear Fission, Nuclear fusion, proton, neutron, electron and atomic structure for school level students made with 3 mm thick aluminum plates fixed with digitally printed material on it. Size 1200 mm x 600 mm (4'x2') each.

T8.3.6 ILLUSTRATIVE DISPLAY CHART - III

The illustrative display chart showing common energy units and their inter-relation, like relation between kW and joule, Kcal and kW etc. made with 3 mm thick aluminum plates fixed with digitally printed material on it. Size 1200 mm x 600 mm (4'x2') each.

T8.3.7 ILLUSTRATIVE DISPLAY CHART - IV

The illustrative display chart depicting Kyoto protocol, CDM and Climate change etc. made with 3 mm thick aluminum plates fixed with digitally printed material on it. Size 1200 mm x 600 mm (4'x2') each.

T.8.3.8 ILLUSTRATIVE DISPLAY CHART - V

The illustrative display chart depicting "What human activities contribute to climate change?' made with 3 mm thick aluminum plates fixed with digitally printed material on it. Size 1200 mm x 600 mm (4'x2') each.

T8.3.9 ILLUSTRATIVE DISPLAY CHART - VI

The illustrative display chart depicting chronological history of Electrical inventions, made with 3 mm thick aluminum plates fixed with digitally printed material on it. Size 1200 mm x 600 mm (4'x2') each.

T8.3.10 ILLUSTRATIVE DISPLAY CHART - VII

The illustrative display chart depicting chronological history of solar energy, made with 3 mm thick aluminum plates fixed with digitally printed material on it. Size 1200 mm x 600 mm (4'x2') each.

T8.3.11 ILLUSTRATIVE DISPLAY CHART - VIII

The illustrative display chart showing comparison between incandescent lamps, fluorescent tubes, CFL, sodium vapour, metal halide, mercury vapour and LED lamps etc. made with 3 mm thick aluminum plates fixed with digitally printed material on it. Size 1200 mm x 600 mm (4'x2') each.

T8.3.12 ILLUSTRATIVE DISPLAY CHART ABOUT IMPORTANCE OF RENEWABLE ENERGY IN OUR FUTURE

The illustrative display chart depicting why Renewable Energy is Important for our Future? The panel is made with 3 mm thick aluminum plates fixed with digitally printed material on it. Size 1200 mm x 600 mm (4'x2') each

T8.3.13 DIGITAL CLOCK

The Digital Clocks will be displayed at different locations in the Energy Park. There will be two types of Digital Clocks:

a) This Digital clock shall be wall mounted and will show both Indian Standard & Greenwich time simultaneously in the Energy Information Center, 2 (two). other exhibition rooms.

b) The digital Clocks mounted outside the building including main gate will only show Indian standard time.

All the digits shall show in seven segment display system either in LED & LCD. The clock shall show hours, minuets & seconds. There shall be suitable time adjustment device. The size of the digits will be 250 mm and 100 mm. The clock shall operate at 230 V, 50 Hz supply with standby battery backup for uninterrupted operation.

T9. EXHIBIT ON ENERGY TRANSFORMATION

T9.1 Objective

The objective of this exhibit is to educate the visitors/students on energy conversion and energy conservation. They should understand energy could only be transformed from one form.

T9.2 Description

The exhibit shall comprise of a floor mounted octagonal display table. The tabletop shall have eight compartments, where different types of conversion of energy in working conditions shall be demonstrated. Each compartment shall have glass cover in such a way that any visitor can run & activate each conversion technique by pressing a pushbutton, which will be suitably placed on the tabletop. Different type of transformation of energy shall also be suitably described. Each compartment earmarked for each conversion shall be suitably illuminated.

T9.3 Specification

The exhibit shall be of a well-decorated floor mounted tabletop exhibit made of good quality ply board of minimum thickness 25 mm pasted with good quality sun mica. Height of the table shall be 900 mm & each side of the octagon shall be at least 600 mm. The transformation technique shall be described through scientific reasoning. The exhibits will include following energy transformation phenomenon.

- ❖ Chemical to electrical (Battery)
- ❖ Electricity to light (LED)
- ❖ Mechanical to electrical (Dynamo)
- ❖ Electrical to mechanical (motor)
- ❖ Electrical to sound (Audio)
- ❖ Electrical to heat (Heating filament)
- ❖ Wind energy to electricity (WEG)

The size of the compartment on the tabletop shall be adequate enough to place the above transformations technique in such a way that visitors can understand the mechanism. The exhibit shall have provision for easy repair or replacement of the defective parts. The exhibit shall be well-decorated floor mounted and made of good quality plywood of minimum thickness 25 mm pasted with good quality sun mica.

Proper write-ups should be given on the top of the exhibit. It should be made in bigger font size of at least 16 No. So that it should be readable by any visitor including children.

T10. EXHIBIT ON STORAGE OF ENERGY

T10.1 Objective

The exhibit will be an explanatory cum working model type. The model will describe the different technique of storage of energy as given below:

- ❖ Potential energy by lifting a mass.
- ❖ Kinetic energy by moving a mass.
- ❖ Kinetic energy by rotating a mass.
- ❖ Magnetic energy stored in a magnetic field.
- ❖ Electrical energy stored in a capacitor.
- ❖ Electrical energy stored in a battery.
- ❖ Energy stored in compressed gas.
- ❖ Energy stored in a spring (potential energy).
- ❖ Energy stored in a hot mass.

T10.2 Technical Specification

The potential energy gained by a mass while it is displaced from a reference point to higher point, the stored energy – mgh (where m= mass, g = gravitational acceleration & h = height) has to be suitably demonstrated in such a way that the stored energy can perform work.

Kinetic energy gained by a mass while it is in motion, the stored energy – ½ mv^2 (where m = mass of the body under motion, v = velocity of the moving body) has to be suitably demonstrated in such a way that the stored energy can perform work.

Kinetic energy gained by a rotating mass while it is in motion, the stored energy – ½ J ω^2 (where J = moment of inertia & ω = angular velocity of the moving body) has to be suitably demonstrated in such a way that the stored energy can perform work.

While a current passing through a solenoid wound on a magnetic material, stored magnetic energy in the magnetic material is expressed by – ½ Li^2, where L = magnetic inductance of the coil & i = current passing through the solenoid. The working principle of storage of energy in a magnetic field & existence of that stored magnetic energy has to be suitably demonstrated.

While a condenser having capacitance C is charged at a voltage V, energy is stored in the capacitor, which is expressed by ½ CV^2. The working principle of storage of energy in a magnetic field & existence of that stored magnetic energy has to be suitably demonstrated.

Battery is an energy storage device for a large quantum of energy. The storage principle has to be suitably demonstrated through a charge & discharge circuit.

Air can be compressed in a closed vessel by a compressor & by this way potential energy can be stored. Releasing the compressed air by a suitable regulator, potential energy can be utilized to do some work. The working principle of stored energy & existence of that stored energy have to be suitably demonstrated.

Potential energy can be stored in spring. The technique of storage of energy & its existence is to be suitably demonstrated by a working exhibit.

T11. DIFFERENT TYPES OF BATTERIES ON DISPLAY

There are many different types of batteries to meet the demands of individual appliances and their users. Different devices operate at different voltages and power levels. They all require batteries that provide the necessary power output at a minimum discharging voltage. The voltage of a given battery depends on the number of single cells connected in series and on their electrochemical system.

T11.1 Series-Parallel Connections of Batteries.

Simple series and parallel connection concept will be shown in an illustrative display chart depicting the simple connection diagrams. The panel will be made with 3 mm thick aluminum plates fixed with digitally printed material on it. Size 1200 mm x 600 mm (4'x2') each.

T11.2 Chart Showing Different Types of Batteries

There are many types of batteries in addition to lead-acid type for various uses. A chart showing some important varieties will be shown as detailed below. The panel will be made with 3 mm thick aluminum plates fixed with digitally printed material on it. Size 1200 mm x 600 mm (4'x2') each.

BATTERY TYPE	VOLTAGE	APPLICATIONS	REMARKS
Main Types			
Zinc carbon and zinc chloride	1.5	Toys, torches, clocks, flash lamps etc.	Low purchase cost. Best with intermittent mode of use. Zinc carbons are the longest established standard cell type. An improved version of the zinc carbon battery was introduced in 1988, zinc chloride, that is better suited to motorized appliances.
Alkaline manganese	1.5	Radios, torches, cassette players, cameras, toys	Radios, torches, cassette players, cameras, toys
Button Cells			
Silver oxide	1.55	Cameras, pocket calculators.	Relatively high purchase cost. Flat discharge. Continuous or intermittent mode of use.
Zinc air	1.4	Hearing aids and pocket paging devices	Flat discharge. Continuous or intermittent mode of use.
Lithium manganese	3	Pocket calculators	Relatively high purchase cost. Flat discharge. Continuous or intermittent mode of use.
Rechargeable			
Nickel cadmium	1.2	Power tools and emergency lighting and other heavy duty motor driven appliances	High initial purchase cost but can be recharged many hundreds of times. Often manufactured as packs supplied with appliances.
Nickel metal hydride	1.2	Mobile phones, camcorders and laptop computers	High initial purchase cost but can be recharged many hundreds of times. Often manufactured as packs supplied with appliances. Increased energy density offers longer service life between charges.
Lithium ion	4	Mobile phones, camcorders and laptop computers	High initial purchase cost but can be recharged many hundreds of times. Often manufactured as packs supplied with appliances. High-energy content (3.6v) and long cycle life lead to low overall energy cost.

T12. FUEL CELL

Fuel cells have several benefits over conventional combustion-based technologies currently used in many power plants and passenger vehicles. They produce much smaller quantities of greenhouse gases and none of the air pollutants that create smog and cause health problems. If pure hydrogen is used as a fuel, fuel cells emit only heat and water as a byproduct.

T12.1 Diagram on what Is a Fuel Cell?

In principle, a fuel cell operates like a battery. Unlike a battery, a fuel cell does not run down or require recharging. It will produce energy in the form of electricity and heat as long as fuel is supplied. The panel will be made with 3 mm thick aluminum plates fixed with digitally printed material on it. Size 1200 mm x 600 mm (4'x2') each.

T12.2 DIFFERENT TYPES OF FUEL CELLS.

T12.2.1 Alkali Fuel Cells

Alkali fuel cells operate on compressed hydrogen and oxygen. They generally use a solution of potassium hydroxide (KOH) in water as their electrolyte**.** Efficiency is about 70 percent, and operating temperature is 150 to 200 degrees C. Cell output ranges from 300 watts (W) to 5 kilowatts (kW). Alkali cells were used in Apollo spacecraft to provide both electricity and drinking water. They require pure hydrogen fuel, however, and their platinum electrode catalysts are expensive. And like any container filled with liquid, they can leak.

The panel will be made with 3 mm thick aluminum plates fixed with digitally printed material on it. Size 1200 mm x 600 mm (4'x2') each

T12.2.2 MOLTEN CARBONATE FUEL CELLS (MCFC)

Molten Carbonate fuel cells (MCFC) use high-temperature compounds of salt (like sodium or magnesium) carbonates (chemically, CO_3) as the electrolyte. Efficiency ranges from 60 to 80 percent, and operating temperature is about 650 degrees C (1,200 degrees F). Units with output up to 2 megawatts (MW) have been constructed, and designs exist for units up to 100 MW. Also, carbonate ions from the electrolyte are used up in the reactions, making it necessary to inject carbon dioxide to compensate.

The panel will be made with 3 mm thick aluminum plates fixed with digitally printed material on it. Size 1200 mm x 600 mm (4'x2') each

T12.2.3 PHOSPHORIC ACID FUEL CELLS (PAFC)

Phosphoric Acid fuel cells (PAFC) use phosphoric acid as the electrolyte. Efficiency ranges from 40 to 80 percent, and operating temperature is between 150 to 200º C. Existing phosphoric acid cells have outputs up to 200 kW, and 11 MW units have been tested. PAFCs tolerate a carbon monoxide concentration of about 1.5 percent, which broadens the choice of fuels they can use. If gasoline is used, the sulfur must be removed. Platinum electrode-catalysts are needed, and internal parts must be able to withstand the corrosive acid.

The panel will be made with 3 mm thick aluminum plates fixed with digitally printed material on it. Size 1200 mm x 600 mm (4'x2') each

T12.2.4 PROTON EXCHANGE MEMBRANE

Proton Exchange Membrane (PEM) fuel cells work with a polymer electrolyte in the form of a thin, permeable sheet. Efficiency is about 40 to 50 percent, and operating temperature is about 80ºC. Cell outputs generally range from 50 to 250 kW. The solid, flexible electrolyte will not leak or crack, and these cells operate at a low enough temperature to make them suitable for homes and cars. But their fuels must be purified, and a platinum catalyst is used on both sides of the membrane, raising costs.

The panel will be made with 3 mm thick aluminum plates fixed with digitally printed material on it. Size 1200 mm x 600 mm (4'x2') each

T12.2.5 SOLID OXIDE FUEL CELL (SOFC)

Solid Oxide fuel cells (SOFC) use a hard, ceramic compound of metal (like calcium or zirconium) oxides (chemically, O_2) as electrolyte. Efficiency is about 60 percent, and operating temperatures are about 1,000ºC.

The panel will be made with 3 mm thick aluminum plates fixed with digitally printed material on it. Size 1200 mm x 600 mm (4'x2') each

T12.3 OTHER PANELS & BLOW UPS

T12.3.1 Geothermal Power – Panel

Geothermal Energy, which has been used to generate electricity since the early 1900s, is a wide spread resource found throughout the World. Its potential as an energy source is substantial. In geological terms, Geothermal Energy is defined as the heat above the mean ambient temperature of earth's solid core, which is about 8 X 10^{30} joules. The amount of Geothermal Energy is enormous, however, only a tiny fraction of natural heat can be extracted from the earth's crust, mainly for economic reasons, which limits exploitation to a maximum depth of 5 km. To this depth, the temperature of the crust increases at an average rate of 30°C to 35°C per kilometers. Size 1200 mm x 910 mm (4'x3') each.

T12.3.2 Geothermal Power Plants

In *geothermal power plants* steam, heat or hot water from geothermal reservoirs provides the force that spins the *turbine generators* and produces electricity. The used geothermal water is then returned down an *injection well* into the reservoir to be reheated, to maintain pressure, and to sustain the reservoir.

There are three kinds of *geothermal power plants*. The kind we build depends on the temperatures and pressures of a reservoir.

The panels and blowups for geothermal power plants will show drawings, diagrams and pictures. The panels will be made with 3 mm thick aluminum plates fixed with digitally printed material on it. Size 1200 mm x 910 mm (4'x3') each.

T12.3.3 PANELS & BLOW UPS ABOUT NUCLEAR POWER

The panels and blow-ups for depicting most simple nuclear power plants just to give some idea to school level students. The panel will be made with 3 mm thick aluminum plates fixed with digitally printed material on it. Size 1200 mm x 910 mm (4'x3') each.

T13. SURVEILLANCE SYSTEM

With safety & security of human lives & property being our top most priority, a suitable Security System tailor made for the Energy Park must be provided. The surveillance equipment consisting of Computer, remote controlled CCTV cameras fitted at important locations from security point of

view, LCD display units etc. should be best available in the market. It is proposed to have Cameras installed at following locations with viewing and recording at the Exhibition Hall.

a) Two gates of the Energy Park.

b) Inside Exhibition Hall.

c) Inside Seminar Hall

d) Near Musical Fountain

e) Near Artificial Waterfall.

f) Four different locations inside Energy Park.

g) Spare 1 No.

T14... MUSCLE POWER EXHIBIT/DYNAMO PADDLE

T14.1 Description

An exercising cycle will be fitted with a DC dynamo by a V-belt for converting muscle power to electricity. Any rider can paddle the cycle, which will drive the dynamo and electricity will be generated. The generated electrical energy will be used to run a tri-colour visual indicating system. The padding speed will change the brightness and colour of light generated.

A standard HERO make exercising paddle cycle shall be rested on a 50 mm X 50 X 6 mm MS angle fabricated structure covered by 18 SWG MS sheet & minimum 1 mm thick Aluminum checker plate over the MS sheet. Front wheel of the cycle shall be fitted with 12V, 20W permanent magnet DC dynamo by a V-belt. There shall be an indicator mounted on a separate frame just in front of the cycle. The frame shall be fitted with the base platform. The indicator shall comprise of 3 X 12 W. coloured lamp (Red, Yellow & Green) with reflector. There shall be an electronic controller for glowing the lamps in such a way that intensity, colour & number of lamps, which will glow, shall depend on number of paddling per min. The exhibit shall be painted with colourful anti-corrosive paint. There will be a blue coloured revolving alarm mounted on the indicating lamppost. The alarm will operate when the cycling speed will be excessively high and just after glowing red indicator lamp. There shall also be an analogue type Speedo meter suitably fitted on the cycle.

T14.2 Specification

Length Breadth and Height of the platform will be minimum 1800 mm, 900 mm and 150 mm respectively. Indicator board will be located suitable in front of rider of the exhibit at a height of about 1050 mm from base platform.

T15. FURNITURES & FIXTURES

T15.1 Inkjet Printer-cum-Scanner

HP make Inkjet Printer-cum-Scanner shall be purchased at manufacturers price as per technical literature.

T15.2 Web Camera

Windows compatible web Camera will be procured as per manufacturer's price list and only from reputed MNC manufacturer.

T15.3 Computer Table (Workstation Type – I)

Computer Table with 1(one) terminal table & printer table attached with fixed Keyboard & 3 drawers on one side. Size - 48"x30"x30".

T15.4 Computer Table (Workstation Type – II)

Computer Table with 1(one) terminal table with sliding Keyboard & 3 drawers on one side. Size - 30"x24"x30”

T15.5 COMPUTER CHAIR

Computer Chair with arms, Godrej or equivalent good make.

T15.6 Executive Table

Executive table, 60"x36"x30"with 3 drawers & one cupboard, Godrej or equivalent good make.

T15.7 Shelves

Enclosed shelves with glass cover, Size - 66"x33"x12

T15.8 Steel Almirah

Steel Almirah - Size 78” x 35” x 19’ with 1 locker and 4 compartments. Steel sheet thickness –19 SWG, Godrej make or equivalent reputed make.

T16. POWER GENERATING DRUM

T16.1 Description

The exhibit is a cylindrical drum made of FRP/NFTC body of about 1700 mm diameter and 1200 mm length with 2 Nos. of circular MS rails fitted along the outer surface of the drum in such a way that the drum can rotate freely on its axis for demonstrating generation of electricity from muscle power. Walking or jogging along the inside periphery results in rotation of the drum. One pair of the wheels fitted with a DC dynamo through gear assembly, which will rotate the dynamo. The Dynamo will generate power, which in turn shall be utilized for Audio – Visual effect to demonstrate the production of electrical energy from muscle power through a joy ride. The total system shall have to be set on brick foundation with MS fabricated base.

T16.2 Specification

Diameter of Drum	1700 mm
Breadth of Drum	1200 mm
Length of Base Platform	1900 mm
Breadth of Base platform	800 mm
Platform material	100 X 50 X 5 mm MS Channel
Diameter of Rail Material	32 mm Bright Rod
Rail Support Ring	150 X 6 mm MS Flat Bar
Number of Spacer Plate	16
Spacer Plate Materials	50 x 6 mm MS Flat Bar
Wheel diameter	235 mm (made of Hard Polymer)
Wheel Thickness	100 mm
Shaft Diameter	40 mm
Diameter of Hand Rail	32 mm (SS Pipe)

Height of Handrail Support	minimum 1200 mm, should be made of Black pipe.
Display Board	600 mm X 300 mm X 100 mm
Visual display	2 X 100 mm diameter LED display Unit 8 X High Intensity LED 100 mm diameter 12 V brass less Fan
Audio System	2 x 15 W Stereophonic auto reverse Cassette Player
Dynamo	60W, 12 V, Permanent Magnet
Dynamo Drive	Grooved Pulley & V-belt

All dimensions are approximate.

T17. SOLAR TOY CAR FOR CHILDREN

T17.1 Description

The solar car shall be of 4 wheels (two at the back side and two in the front side) suitable for riding children up to the age of 10 years. The car shall be fitted with a module of capacity not less than 50Wp with suitable Charge Controller and 12V 30AH rechargeable maintenance free battery. The car shall by driven by a DC motor of rating not less than 12V, 6A, through suitable controller. The car shall be provided with mechanical arrangement to move forward and backward in such a way that the rider can easily handle the car. The car shall also be provided with low powered horn & head light with controlling switches. The body of the car shall be made of fiberglass. The car shall have electronic breaking arrangement. The car shall have back horn, sidelight etc. The wheels of the car shall be made of molded PVC having diameter 8" approx. Provision for charging the battery from external sources should also be provided. Over all dimensions will be 1335mm X 700 mm X 670 mm (LXWXH).

T17.2 Specification

i) Working head lights and turning signals

ii) Forward and reverse driving

iii) High and slow speed control

iv) Two-seater capacity

v) Brake, battery charge indicator

vi) Speed: 5 to 7 kmph

vii) 50 Wp Solar panel integrated with the car.

viii) Spring type shock absorber for comfort

ix) Realistic bumpers

x) Safety Seat belts

xi) Toy cellular phone, floor carpet and working stick shift

xii) Moulded PVC body.

xiii) Overall size: 1335 mm (L) x 700 mm (W) x 670 mm (H).

xiv) Openable door, hood & trunk

xv) Colour; Red or Green

xvi) Provision shall be made for charging the battery from outside power source at 230 Volt AC.

T18. BATTERY OPERATED BICYCLE

T18.1 Description

A standard cycle fitted with a battery driven motor. A small charger for the battery will be installed in a convenient place in the Energy Park. The cycle will be made available to Visitors on rental basis for joy ride.

T18.2 Specification

i)	Cycle size:	26”
ii)	Motor:	24 Volt DC, 300 watts.
iii)	Drive:	Rear Wheel direct drive.
iv)	Battery:	Rechargeable sealed Lead-Acid 12 volt, 17 Ah - 2
v)	Riding Range;	30 – 50 kms.
vi)`	Gradient:	8 Degree.
vii)	Speed:	25 kmph (max^m)
viii)	Light:	Fitted in both front and rear.

T19. ENERGY SLIP

T19.1 Description

The Energy Slip is made of a robust soft endless conveyor belt fitted with suitable metallic wheels. The conveyor belt is inclined at a suitable angle with respect to horizontal axis. When a rider tries to come down from top most point the inclined conveyor belt moves due to gravitational pull. The conveyor belts rotate the upper drum, which is coupled to a DC dynamo through a gear assembly. During sliding electricity is generated due to rotation of the upper drum. The electricity thus produced may be used to produce audio effect through a musical system. A staircase made of GI angle or GI pipe shall be made for going up to the top point of the Energy Slip. The staircase shall be provided with proper handrail and chequered plates for stepping.

T19.2 Specification

i)	Total length:	7500 mm
ii)	Total breadth:	670 mm
iii)	Point of conveyor slide:	3900 mm
iv)	Breadth of conveyor belt:	500 mm
v)	Top edge height of slide:	2400 mm
vi)	Dynamo;	12 Volt, 15 watt
vii)	Diameter of Idler Drum:	200 mm
viii)	No. Of rollers:	12
ix)	Display unit LED display unit with logo –	“ENERGY SLIP’
x)	Dynamo rating	12 volt, 1 Amp.
xi)	Dynamo drive DC dynamo shall be fitted with top edge wheel by means of 75 mm dia rubber pulley.	
xii)	Foundation The structure shall be fitted with RCC foundation by nuts & bolts. All dimensions are approximate.	

T20. SOLAR TROLLEY BUS (MINI)

T20.1 Description

The Solar Trolley Bus will be a ten-seater bus of fiberglass body. This will operate on a concrete pathway as shown in the layout drawing. The Bus will cover 400 meter distance in about 15 minutes with a brief stop at the "Station". This bus will operate within the park over the internal roads to be modifies and overhead line erected on GI supports made out of GI pipes.
The trolley bus will collect power from current carrying conductor through a current collecting system and a trolley cable. The trolley bus will be fitted with back-up battery system for short run upto 5 kms. And also for taking u-turn etc. A 72 volt DC traction system suitable for operation of two buses with 5.5 kW (approx.) motors each. The current carrying trolley wire shall be made of copper of appropriate size. The trolley conductor shall be fitted on MS cross arms fitted on small RCC poles with proper insulator, stays and guys etc. as required to complete the system. There will be two buses and one will follow the other.

TECHNICAL SPECIFICATIONS OF SOLAR TROLLY BUS

Speed	50 mtrs/minutes.
Motor	D.C. Series Motor.
Capacity	5.5 kW (Approx.)
Motor control System	MOSFET based Electronic controller
Body	Transparent Fiber Glass.
Comfort & luxury	Large and rooms interior with excellent visibility. No clutch and gear. The Bus will have desert cooler inside.
Length (Approx)	3500 mm.
Width (Approx)	1600 mm.
Ground Clearance	160 mm(Approx)
Power Connection	Flexible cable with copper Bus

T21. SOLAR OUTDOOR LIGHTING SYSTEM WITH LED LAMPS (street light type)

The broad performance specifications of a white Light Emitting Diode light source based Solar Street Light system are given below:

T21.1 Broad Performance Parameters

a)	Light Source	White Light Emitting Diode (W-LED)
b)	Light Output	White colour, minimum 6 lux when measured from a height of about 3.66 m and illuminated over an area equal to atleast 2.5 m. Higher light output will be preferred.
c)	Mounting Height	4.6 m high pole with extended arm to hold luminaries.
d)	PV Module	37 Wp under STC, measured at 16.4 V as Vload Module Voc minimum 21 V.
e)	Battery	Flooded lead acid tubular plate, 12 V – 40 Ah @ C/10, Max. DOD 75%.
f)	Electronic Circuit Efficiency	Minimum 72%
g)	Average Duty Cycle	Dusk to Dawn
h)	Autonomy	Minimum 3 days.

T21.2 Duty Cycle

The LED street lighting system shall be designed to operate from dusk to dawn under average daily insolation of 4.9 kWh/sq.m on horizontal surface.

T21.3 Light Source

a) The light source shall be of white LED type. Single or multiple lamps can be used. Wider view angles preferred. The luminous performance of LEDs used should not be less than 30 lumen/watt. Use of LEDs, which emit ultraviolet light, shall be avoided.

b) The light source shall remain constant with variation of battery voltage.

c) The lamps shall be housed in an assembly suitable for outdoor use. While fixing the assembly, the lamp should be held in a base up configuration.

d) The test report on the technical characteristics of LEDs conducted in a Test laboratory approved by MNRE should be furnished.

T21.4 PV Module

a) The PV Module shall contain crystalline silicon solar cells.

b) The Operating voltage corresponding to the power output mentioned above shall be 16.4 Volt.

c) The open circuit voltage of the PV modules under STC shall be atleast 21.0 Volts.

d) The terminal box on the module shall have provision for opening for replacing the cable, if required.

e) A strip containing the following details shall be laminated inside the module so as to be clearly visible from the front side:

i) Name of manufacturer or distinctive logo.

ii) Model or Type No.

iii) Serial No.

iv) Year of make.

T21.5 Battery

a) Flooded lead acid battery maintenance free battery. It shall conform to latest BIS standards or equivalent international standards.

b) 75% of the rated capacity of the battery shall be between fully charged & load cut off conditions.

T21.6 Electronics

a) The total electronic efficiency should be at least 72%.

b) The electronic system shall operate at 12 volt and shall have temperature compensation for proper charging of the battery through out the year.

c) The light output shall remain constant with variations in the battery voltages.

d) Necessary lengths of wire/cables, switches suitable for DC use and fuses shall be provided.

e) The PV Module will be used to sense the ambient light level for switching ON and OFF the lamp.

T21.7 Electronic Protections

i) Adequate protection is to be incorporated under no load conditions e.g. when the lamp is removed and the system are switched ON.

ii) The system should have protection against battery overcharge and deep discharge conditions. The numerical values of the cut-off limits must be specified.

iii) A blocking diode should be provided as part of the electronics, to prevent reverse flow of current through the PV module(s), in case such a diode is not provided with the solar module(s).

iv) Full protection against open circuit, accidental short circuit and reverse polarity should be provided.

T21.8 Mechanical Hardware

i) A metallic frame structure (with corrosion resistance paint) to be fixed on the top of the pole to hold the SPV module. The frame structure should have provision to adjust its angle of inclination to the horizontal between 0 and 45, so that the module(s) can be oriented at the specified tilt angle.

ii) The design of Structure is enclosed herewith. The pole should be made of mild steel pipe with a height of 4 meters above the ground level, after grouting and final installation. The pole should have the provision to hold the weatherproof lamp housing with a metallic arm of 1.25 m length.

iii) A vented, acid proof and corrosion resistant painted metallic box for outdoor use should be provided for housing the battery.

T21.9 Other Features

The system should be provided with 2 LED indicators: a green light to indicate charging in progress and a red LED to indicate deep discharge condition of the battery. The green LED should glow only when the battery is actually being charged. There will be a Name Plate on the system, which will indicate:

(a) Name of the Manufacturer or Distinctive Logo.

(i) Serial Number. Components and parts used in the solar street lighting systems should conform to BIS specifications, wherever such specifications are available and applicable

T21.10 Charging Indication

One green and another red LED indicators will be provided. The green light will indicate charging in progress and the red LED will indicate deep discharge condition of the battery. The green light will glow only when the battery will be actually charged.

T21.11 Quality & Warranty

The components of the lighting system should conform to latest BIS or International specifications of an advanced country. The warranty period for Solar PV Module will be 10 (ten) years from the date of supply and the warranty for the balance of system will be for at least 5 (five) years from the date of supply.

T22. SOLAR PHOTOVOLTAIC PUMP (Surface) WITH SPRINKLER

The solar water pumping system shall consist of 1800 Wp SPV Array with structure, cabling and associated equipment along with DC 2 HP centrifugal pump of Rotomag or equivalent good make. The pump shall be designed for high head and medium flow multi stage high efficiency pump with microcomputer based Inverter. The Inverter will optimize the power input and enhance overall system efficiency.

Specification:

AC, Three phase, Submersible Pump

Array capacity – 1800 Wp.

Total Dynamic Head (TDH) – 50 m (166 ft.)

Water discharge per day – 35,000 liters

Unlike drippers, micro sprinklers spray water over a wide area when low volume overhead irrigation is desired. They are designed for areas where drippers are not practical, such as large areas of ground cover or small flowerbeds, and for oddly shaped areas. Like all low volume irrigation systems, they require a pressure regulator and filter, and are available in variety of flow rates and diameters

T23. 500 LPD SOLAR WATER HEATER

T23.1 Description

The solar water heating system shall be of thermo siphon type conforming to IS: 12933 and shall consist of tilted collectors with selectively coated all-copper absorbers. The collectors are to be arranged in series-parallel connection to minimize the pressure drop. Natural convection circulates the water in the heating system. A non-return valve shall be provided before the collector array inlet to avoid the hot water back flow from the system to the cold-water storage tank.

T23.2 Specification

a)	System Capacity –	500 LPD
b)	Average water inlet temperature -	30(C.
c)	Average outlet water temperature -	65(C
d)	Nominal dimension –	1000 mm x 2100 mm
e)	Housing material –	Aluminum
f)	Absorber -	selectively coated all copper absorber.
g)	Glazing -	Material – 4 mm thick tempered / Toughened glass. Transmissivity – 0.85 (Min.)
h)	Bottom side insulation -	Resin bonded pads/PU Foam
i)	Hydraulic test pressure -	5 kg/cm^2
j)	Collector support material -	Hot-dip galvanized MS angle.
k)	Water storage tank -	Material – 500 liter MS tank. Corrosion protection – Epoxy coating inside the tank.

		Insulation material – resin bonded pad/ Spintex 300.
		Cladding material – 24 SWG Aluminum.
l)	Instrumentation	Water Meter – reputed make
		Thermometers – Dial type, 0 to 1008C
m)	Non-return valve -	Reputed make.
n)	Internal piping -	GI class 'B' as per IS: 1239
		Insulation – PU pipe section/resin bonded pads.

T23A ALTERNATIVE SPECIFICATION

Alternatively, water heaters of same capacity with more advanced design may be considered for acceptance if justification for technology may be explained with supporting technical documents at a competitive price.

T24. SOLAR CABINET DRYER

The solar cabinet dryer shall be of 1500 mm x 600 mm x 600 mm size. The outside body will be made of aluminum sheets and the inside shall be made with MS sheets.

The chamber of the dryer shall be provided with double glass top, through which sunlight will fall directly on vegetables/fruits, which will get dried. A solar exhaust fan will drive out the liberated water vapour

The principal components of the drier are:

i) Transparent cover of glass sheet or plastic film

ii) Frame work made of MS sheets

iii) Outside cover made with aluminum sheets

iv) Glass wool insulation.

v) 4 Nos. of perforated racks.

SCHEDULE OF ITEMS OF EXHIBITS FOR STATE LEVEL ENERGY PARK AT RANCHI

Sl. No.	Devices / Description of Items	Proposed Quantity	Rate, Rs	Rate in Words	Amount, Rs.
A	**INDOOR EXHIBITS**				
1	**Solar Power Centre**				
1.1	Physics of Solar Photovoltaic as specification No. T4.1	1			
1.2	Flat screen TV with audio visual as per Specification No. T4.2.	1			
1.3.1	Solar parabolic Cooker as per spec. No. T4.3.1	1			
1.3.2	Solar Box Type Cooker as per spec. No. T4.3.2.	1			
1.4	Refrigerator as per Spec. No. T4.4.	1			
1.5	Weighing Machine as per Spec No. T4.5.	1			
1.6	Music System/ Public address-cum-Music System as per spec. No. T8.3.	1			
1.7	Computers for Quiz & Games Ts per Spec. No. T.4.6.	2			
1.8	Solar Replica as per Spec. No. T4.7.	1			
1.9	Panels & Blow ups etc. made with digital prints fixed on 3 mm thick aluminum sheets, Size -4'x3' Ts per Spec. No. T4.8.	3			
1.10	Solar Educational Kit for Children as per Spec. No. T4.9.	3			
1.11	Solar PV Module for display,12 Volt, 10 Wp as per Specification No. T4.10.	2			
2	**Wind Power Centre**				
2.1	Wind Blower(included in Sl. No.2.2) as per spec. No. T5.1	1			
2.2	Wind blower and Wind Electro Generator Models as specification	1 Set of 5 types			
2.3	Flat TV Screen with audio visual as per specification No. T5.2.	1			
2.4	Computers for Quiz & Games Ts per specification No. T5.3.	3			
2.5	Blow-ups & panels made with digital prints fixed on 3 mm thick aluminum sheets. Size -4'x3' as per specification No. T5.4.	2			
	Sub-total				

3	**Hydel Power Centre** (Indoor)				
3.1	Flat plate TV Screen with audio visual as per specification No. T6.8.	1			
3.2	Computers for Quiz & Games as per specification No. T6.9.	2			
3.3	Blow ups & panels made with digital prints fixed on 3 mm thick aluminum sheets for Tidal power Plant, Ocean Thermal Power Plant, Wave Power, Rainwater harvesting, cross section of 3 types hydro turbines as per specification No. T6.10.	7			
	Sub-total				

4	**Bio Energy Centre**				
4.1	Biomass Gasifiers (Models) as per specification No. T7.1.	2			
4.2	Biogas Plant (Cut Models) as per specification No. T7.2.	2			
4.3	Different Models of Chulhas as per specification No. T7.3.	8			
4.4	Flat plate TV Screen with audio visual as per specification No. T7.4.	1			
4.5	Computer for Quiz & Games as per specification No. T7.5.	2			
4.6	Panels & Blow up Diagrams made with digital prints fixed on 3 mm thick aluminum sheets of Photosynthesis, Biomass gasifier based power plant, Biomethanation Plant, Biomass Combustion based Power Plant and biodiesel technology as per specification No. T7.	5			
4.7	Illustrative display chart made with digital prints fixed on 3 mm thick aluminum sheets showing properties of Jatropha Oil, Karanj Oil and comparison with mineral diesel oil. Size -4'x2' Ts per specification No. T7.7.	2			
4.8	Illustrative Chart showing Calorific value, proximate analysis and ultimate analysis of Rice Husk, 3 samples of wood, coal (Class a to Class E) & 5 other biomass fuels	1			
	Sub-total				

5	**Energy Information Centre**				
5.1	Internet enabled three Computers/ other equipments, CD Bank, Books, Literature and regular energy journals as per specification No. T8.1 & T6.2.1	3			
5.1.1	Computer Interactive software No. I, on (i) How electricity is made, electrical distribution basics, AC & DC electricity and other basic knowledge about electricity for school level children as per T8.1 & T8.2.1	3			

5.1.2	Computer interactive software No.-III, about earth, sun, moon, planets, solar radiation, orbit & diameter of these and other details for school level children as per spec No. T8.2.3.	3			
5.2	Illustrative Chart No. 1, made with digital prints fixed on 3 mm thick aluminum sheets for basic electricity, current, voltage, kW, kWh, MW, GW, kV & KVAr etc. Size -4'x2' as per Spec. No. T.8.3.4.	1			
5.3	Illustrative Chart No. II, made with digital prints fixed on 3 mm thick aluminum sheets on Nuclear Fission and Fusion, proton, electron and neutron etc. for Junior school level students. Size -4'x2' as per Spec. No. T8.3.5.	1			
5.4	Chart No. III, made with digital prints fixed on 3 mm thick aluminum sheets showing common energy units and their inter-relation with scientific notations. Size -4'x2' as per Spec. No. T8.3.5.6.	1			
5.5	Illustrative Chart No. IV, made with digital prints fixed on 3 mm thick aluminum sheets showing brief details of Kyoto protocol, CDM and Climate Change for Children. Size -4'x2' as per Spec. No. T8.3.7.	2			
5.6	Illustrative chart No. V, made with digital prints fixed on 3 mm thick aluminum sheets on "What human activities contribute to Climate Change?' Size -4'x3' as per Spec. No. T8.3.8.	2			
5.7	Illustrative Chart No. VI, made with digital prints fixed on 3 mm thick aluminum sheets on Chronological History of electrical inventions. Size -4'x2' as per Spec. No. T8.3.9.	1			
5.8	Chart No. VII, made with digital prints fixed on 3 mm thick aluminum sheets showing chronological history of solar energy. Size -4'x2' as per Spec. No. T8.3.10.	1			
5.9	Chart No. VIII, showing comparison between Incandescent lamps, fluorescent tubes, CFL lamps and LED lamps etc. with diagrams & photos. Size -4'x2' as per Spec. No. T8.3.11.	1			
5.10	Illustrative Chart showing "Importance of Renewable Energy in our Future; digital prints fixed on 3 mm thick aluminum sheets). Size -4'x2' as per Spec. No. T8.3.12.	1			
5.11a	Digital Clock - digit size 250 mm for outdoor display as per Spec. No. T8.3.13.	4			
5.11b	Digital Clock - digit size 100 mm for outdoor display as per Spec. No. T8.3.13.	2			
5.13	Exhibit on Energy transformation as per specification as per Spec. No. T9.	1			
5.14	Exhibit on Storage of Energy as per Spec. No. T10.	1			

5.15	Different types of batteries for physical display as per spec. No. T11.	1 lot of 6 (six) batteries			
5.16	Chart on Series-Parallel connection of batteries as per spec. No. T11.1.	1			
5.17	Chart on different types of batteries as per spec. No. T11.2.	1			
5.18	Exhibit of Fuel Cell complete with 1.6 watt, 2.0 VDC solar module, electrolyser, load box & display meters etc. as per spec. No. T12.	1			
5.19	Blow up about "what is a Fuel Cell?" as per spec. No. T12.1.	1			
5.20	Blow up of Alkaline fuel cell as per spec. No. T12.2.1.	1			
5.21	Blow up of Molten Carbonate fuel cell (MCFC) as per spec. No. T12.2.2.	1			
5.22	Blow up of Phosphoric Acid fuel cell (PAFC) as per spec. No. T12.2.3.	1			
5.23	Blow up of Proton Exchange Membrane (PEM) fuel cell as per spec. No. T12.2.4.	1			
5.24	Blow up of Solid Oxide fuel cell (SOFC) as per spec. No. T12.2.5.	1			
5.25	Blow up on Geothermal Power Plant made with digital prints fixed on 3 mm thick aluminum sheets. Size -4'x3' as per specification No.T12.3.1.	1			
5.26	Blow up showing geothermal power plants made with digital prints fixed on 3 mm thick aluminum sheets. Size -4'x3' as specification No. T12.3.2.	1			
5.27	Blow up of Nuclear Power Plant made with digital prints fixed on 3 mm thick aluminum sheets. Size -4'x3' as specification No. T12.3.3.	1			
5.28	Surveillance System as specification No. T13.	1			
	Sub-total				

6	**Muscle Power Exhibits/Dynamo Paddle Cycle as per spec. No. T14.**	1			

7 Furniture & fixtures

7.1	Inkjet Printer-cum-Scanner as per spec. No. T15.1.	2			
7.2	Web Camera windows compatible, resolution -640x480 as per spec. No. T15.2.	2			
7.3	Computer Workstation with 1(one) terminal table & printer table attached with fixed Keyboard & 3 drawers on one side. Size - 48"x30"x30" as per spec. No.T15.3.	3			
7.4	Computer Workstation with 1(one) terminal table with sliding Keyboard & 3 drawers on one side. Size - 30"x24"x30" as per spec. No. T15.4.	2			

7.5	Computer Chair with arms, Godrej or equivalent good make as per spec. No. T15.5.	6			
7.6	Steel Chair without arms but with cushion seat	12			
7.8	Executive table, 60"x36"x30"with 3 drawers & one cupboard, Godrej or equivalent good make as per spec. No. T15.6.	4			
7.9	Enclosed shelves with glass cover, Size - 66"x33"x12" as per spec. No. T15.7.	2			
7.10	Steel Almirah - Size 78" x 35" x 19' with 1 locker and 4 compartments. Steel sheet thickness –19 SWG, Godrej make or equivalent reputed make as per spec. No. T15.8.	4			

SUB-TOTAL

B OUTDOOR EXHIBITS

1	Power Generating Drum as per Spec. No. T16.	1			
2.1	Solar Toy Car as per spec. No.T17.	1			
2.2	Battery Operated Bicycles as per spec. No. T18.	3			
3	Energy Slip as per specification No. T19.	1			
4	Solar Photovoltaic Street Lights as per specification No. T21.	25			
5	Solar Garden Lights.	15			
6	Solar Photovoltaic Pump (surface pump) with sprinkler (1800 watt peak PV array capacity) as per spec. No. T22.	1			
7	Solar pump set for water supply,1800 Wp for water supply with submersible pump.	1			
8	Solar Water Heating System (500 LPD) (Collectors BIS approved) and Solar Cooking Systems (Concentrating type) as per spec. No. T23.	1			
9	Solar Trolley Bus fitted with 5.5 kW DC motor to be operated on 72 Volt DC supply to be taken from 415 Volt 3 phase output power of 20 kWp BIPV power plant (The power plant is not included but suitable rectifier for converting 415 , 3 phase AC power to 72	2			
10	Solar Cabinet Dryer as per spec. No. T24.	1			
11	Solar water distillation unit as per specification No. T4.11.	1			
12	Water fall animation (Outdoor)/ Artificial water fall on existing rocky hillock to be illuminated with coloured LED lamps as per spec. No. T6.1.	1			

13	Working Model of Turbines (Outdoor) as per spec. No. T6.2 to T6.5.	5			
	(Pelton Turbine, Francis, Kaplan, Bulb Turbine and Stream Flow Turbine)				
14	Water supply system for exhibits as per spec. No. T6.6.	Lot			
15	Musical Fountain replacing the existing fountain as per spec. No. T6.7.	1			

Sub-total of B

Grand Total (A + B)

C.	**Annual Comprehensive Maintenance Contract (ACMC)**				
	Comprehensive Maintenance Contract for 10 years - The contractor will be responsible for all costs of replacement, rectification and maintenance for first 5 years. For the next 5 years JREDA will bear the cost of only spare parts if required for replacement. The Contractor will maintain sufficient employees to maintain the exhibits.	1^{st} 5 Years			
		6^{th} to 10^{th} year			

20 kWp Solar PV power plant considered separately with Exhibition Hall based on solar passive architecture. Trolley bus instead of toy train due to operational problems.

ANNEXURE – I

Format for Confirmation of Basic Eligibility Criteria
(To be submitted by the Tenderer in official letterhead of the Company)

No…….. Date…….

To
The Director
Jharkhand Renewable Energy Development Agency
328/B, Road No. 4, Ashok Nagar,
Ranchi 834002

Sub: Confirmation of meeting the Basic Eligibility Criteria.

Tender No. Your NIT No…

Sir,

Having examined the tender documents No……., we hereby confirm the following towards minimum eligibility conditions to participate in the aforesaid tender:

1. We have supplied & installed at least one State Level Energy Park, Which is being maintained by us for not less than two years.

2. We confirm that the equipment quoted by us conforms to best engineering practices and are appreciated by users.

(Authorized Signatory)

Name
Designation
Company seal

PROFORMA FOR BANK GUARANTEE IN LIEU OF EARNEST MONEY DEPOSIT

(To be executed on non-judicial stamp paper of appropriate value)

WHEREAS……(hereinafter called the bidder) have submitted their bid dated……..against NIT No…….for the work of:

KNOW ALL people by these presents that we…….having our registered office at ……(hereinafter called "the bank") are bound unto ……..(hereinafter called the employers representative) in the sum of ……. for which payment well and truly to be made to the Employers representative the bank binds itself, his successors and assign these presents.

SEALED with the common seal of the bank this

THE CONDITIONS of this obligation are:

If after Bid opening the bidder withdraws or modifies his bid during the period of validity specified in the Bid/Tender document, or

If the bidder having notified of the acceptance of his Bid/ Tender by the employer during the period of bid validity:

Fails to execute the Form or Agreement in accordance with the Instructions to Bidders, if required, or……..

Fails or refuses to furnish the Performance Security, in accordance with instructions to the bidders.

Does not accept the correction of the Bid Price pursuant to clause G40 of the general terms and Conditions of Contract.

We undertake to pay the Employers Representative up to the above amount upon receipt of his first written demand, without the Employers Representative having to substantiate his demand, provided that in his demand the Employers Representative will note that the amount claimed by him is due to him owing to the occurrence of one or both of the two conditions specifying the occurred condition(s).

This guarantee will remain in force unto and including the date ……after the deadline for submission of bids as such deadline is stated in the instructions to bidders or as it may be extended by the employer, notice of which extensions of the Bank is hereby waived. Any demand in respect of this guarantee should reach the bank not later than the above date.

Notwithstanding anything contained therein:-

h) Our liability under this guarantee shall not exceed……

i) This Guarantee shall be valid upto…….

j) We are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only and if you serve upon us a written claim or demand on or before…….

Date

Signature of the Authorized Officer
of
The Bank

Name:

Designation……

Seal