

Bharat Heavy Electricals Ltd
Electronics Division
Mysore Road, Bangalore – 560 026

Tender document for
Specification for Consultancy for preparation of Solar array layout drawing and shadow analysis at 50 MW Solar Photovoltaic Power Plant at Mandsaur site, MP

Due date & time for tender document submission: 17-June-2016 before 13.00 hours

This tender document contains following documents

- (a) **Annexure-I:** Technical-cum-commercial-bid (part-I) - Two sheets)
- (b) **Annexure-II:**
Information to Tenderer including General conditions of contract and Special conditions of contract that includes schedule of works (13 sheets)
- (c) **Annexure -III:** Price-bid (1 sheet)
- (d) BHEL specification PS-439-1034 Rev 00 (1 sheet)

Documents to be submitted along with tender:

- 1) Technical-cum-commercial bid consists of Annexure-I and Annexure-II as below:
- 2) **Annexure-I** shall contain following documents:
 - a) Filled-up Part-I technical-cum-commercial bid (Two pages in this document.)
 - b) Order copy for similar works in the past, min 5 MW consultancy works
 - c) List of equipments / softwares
- 3) **Annexure-II** contains terms and conditions (GCC and SCC), to be signed on each sheet
- 4) Annexure-I and Annexure-II to be sealed in a SINGLE COVER and superscribed "TECHNICAL-CUM COMMERCIAL OFFER" and with the name of work and name & address of the tenderer
- 5) **Annexure-III** is price bid, with filled-in with prices and to be sealed in a ANOTHER separate cover and superscribed "PRICE BID" and with the name of work and name & address of the tenderer
- 6) Both sealed covers as per 4) and 5) above should be put in an outer envelope, super scribed with the name of work and name & address of the tenderer.

Note:

The tender document shall be addressed to AGM (SC&PV-Engineering), BHEL, Electronics Division, Mysore Road, Bangalore 560 026.



Annexure-I

Bharat Heavy Electricals Limited, Electronics Division, Mysore Road, Bangalore 560026

DEPARTMENT: SC & PV

SECTION: PV SYSTEM ENGINEERING

Tender Enquiry / RFQ No: EDN:SCPV:NTPC-Mandsaur:Consultancy-01, 10-June-2016

TECHNICAL-CUM-COMMERCIAL BID

01. NAME OF THE WORK

Consultancy for preparation of Solar array layout drawing and shadow analysis at 50 MW Solar Photovoltaic Power Plant at Mandsaur site, MP , as defined in BHEL specification PS-439-1034 and details as per Technical-cum-commercial terms as per Annexure-I and further in special conditions of contract of Annexure-2, for 50 MW Grid Interactive solar PV project at Mandsaur site, MP.

02. STIPULATED PERIOD:

Work shall commence immediately after receipt of work order.

- (i) Site visit within 3 days of date of work order.
- (ii) First layout drawing within 7 days of site visit and max 10 days from work order date.
- (iii) Shadow analysis within 10 days of BHEL-approved layout drawing.

03. PAYMENT TERMS

- (1) No advance payment
- (2) Stage-wise payments upon completion of milestone activities as defined below:
 - Stage-1: Layout of solar array
 - Stage-2: Shadow analysis

04. NAME OF CONTRACTOR :

05. ADDRESS
(A) OFFICE :
.....
.....

TEL.PH NO :

Cell no :

Email address :

CONTRACTOR
(Signature with seal)

EMPLOYER
(Signature with seal)



06. QUALIFICATION :
07. STAFF STRENGTH :
(A) TECHNICAL :
(B) GENERAL :
08. Shadow analysis, mention the software proposed (**LICENCED ONLY**) :
- 09a) SCOPE OF WORK : UNDERSTOOD / NOT UNDERSTOOD
(as per schedule of works)
b) ACCEPT TO EXECUTE IN TOTAL : YES / NO
within time-frame as specified under 02(i), (ii) and (iii).
10. ACCEPTANCE OF BHEL specification PS-439-1034:
11. FINANCIAL TURN OVER DURING
LAST 2-3 YEARS (please enclose copy of details):
Details of balance sheets to be furnished.
12. EXPERIENCE CERTIFICATE SUCCESSFULLY :
HAVING COMPLETED SIMILAR CONSULTANCY
WORKS for minimum of 5 MW solar plant capacity
(Order copy to be enclosed)
13. EMD PARTICULARS : **Not applicable**
14. SECURITY DEPOSIT : **Not applicable**
- 15a) WHETHER REGISTERED WITH GOVT. AGENCIES
SUCH AS CPWD/STATE PWD/MES/RAILWAY/
OTHER PUBLIC SECTOR UNDERTAKING ETC. :
(For information only)
b) VALIDITY OF REGISTRATION :
16. BHEL PAYMENT TERMS : WHETHER ACCEPTABLE / NOT
17. **Comprehensive Insurance policy** :
Agreeable to take insurance (CAR policy) for all
his persons visiting the site

V. Akhanna

CONTRACTOR
(with Seal)

EMPLOYER



Annexure-II (13 sheets)

Phone: 080- 26989253

**Bharat Heavy Electricals Limited (Electronics Division)
Mysore Road, Bangalore - 560 026.**

NOTICE INVITING TENDERS

1. TENDER REFERENCE NO : **EDN:SCPV:NTPC-Mandsaur:Consultancy-01 dated 10-June-2016**
2. NAME OF THE WORK : **Consultancy for Specification for Consultancy for preparation of Solar array layout drawing and Shadow analysis at 50 MW Solar photovoltaic power plant at Mandsaur site, MP**
3. STIPULATION PERIOD/ PENALTY/ : Work shall commence immediately after receipt of order
 - (i) Site visit within 3 days of date of work order.
 - (ii) First layout drawing within 7 days of site visit and max 10 days from work order date.
 - (iii) Shadow analysis within 10 days of BHEL-approved layout drawing.
4. PRICE VARIATION CLAUSE : **Price variation clause is NOT applicable.**
5. EARNEST MONEY DEPOSIT : Not applicable.
6. SECURITY DEPOSIT (SD) : Not applicable
7. LAST DATE AND TIME FOR THE SUBMISSION OF DULY FILLED IN TENDER DOCUMENT : **BEFORE 13.00 hours on 17th June 2016**
8. PLACE OF SUBMISSION OF TENDER DOCUMENT & PLACE : **TO BE ADDRESSED TO
AGM (SC&PV-Engineering)
BHEL, Electronics Division, Mysore Road,
Bangalore 560 026**
9. DATE AND TIME FOR TECHICAL: BID OPENING : **13.30 hours on 17th June 2016**

NOTE: Tenderer shall return the filled-in Tender document after affixing signature on all pages.

V. Akhanna

CONTRACTOR

EMPLOYER



Bharat Heavy Electricals Limited
(ELECTRONICS DIVISION)
MYSORE ROAD, BANGALORE - 560 026

INSTRUCTIONS TO TENDERER

1. Sealed Tender for the above noted work is hereby invited from Architects experienced in works of similar kind and magnitude.
2. Tenders should be addressed to the AGM/SC&PV ENGG. Electronics Division, Bharat Heavy Electricals Limited, Mysore road, Bangalore – 560 026, super scribing the Name of Work and Name and Address of the Tenderer.
- 2.1 . The local address of the Contractors, the name of the person to whom all the correspondence are to be addressed should be indicated, with telephone number (both office and residence).
3. All entries in tender documents should be in one ink. Eraser and over writing are not permitted. All cancellation and insertion should be duly signed by tenderer concerned with proper indication of the name designation and address of the person signing.
4. Tenderers shall fill in all the required particular in the blank space provided for this purpose in the tender documents and also sign in each and every page of the tender document including the drawings attached there to before submitting tender.
5. Unit rate should be quoted in figures as well as in words in Indian Currency only i.e. Rupees and Paise with reference to each item and for the items shown in the attached schedule. The rate shall include all taxes and duties payable an account of Octroi, Sales Tax, tax on work contract etc., and also expenses towards all statutory formalities (see clauses 8, 39 and Annexure ‘C’). Amount of each item and total on each sheet as also the grand total amount of the whole contract shall be filled by the tenderers.
6. In case the rate quoted in figures differs from those quoted in words, the lower of the rates will be taken as the tendered rate and shall be binding on the tenderer.

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7. In quoting rates, the tenderer are advised to take into account all factors including any fluctuations in market rates. No claim for enhanced rates will be entertained on this account after acceptance of the tender or during the currency of the contract.
8. The rate to be quoted by the tenderer shall be firm and shall cover and include all statutory levies such as "Service tax etc., arising from Act passed by Parliament or State Legislature and rules framed there –under. The rates shall further be deemed to include statutory levies arising from such Acts, Central or State, which may come into force, subsequent to submission of tenders. The tenderer shall note that no claim for enhancement rates, on the ground that existing statutory levies have been increased, or that new statutory levies have come into effect after tender, or on any other ground, will be entertained on any account.
- 9(a) The rate quoted in the tender shall remain valid for a period of ONE MONTH from the date of opening tender.
(b) Tenderer shall not increase their quoted rates, once the tenderer has submitted his quotation and during execution of contract in case his tender is accepted.
- 10 Quantities shown in the schedule are only approximate and are liable to variation without entitling the Contractors to any compensation, provided the total value of the contract does not vary by more than 20% (Twenty percent).
- 11 The details of the site are as below:
50 MW solar power plant at Mandsaur site, MP
12. Should a tenderer find discrepancies or omission in the drawing attached to the tender documents or should be in doubt as to their meaning he should at once address to the authority inviting the tender for clarifications.
Every endeavor is made to avoid any error which can materially affect the basis of the tender but successful tenderer shall take upon himself to provide for the risk of any error which may be subsequently discovered and shall make no subsequent claim on account thereof.
13. The tender being submitted by a firm the tender must be signed separately and legibly by each partner or member of the firm or in their absence, by the person holding the power of Attorney on behalf of firm concerned. In the later case, a copy of the power of Attorney duly attested by the Gazetted Officer must accompany the tender.
14. If in any case, the date of Tender Opening falls on holiday, the Tender will be opened on the next working day.
15. If after opening of tenders a tenderer revokes his tender or increase his earlier quoted rates or after acceptance of his tender does not commence the work in accordance with the instruction of Engineer –in-charge, the work order shall be cancelled forfeited will be based on value of the contract so awarded.

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16. BHARAT HEAVY ELECTRICALS LIMITED reserve the right to reject any or all the tenders received or accept any tender or part thereof without assigning reason thereof. In the case of acceptance of a part of tender, the time for completion may also be reduced to the extent considered approximately by the accepting authority.
17. Conditional and Unsigned tenders, tender containing absurd rates and amounts, tenderer which are incomplete or otherwise considered defective, tenders which are not in accordance with the tender conditions laid down by the accepting officer and tenders not submitted in the prescribed forms are liable to be rejected.
18. The Contractors not borne on the approved list of Contractors of this organization must submit the following testimonials simultaneously with their tender super scribed. These testimonials shall be signed by the person(s) issuing the same indicating their name designation and full address.
19. The tenders should be accompanied by a list of contracts or works already held by the Contractor at the time of submitting the tender and giving the following particulars:
 - a) Name of the work, value and address.
 - b) The balance work remaining to be done on the same.
20. Tenders received after the due date of opening tenders are liable to be rejected.
21. The Contractors responsibility under this contract shall commence from date of receipt of the order or acceptance of tender.
22. If tenderer expires after the submission of the tender or acceptance of his tender, the BHEL, may at their discretion cancel such tender.
If a partner of a firm expires after the submission the tender, after the acceptance of tender, BHEL, may cancel such tenders at their discretion unless the firm retains its character/s.
23. BHARAT HEAVY ELECTRICALS LIMITED will not be bound by any power of Attorney granted by the tenderer or changes in the composition firm made subsequent to execution of contract. They may however recognize such power of Attorney and changes after obtaining proper legal advice, the cost of which will be chargeable to the Contractor concerned.
24. If the tenderer deliberately gives wrong information on his tender, the BHEL reserves the right to reject such tender at any stage.
25. Words imparting the singular number shall also be deemed to include the plural number and vice-versa where the context so require.
26. The General and Special Conditions are complementary to each other and where they are in conflict, the special condition shall prevail.
27. After completing of the job, the contractor has to furnish actual drawings of work done in consultation with Engineer-in-charge.

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28. Should a tenderer or a contractor on the list of approved contractors has a relative or in the case of firm or Company of Contractors any of its share holders relative is employed in a Gazetted Capacity in the Electronics Division of Bharat Heavy Electricals Limited, Banalore-26, the authority inviting tenders shall be informed of this fact at the time of submission of the tender, failing which tender may be disqualified or if such fact subsequently come to light, the relevant provisions of the General Conditions of Contract will apply.
29. These 'INSTRUCTIONS TO TENDERERS' & GENERAL CONDITIONS OF CONTRACT OF BHEL' shall be deemed to form an integral part of the Contract agreement for the work to be entered into. In cases of variation between the two in any matter, the conditions in the 'THE INSTRUCTIONS TO TENDERERS' shall prevail. Extracts of some of the important clauses of BHEL G.C.C are enclosed (Annexure containing extracts of clauses 20, 38 and 58 of BHEL G.C.C).
30. The contractor should comply with all the statutory provisions concerning the works contracts while executing works at site.
31. Any action brought in by anybody on BHEL regarding patent, right etc., used by Contractor in execution of work shall be defended by the Contractor and / or reimburse BHEL the cost of the same.
32. Contractor shall produce necessary records, documents, explanation whenever he is called upon to do by any Government Agencies like ESI, PF, etc. as applicable.
33. **Comprehensive Insurance policy:**
The contractor shall take Comprehensive insurance policy for all his persons visiting the site and submit a copy of the Insurance policy to BHEL.
34. **Indemnity bond:**
The Contractor shall submit indemnity bond, indemnifying BHEL against any loss that he may suffer due to injury to his persons / materials while visiting the site.
35. They should be well versed with BHEL General conditions of Contract instruction to the tenderers, drawing and specification and all other documents which form part of the agreement to be entered into subsequent award of work.

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BHARAT HEAVY ELECTRICALS LIMITED
ELECTRONICS DIVISION
MYSORE ROAD, BANGALORE-560 026

GENERAL CONDITIONS OF CONTRACTS

It is hereby agreed by me/us that the BHEL General Conditions of Contract including subsequent amendments/ additions/deletions to clauses if any, and conditions pertaining to the settlement of disputes by Arbitration form an integral part of the tender documents and that the tender submitted by me/ us is subject to the aforesaid BHEL General Conditions of Contract which has been read and accepted by me/us.

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SAFETY CODE

RESPONSIBILITIES OF THE CONTRACTOR IN RESPECT OF SAFETY OF MEN, EQUIPMENT, MATERIAL AND ENVIRONMENT

1. The Contractor shall take care of the safety aspects to ensure safety of men, equipment, material and environment during execution of the work. During the work execution of the contract BHEL shall have right to review and suggest modification in the Safety Plan. Contractor shall abide by BHEL decision in this respect.
2. The contractor shall take all necessary safety precautions and arrange for appropriate appliances as per direction of BHEL or its authorised officials to prevent loss of human lives, injuries to personnel engaged, and damage to property and environment.
3. The contractor shall provide to its work force and ensure the use of the following personal protective equipment as found necessary and as directed by the authorised BHEL officials: -
 - (i) Safety Helmets conforming to IS-2925: 1984.
 - (ii) Safety Belts conforming to IS-3521: 1983.
 - (iii) Safety Shoes conforming to IS-1989: 1978.
 - (iv) Eye and Face protection devices conforming to IS-8520: 1977 and IS-8940: 1978.
 - (v) Hand and body protection devices conforming to:
 - IS-2573: 1975
 - IS-6994: 1973
 - IS-8807: 1978
 - IS-8519: 1977

All tools, tackles, lifting appliances, material handling equipment scaffolds, cradles, safety nets, ladders, equipment's etc. used by the contractor shall be of safe design and construction.

In case of a fatal or disabling injury accident to any person at construction sites due to the lapses by the contractor, the victim and/or his/her dependents shall be compensated by the contractor as per statutory requirements. However, if considered necessary, BHEL shall have the right to impose appropriate financial penalty on the contractor and recover the same from payments due to the contractor for suitably compensating the victim and/or his/her dependents. Before imposing any such penalty, appropriate enquiry shall be held by BHEL giving opportunity to the contractor to present his case.

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In case of any damage to property by the contractor, BHEL shall have the right to recover cost of such damages from payments from payments due to the contractor after holding an appropriate enquiry.

If the contractor fails to improve the standards of safety in its operation to the satisfaction of BHEL after being given a reasonable opportunity to do so; and/or if the contractor fails to take appropriate safety precautions or to provide necessary safety devices and equipment or to carry out instructions regarding safety issued by the authorised BHEL official, BHEL shall have the right to take corrective steps at the risk and cost of the contractor after giving a notice of not less than seven days indicating the steps that would be taken by BHEL.

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SPECIAL CONDITONS OF CONTRACT

1.0 GENERAL

The special conditions of contract and other contract documents are complimentary to each other and shall be read in conjunction with each other. In case of any conflict of meanings between the special conditions of contract and the BHEL General Conditions of Contract the provisions of the special conditions of contract shall override the corresponding provisions of the BHEL General Conditions of Contract.

2.0 SCOPE OF WORK

Stage	Works	Quantity
Stage-1	<p>Drafting, delivery of documents for Preparation of AUTOCAD drawing Preparation of AUTOCAD drawing showing the layout of structures for the 50 MWp solar plant. The layout shall be made with minimum of cutting / filling costs / volume so that the solar array follows the slope of the land. Filling and cutting volumes to be furnished. Accordingly, the spacing between rows shall be modified to meet the inter-row shadows. The drawing may involve a number of iterations based on comments from BHEL.</p> <p>Preliminary Site visit to be made within 3 days of order issuance for study of contours and water bodies based on which array layout shall be prepared. Preliminary drawing shall be submitted within 1 week of the site visit.</p>	1 lot
Stage-2	<p>The Consultant shall carry out the following using proven and established software as per item no. 2 of PS-439-1034.:</p> <p>(i) Shadow Analysis of the entire plant (including arrays, transmission towers, buildings, etc.). BHEL will include the transmission towers, Inverter room buildings, etc., to prepare the shadow analysis.</p> <p>(ii) Shadow analysis and submission of calculations for spacing</p> <p>(iii) Calculation of energy output / exported</p> <p>(iv) Optimisation of solar array layout based on the above.</p>	1 lot

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4 ESCALATION: -

The rates to be quoted by the tenderer shall be firm and shall cover and include all statutory levies, arising from, acts passed by parliament or by state legislature, the rates shall further be deemed to include statutory levies arising from such Acts, Central or State, which may come in to force subsequent to submission of tenders. The tenderer shall note that no claim for enhancement of rates, on the ground that existing statutory levies have been increased, or that new statutory levies have come in to effect after tender, or on any other ground, will be entertained on any account.

5. PAYMENT TERMS:

- (1) No advance payment
- (2) Stage-wise payments upon completion of milestone activities as defined below: based on schedule of works in part-II and based on certification by BHEL engineer.
 - Stage-1: After completion and certification
 - Stage-2: After completion and certification

6 STATUTORY DEDUCTION TOWARD INCOME TAX WILL BE MADE as per rules.

7 TIME OF COMPLETION

Consultancy services during the project activities as per PS-439-1034, comprising of stage-wise design, drafting, delivery of documents, inspection at site etc., shall be as per the time schedule that will be indicated by BHEL. Work shall commence immediately after receipt of work order.

- (i) Site visit within 3 days of date of work order.
- (ii) First layout drawing within 7 days of site visit and max 10 days from work order date.
- (iii) Shadow analysis within 10 days of BHEL-approved layout drawing.

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FORM OF TENDER

Having examined the invitation to bid, Instructions to Bidder, General conditions of contract, special conditions, specifications tender schedule, contract drawings and other documents for the above work, we the undersigned, offer to construct, erect complete and maintain the whole of the said in conformity with the said bid documents on the terms and conditions and under the provisions set out or called for in the contract documents at the rates listed in the schedule of unit prices or else wherein the contract documents.

We undertake if our bid is accepted, to commence the works from the date of issue of award and to complete and delivery the whole of the works comprised in the contract as per the time schedule agreed to the contract document.

We agree to abide by this bid for the period of one month from the date of opening of the tender and it shall remain binding upon us and may be accepted at any time before expiry of the period.

Until and unless a formal agreement is prepared and executed this bid, together with your award thereof shall constitute a binding contract between us.

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CLAUSE 58 OF GENERAL CONDITIONS OF CONTRACT

ARBITRATION:

Except where otherwise provided for in the contract all questions and disputes relating to the meaning of the specifications, designs, drawings and instructions herein before mentioned as to the quality of workmanship or materials used on the work or as to any other question, claim, right, matter or thing whatsoever in any way arising out of or relating to the contract, designs, drawings, specifications, estimates, instructions, orders or these conditions or otherwise concerning the works, or the execution or failure to execute the same whether arising during the progress of the work or after the completion or abandonment thereof shall be referred to the sole arbitration of the Executive Director/General Manager of BHEL and if the Executive Director/General Manager is unable or unwilling to act to the sole Arbitration of some other person appointed by the Executive Director / General manager willing to act as such Arbitrator. There will be no objection if the arbitrator so appointed is an employer of BHEL or an employer of any other unit of BHEL and that he had to deal with the matters to which the contract relates and that in the course of its duties as such he had expressed views on all or any of the matters in dispute or difference. The Arbitrator to whom the matter is originally referred being transferred or vacating his office or being unable to act for any reason, such Executive Director / General Manager as aforesaid at the time of such transfer vacation of office or inability to act, shall appoint another person to act as arbitrator in accordance with the terms of the contract. Such person shall be entitled to proceed with the reference from the stage at which it was left by his predecessor. It is also a term of this contract that no person other than a person appointed by such Executive Director/General Manager or an employee appointed as arbitrator as aforesaid should act as arbitrator and the arbitrator shall give reasons for the award.

Subject as aforesaid the provision of the Arbitration Act, 1940 or any statutory modification or re-enactment thereof and the rules made there under and for the time being in force shall apply to the arbitration proceeding under this clause.

It is a term of a contract that the party invoking arbitration shall specify the dispute or disputes to be referred to arbitration under this clause together with the amount or amounts claimed in respect of each such dispute.

The arbitrator(s) may from time to time with consent of the parties extend the time, for making the publishing the award.

The work under the contract shall, if reasonably possible, continue during the arbitration proceeding and no payment due or payable to the contractor shall be withheld on account of such proceedings.

The arbitrator shall be deemed to have entered on the reference on the date he issued notice to both the parties fixing the date of the hearing.

The arbitrator shall give a separate speaking award in respect of each dispute or difference referred to him.

The venue of arbitration shall be such place as may be fixed by the arbitrator in his sole discretion.

The award of the arbitrator shall be final, conclusive and binding on all parties to this contract.

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In respect of all labour directly or indirectly employed on the work by the Contractor, the Contractor shall comply with the provisions of the contract labour (Regulation and Abolition) Act 1970 or any amendment thereof and all legislations and rules of the State and or Central Government or other Authority, framed from time to time governing the protection of health, sanitary arrangements, wages, welfare and safety for labour employed on building and construction works. The rules and other statutory obligations with regard to fair wages, welfare and safety measures, maintenance of the register etc., will be deemed to be part of the contract.

The Contractor is required to take insurance for all workers employed on works towards payment for workmen compensation. The insurance has to be taken out within 15 days of the award of work and has to be produced at the time of signing agreement. Half (1/2%) shall be deducted for every bill if the contractor fails to produce a proof of having taken such an insurance to cover his workmen.

However the contractor shall be fully responsible for all the consequences arising out of such default. This may also be read with clause 20 of BHEL GCC.

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EDN:SCPV:NTPC-Mandsaur:Consultancy-01 dated 10-June-2016
Annexure-III (Price Bid of Schedule of Works)


Stage	Works	Qty	Unit rate (Rs), all taxes inclusive	Total amount (Rs)
Stage-1	<p>Drafting, delivery of documents Preparation of AUTOCAD drawing showing the layout of structures for the 50 MW solar plant as per item no. 1 of PS-439-1034. The layout shall be made with minimum of cutting / filling costs / volume so that the solar array follows the slope of the land – cutting and filling volumes to be furnished. Accordingly, the spacing between rows shall be modified to meet the inter-row shadows.</p> <p>The drawing may involve a number of iterations based on comments from BHEL. Preliminary Site visit to be made within 3 days of order issuance for study of contours and water bodies based on which array layout shall be prepared.</p> <p>Preliminary drawing shall be submitted within 1 week of the site visit.</p>	1 lot		
Stage-2	<p>The Consultant shall carry out the following using proven and established software as per item no. 2 of PS-439-1034:</p> <p>(i) Shadow Analysis of the entire plant (including arrays, transmission towers, buildings, etc.). BHEL will include the transmission towers, Inverter room buildings, etc., to prepare the shadow analysis.</p> <p>(ii) Shadow analysis and submission of calculations for spacing</p> <p>(iii) Calculation of energy output / exported</p> <p>(iv) Optimisation of solar array layout based on the above.</p>	1 lot		
	Total Amount in Rs. (inclusive of all taxes)			
	Total amount in words (inclusive of all taxes)			

- All prices to be inclusive of all taxes

V. P. ...

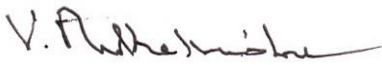
Contractor / Consultant with seal

Employer

	Specification for Consultancy for preparation of Solar array layout drawing and shadow analysis at 50 MW Solar Photovoltaic Power Plant at Mandsaur site, MP	PS-439 -1034
		REV NO: 00
		PAGE : 1 OF 1

Bharat Heavy Electricals Limited (BHEL), Electronics Division, Bangalore is setting up a 50 MW Grid- connected SPV Power Plant at Mandsaur site, Madhya Pradesh.

#	Consultancy works and specification
1	<p>SOLAR ARRAY LAYOUT FROM CONTOUR MAP LAYOUT:</p> <p>Preparation of AUTOCAD drawing showing the layout of structures for the 50 MWp solar plant. The layout shall be made with minimum of cutting / filling costs / volume so that the solar array follows the slope of the land. Filling and cutting volumes to be furnished. Accordingly, the spacing between rows shall be modified to meet the inter-row shadows.</p> <p>The drawing may involve a number of iterations based on comments from BHEL.</p> <p>Preliminary Site visit to be made within 3 days of order issuance for study of contours and water bodies based on which array layout shall be prepared.</p> <p>Preliminary drawing shall be submitted within 1 week of the site visit.</p> <p>The following details shall be considered:</p> <ul style="list-style-type: none"> -BHEL shall furnish the Topographical survey AUTOCAD drawing, Soil investigation report - BHEL shall furnish required spacing between consecutive rows considering flat surface. For inclined slopes (both North and South facing) the necessary spacing to be calculated accordingly. -Plan for the table of solar structure with piles position.
2	<p>SOLAR ARRAY RELATED DESIGNS:</p> <p>Shadow Analysis of the entire plant (including arrays, transmission towers, buildings, etc.). BHEL will include the transmission towers, Inverter room buildings, etc., to prepare the shadow analysis. The Consultant shall carry out the following using proven and established software:</p> <p>Review of the solar array layout furnished by BHEL</p> <p>Shadow analysis and submission of calculations for spacing</p> <p>Calculation of energy output / exported</p> <p>Optimisation of solar array layout based on the above.</p>

Revision details :R 0	Prepared	Approved  V Radhakrishnan	Date 10-June 2016
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