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TECHNICAL CONDITIONS OF CONTRACT (TCC) FOR O&M AT 50MW SOLAR POWER PLANT OF NTPC, MANDSAUR, MP.

TCC No: HY/PE&SD/O&M/ Solar/50MW/NTPC/01, Rev.00

BHARAT HEAVY ELECTRICALS LIMITED

PROJECT ENGINEERING & SYSTEMS DIVISION HYDERABAD



TECHNICAL CONDITIONS OF CONTRACT (TCC)

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TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-I Project Information

1.0 Project Details

NTPC LTD. has established a 250 MW Grid connected Solar PV Plant on EPC basis at Gujarkhedi, Near Runija village in Mandsaur District in Madhya Pradesh. The Plant is divided into 5 blocks, each of 50 MW. BHEL has constructed **1 block of 50 MW**.

1	Customer	:	NTPC LTD.
2	Project Information	:	5x50 MW Solar PV Plant of NTPC at Mandsaur District in Madhya Pradesh. BHEL Scope: 1x 50 MW SPV Block
3	Location	:	Near Runija (V), Madsaur District in Madhya Pradesh
4	Address Detail	:	Gujarkhedi, Near Runija Village, Mandsaur District in Madhya Pradesh
5	Nearest Railway Station	:	Suwasra, Madhya Pradesh, Which is about 11km from Runija village
6	Road Approach	:	The project site is located at a distance of 9 km from the Runija Village. Road is available up to 7 km and after that project site is approachable through cart track (2 km).
7	Nearest Air Port	:	Udaipur
11	Ambient Air Temperature (Average)	:	a) Maximum : 42 ⁰ C b) Minimum : 16 ⁰ C
12	Average Relative Humidity	:	17-78 %
13	Climatic Condition	:	Tropical Climate

Bidder is advised to visit the project site and appraise himself about the local conditions and infrastructure available in the area for fulfilling their commitments under the contract. BHEL will not admit any claims whatsoever on account of Contractor's non-familiarization of local conditions.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-I Project Information

1.1 INTRODUCTION:

1.1.1 Project outline of 50MWp solar photovoltaic power plant:

Bharat Heavy Electricals Limited (BHEL), PE&SD, Hyderabad has set up a 50MWp solar photovoltaic (SPV) power plant at Mandsaur, MP for NTPC. An overview outline of the project is as follows:

- (a) The SPV modules employed at the power plant generates DC electricity that in turn is inverted to 3-phase AC with ~ 350V. The voltage is further stepped up to 33kV using 2.5MVA transformers. Twenty such transformers are employed to achieve 50MWp.
- (b) String monitoring boxes (SMBs) are employed to monitor the DC parameters of the strings of solar array. The DC power outputs from the SMBs are fed to 40 Nos of 1250kW grid-interactive power conditioning units (inverters) that are housed in a distributed manner among 10 inverter rooms and one central monitoring and control station (CMCS) room. The inverter rooms, each generating 5MWp, are placed at different locations of the power plant. Each room is associated with a 33kV transformer yard, employing two oil-immersion transformers each of 2.5MVA, 33kV/350-350 V (one HV and two LV windings). Each LV winding voltage is expected to be in the range ~350V. Exact value will be known only upon finalization of inverter make/model. The vacuum circuit breaker (VCB) protection indoor panels are also placed in each inverter room. Thus, all these ten inverter rooms, put together, generate 50MWp.
- (c) The overall output of the power plant is split into two 25MW feeders. Each feeder line is supported by a 33kV metering yard comprising of outdoor-mounted equipment viz. CTs, PTs, surge arrestors, GOS isolators, earth switches, support structures, ACSR conductors etc. Each feeder line is provided with three ABT meters (main, check and standby) that are housed in independent panels kept in CMCS room.
- (d) The parameters (DC solar array, LT AC inverter level, HT 33kV transformer level) of solar power plant are monitored using SCADA system.
- (e) Power plant is supported by underground earth mat grid system for various electrical installations such as Solar array structures, string monitoring boxes, Inverter/CMCS room electrical panels, Transformer yards, Metering yard and other installations.
- (f) DC supply (110V) for various electrical equipment such as protection relays, indication lamps etc. is provided by a set of battery banks of UPS panels in CMCS and inverter rooms. The power supply to UPS panels is fed from ACDB distribution panels.
- (g) The plant has several other infrastructural support systems such as bore wells (for water supply), underground water pipeline network system for cleaning of SPV modules, lighting system for illumination of plant, fire alarm system for the inverter /CMCS rooms, CCTV, fire extinguishers, tools and instruments for operations and maintenance, etc

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-I Project Information

(h) The plant is provided with all-around chain-link fencing with a gate. Transformer yards / switchyards are provided with chain-link fencing and gate. Approach roads, pathways, drainage system.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-II Scope of Works

2.0 SCOPE OF WORK

Vendor scope includes:

2.1 Operations and maintenance of the complete plant for a period of (38) thirty-eight months.

2.2 Coordination / liaison activities (related to clearance / approval) with concerned state / central authorities such as CEIG/CEA etc. including renewal of CEIG license during O&M period.

2.3. Furnishing all labour, materials, supervision, equipment, supplies, transport, to and from the site, fuel, electricity, compressed air, water, transit and storage insurance and all other incidental items and temporary works not shown on specified but reasonably implied or necessary for the proper operation & maintenance and handling over the works, except in accordance with the stipulations laid down in the contract documents and additional stipulations as may be provided by the engineer during the course of works.

2.4 The scope of work will also include such other related works although they may not be specifically mentioned in the above paragraph and all such incidental items not specified but reasonably imply and necessary for completion of the job as a whole all as desired and as directed by the engineer.

2.5 Site office for vendor use:

Vendor shall necessarily establish Site Office for their own purpose.

2.6 Electrical power / water for construction, drinking water

Vendor shall organize, on their own, necessary electrical power supply such as DG sets, Service water, drinking water etc. required for Site office/staff/employees of vendor.

2.7 Furnishing samples of all materials required by the engineers for testing/inspection and approval for use in the works. The samples may be retained by the engineer for final incorporation in the works.

2.8 Furnishing test reports for the products used or intended to be used, if called for the specifications or if so desired by the engineer.

2.9 Giving all notices, paying all fees, taxes etc., in accordance with the general conditions of contract, that are required for all works including temporary works.

2.10 Arranging manufacturer's supervision for items of work done as per manufacturer's specifications when so specified.

2.11 Providing all incidental items not shown or specified but reasonably implied or necessary for the successful completion of the work in accordance with contract.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-II Scope of Works

WORK BY OTHERS

No work under the specification will be provided by any agency other than the contractor unless specifically mentioned elsewhere in the contract.

**FOR FURTHER DETAILED SCOPE OF WORKS REFER RELEVANT
TECHNICAL SPECIFICATIONS PROVIDED IN THE SUBSEQUENT
CHAPTERS IN THE TCC**

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter – IV: T&Ps to be deployed by Contractor

S. No.	Description	Scope / to be taken care by		Remarks
		BHEL	Bidder	
	PART I			
3.1	ESTABLISHMENT			
3.1.1	FOR CONSTRUCTION PURPOSE:			
a	Open space for office (as per availability)	Yes		Location will be finalized after joint survey with customer (NTPC)
b	Open space for storage (as per availability)	Yes		Location will be finalized after joint survey with customer (NTPC)
c	Construction of bidder's office, canteen and storage building including supply of materials and other services		Yes	
d	Bidder's all office equipments, office / store / canteen consumables		Yes	
e	Canteen facilities for the bidder's staff, supervisors and engineers etc		Yes	
f	Firefighting equipments like buckets, extinguishers etc		Yes	
g	Fencing of storage area, office, canteen etc of the bidder		Yes	
3.1.2	FOR LIVING PURPOSES OF THE BIDDER			
a	Open space for labour colony (as per availability)	Yes		Can be provided as per availability
b	Labour Colony with internal roads, sanitation, complying with statutory requirements		Yes	
3.2.0	ELECTRICITY			
3.2.1	Electricity For construction purposes		Yes	
3.2.2	Electricity for the office, stores, canteen etc. of the bidder		Yes	
3.2.3	Electricity for living accommodation of the bidder's staff, engineers, supervisors etc		Yes	
3.3.0	WATER SUPPLY			
3.3.1	For construction purposes		Yes	
3.3.2	<u>Water supply for bidder's office, stores, canteen etc</u>		Yes	
3.3.3	<u>Water supply for Living Purpose</u>		Yes	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter – IV: T&Ps to be deployed by Contractor

S. No.	Description	Scope / to be taken care by		Remarks
		BHEL	Bidder	
3.4.0	PART I LIGHTING			
a	For construction work (supply of all the necessary materials) 1. At office/storage area 2. At the preassembly area 3. At the construction site /area		Yes	
b	For construction work (execution of the lighting work/ arrangements) 1. At office/storage area 2. At the preassembly area 3 At the construction site /area		Yes	
c	Providing the necessary consumables like bulbs, switches, etc during the course of project work		Yes	
d	Lighting for the living purposes of the bidder at the colony / quarters		Yes	
3.5.0	COMMUNICATION FACILITIES FOR SITE OPERATIONS OF THE BIDDER			
a	Téléphone, fax, internet, intranet, e-mail etc.		Yes	
3.6.0	COMPRESSED AIR wherever required for the work		Yes	
3.7.0	Demobilization of all the above facilities		Yes	
3.8.0	TRANSPORTATION			
a	For site personnel of the bidder		Yes	
b	For bidder's equipments and consumables (T&P, Consumables etc)		Yes	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter – IV: T&Ps to be deployed by Contractor

F. LIST OF TOOLS AND PLANT:

The following tools and equipment but not limited to, are required for the efficient execution of the civil works. The contractor shall make them available for construction purposes, including all consumables likely to be used at his own cost at the time of mobilization.

S.No.	Description	Minimum Quantity	Remarks
1.	Hydra	1	Need based
2.	JCB	1	Need based
3.	Tractor	1	Need based
4.	Cable unwinding Machines, rollers etc	1 No	
5.	MC4 connector tool kit containing (1) crimping plier MC4, (2) open end spanner set MC4, (3) stripping plier MC4, (4) socket wrench insert to tighten, (5) socket wrench insert to secure, inserts for both 4 sq-mm and 6-sqmm (of both pliers).	2 Set	
6.	Electrical measuring instruments		
	a) Megger- 1 Kv	1 No	
	b) HV tester- 10 Kv	1 No	
	c) Logic probe	1 No	
	d) Modbus communication check kits	1 No	
	e) Digital multi meter	3 No	
7.	Tong testers	3 No	
8.	Digital power meters	1 No	
9.	Phase sequence meter	1 No	
10.	OFC termination kit, Splicing kits	1 Set	
11.	Primary / Secondary injection kit	1 No each	Need based
12.	Transformer oil filtration unit	1 No	Need based
13.	Earth resistance measuring kit	1 No	
14.	Lugs, glands	1 set	Need based
15.	Transmission line stringing equipment	1 No	
16.	DG sets	1 No	
17.	Cable jointing kit and associated tools	2 Set	
18.	Welding equipment	1 No	

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Chapter – IV: T&Ps to be deployed by Contractor

19.	Flood lights	5 No	
20.	Set of screw drivers	1 set	
21.	Set of Allen keys (mm & inch)	1 set	
22.	Small size hacksaw & fraksaw	1 set	
23.	Cutting pliers	2 no	
24.	Nose pliers	2 no	
25.	Insulation stripers	2 no	
26.	Dry cable jointer	1 no	
27.	Number punches	1 no	
28.	Alphabet punch	1 no	
29.	Embossing machine with cassettes (Numbers and alphabets)	1 no	
30.	Portable drilling machine up to 1-1/2"	1 set	
31.	Soldering gun	1 no	
32.	Soldering Iron	1 no	
33.	Continuity tester	5 no	
34.	Double ended spanner Set of sizes 10-11, 12-13, 14-15, 16-17, 17-18	2 nos each	
35.	Crimping tool with Dye range 50-400sqmm cable, mechanical gear power, hand operated	1 set	
36.	Crimping tool up to 6 sq-mm cable	1 set	
37.	Drilling machine AC, hand operated, with bit size up to 20 mm	1 set	
38.	Measuring Tape, 5m	2 no	
39.	Measuring Tape, 50 m	2 no	
40.	Adjustable spanner 2-inch size	1 no	
41.	Hammer	2 no	
42.	Rough file kit	1 set	
43.	Vacuum cleaner, of industrial type, for control room sweeping / cleaning.	1 no	
44.	Blowers for cleaning the panels	2 no	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter – V: T&Ps to be deployed by BHEL on sharing basis

BHEL will not provide any tool, plants or any testing facility/apparatus for the work. It will be contractor's responsibility to arrange all required tools, plants and other testing apparatus, etc. at their own cost. The prices quoted & finalized are inclusive of the charges towards providing such T&P. No extra payment will be entertained on account of this.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-VI: Time Schedule

6.1 TIME SCHEDULE

6.1.1

The work of O&M for 50MW Solar power plant is for a period of 38 months.

6.1.2

During the total period of contract, the contractor has to carry out the activities in a phased manner as required by BHEL and the program of milestone events.

6.1.3

The work shall be commenced on the mutually agreed date between the bidder and BHEL engineer and shall be deemed as completed in all respect only when the unit is in operation. The decision of BHEL in this regard shall be final and binding on the contractor. The scope of work under this contract is deemed to be completed only when so certified by the site Engineer.

6.2 COMMENCEMENT OF CONTRACT PERIOD

The date of commencement of contract period shall be the mutually agreed date between the bidder and BHEL engineer to start the work. In case of discrepancy the decision of BHEL engineer will be final.

6.3 MOBILISATION

6.3.1

The contractor should mobilize man power in order to complete the work of O&M of 50MW Solar power plant for a period of 38 months

6.3.2

Requisite Material, men and machinery should be arranged in order to complete the O&M work within stipulated time period.

6.3.3

The contractor has to augment his resources in such a manner that following major milestones of the project are achieved on specified schedules:

TENTATIVE SCHEDULE

S.No.	Activity/Mile stone	Duration in months	
		Start	Finish
1	O&M	Nov'19	Dec'22

In order to meet above schedule in general, and any other intermediate targets set, to meet customer/project schedule requirements, contractor shall arrange & augment all necessary resources from time to time on the instructions of BHEL.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-VI: Time Schedule

6.4 CONTRACT PERIOD

Operations and maintenance of the complete plant 50MW for a period of (38) thirty-eight months.

6.5 PROTECTION OF WORK

The contractor shall have total responsibility for protecting his works till it is taken over by the Employer. No claim will be entertained by the Employer or the representative of the Employer for any damage or loss to the Contractor's works and the Contractor shall be responsible for complete restoration of the damaged works to original conditions to comply with the specification and drawings. Should any such damage to the Contractor's Works occur because of other party not being under his supervision or control, the Contractor shall make his claim directly with the party concerned.

If disagreement or conflict or dispute develops between the Contractor and the other party or parties concerned regarding the responsibility for damage to the Contractor's Works the same shall be rectified. The Contractor shall not cause any delay in the repair of such damaged Works because of any delay in the resolution of such disputes. The Contractor shall proceed to repair the Work immediately and no cause thereof will be assigned pending resolution of such disputes.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-VII: Payment Terms

7.1

The progressive payment for the work on accepted price of contract value will be released on the basis of running account bills & other bills as per the provisions of relevant clauses of GCC and SCC.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-VIII: Taxes & Duties

8.0 TAXES AND DUTIES

The quoted rates shall be exclusive of GST but inclusive of all other taxes, including any cess or surcharge or levy/tax by whatever name called, imposed under GST law or any other law at any time, for which input credit is not available to BHEL under any interpretation of the law.

GST at the applicable rates shall be payable extra. SAC code is 995424. However, the same shall not be paid if the input credit thereof is not available to BHEL due any reason attributable to the supplier/bidder.

TDS under GST as and when applicable, shall be deducted at prevailing rates.

GST as applicable on the LD/Penalty shall also be recoverable in addition to LD/Penalty applicable on delayed supplies.

Bidders have to comply with all requirements of the GST law as may be prescribed by the Government from time to time (including provisions related to E-way bills as and when prescribed). In the event of any non-compliance to any of the requirements of the GST law by the supplier/bidder, any consequential financial implication to BHEL, including interest on delayed discharge of BHEL's GST liability, denial of input credit of GST, etc., shall be recoverable from the supplier/bidder.

8.1 SUPPLY:

Bidders have to issue GST compliant invoices showing:

BHEL PE&SD R C Puram Hyderabad GSTIN No.36AAACB4146P1ZG under "Details of Receiver (Billed To)

BHEL's Customers details (mentioned in SCC/Dispatch Instructions) under "Details of Consignee (Shipped To)

State of Telangana as the "Place of Supply" irrespective of where the goods are shipped to, since these transactions fall under Section 10(1)(b) of the IGST Act in case of suppliers from outside Telangana.

Details of dispatch comprising of copies of GST Invoice, LR/Delivery challan, Packing list etc. have to be submitted to BHEL through email to the concerned purchase officer, prior to dispatch. BHEL shall issue GST invoice (on BHEL's customer) and forward the transporter's copy to the vendor for the movement of the goods. Thereafter, the vendor shall ensure immediate movement of goods under the same documentary details submitted to BHEL. In the event of any delay in movement of goods/submission of these documents to BHEL and/or any documentary discrepancies, any consequential financial implication to BHEL, including interest loss on discharge of BHEL's GST liability, denial of input credit of GST, etc., shall be recoverable from the supplier/bidder.

8.2 SERVICES (E&C, Supervision of E&C, Civil Works etc.):

Bidders have to issue GST compliant invoices showing:

BHEL, State of _____ (State in which the project site is located) GSTIN of BHEL in such State (to be obtained by the bidders before raising any invoice) under "Details of Receiver (Billed To)

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-VIII: Taxes & Duties

BHEL's Customers details (mentioned in SCC/Dispatch Instructions) under "Details of Consignee (Shipped To) State in which the project is located, as the "Place of Supply".

The invoices shall be raised within the time limit prescribed under the GST law. In the event of any delay in submission of the invoice to BHEL, any consequential financial implication to BHEL, including interest loss on discharge of BHEL's GST liability, denial of input credit of GST, etc., shall be recoverable from the supplier/bidder.

8.3 PAYMENT OF GST:

The GST amount on gross value of each invoice shall be claimed by the bidders along with the first stage payment by submission of GST invoice as mentioned above. However, the amount of GST shall be paid only upon confirmation of the following:

The bidder declaring the invoice in his GSTR-1 and

Confirmation of payment of GST thereon by bidder on GSTN Portal.

However, BHEL, at its discretion, may release the GST amount based on undertaking by the bidders in the prescribed format(Ann. I), Pending the above confirmation, and in such cases, if any discrepancy is found on subsequent verification as per data available from GSTIN Portal, the entire financial implication thereof on BHEL shall be recovered from the bidder

8.4 PENALTY:

In addition to the Penalty determined as per clause in GCC, GST on penalty is also recoverable.

8.5 BUILDING & OTHER CONSTRUCTION WORKERS (REGULATION OF EMPLOYMENT AND CONDITIONS OF SERVICE) ACT, 1996 (BOCW Act) AND RULES OF 1998 READ WITH BUILDING & OTHER CONSTRUCTION WORKERS CESS Act, 1996 & CESS RULES, 1998.

In case any portion of work involves execution through building or construction workers, then compliance to the above titled Acts shall be ensured by the contractor and contractor shall obtain license and deposit the cess under the Act. In the circumstances it may be ensured as under:-

- i. It shall be the sole responsibility of the contractor in the capacity of employer to forthwith (within a period of 15 days from the award of work) apply for a license to the Competent Authority under the BOCW Act and obtain proper certificate thereof by specifying the scope of its work. It shall also be responsibility of the contractor to furnish a copy of such certificate of license / permission to BHEL within a period of one month from the date of award of contract.
- ii. It shall be the sole responsibility of the contractor as employer to ensure compliance of all the statutory obligations under these act and rules including that of payment / deposit of 1% cess on the extant of work involving building or construction workers engaged by the contractor within a period of one month from the receipt of payment.
- iii. It shall be the responsibility of the sub-contractor to furnish the receipts / challans towards deposit of the cess together with the number, name and other details of beneficiaries (building workers) engaged by the sub-contractor during the preceding month.

It shall be the absolute responsibility of the sub-contractor to make payment of all statutory payments & compensations to its workers including that is provided under the Workmen's Compensation Act, 1923. (building/Inter-state Migrant workmen) engaged by the sub-contractor during the preceding month.

It shall be the absolute responsibility of the sub-contractor to make payment of all statutory payments & compensations to its workers including that is provided under the Workmen's Compensation Act, 1923.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-I General

1.1

The work covered under this specification is of highly sophisticated nature, requiring the best quality of workmanship for construction, engineering and construction management. The Bidder should ensure timely completion of work. The Bidder must have adequate quantity of tools, construction aids, equipment's etc., in his possession. He must also have on his rolls adequate, trained, qualified and experienced supervisory staff and skilled personnel.

1.2

The work shall be executed under the usual conditions affecting industrial construction and in conjunction with numerous other operations at site. The Bidder and his personnel shall co-operate with the personnel of other agencies, co-ordinate his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.

1.3

All the work shall be carried out as per the instructions of BHEL engineer. BHEL engineer's decision regarding the correctness of the work and method of working shall be final and binding on the Bidder.

1.4

The Bidder shall at his cost perform any services, tests etc, although not specified but nevertheless required for the completion of work.

1.5

Contractor shall execute the work as per sequence prescribed by BHEL at site. The sequence of activities, methodology will be decided by the BHEL engineers depending upon the availability of material, drawings, work fronts etc. No claims for extra payment from the Contractor will be entertained on the grounds of deviation from the methods and sequence of construction advised and agreed by BHEL engineer or for any reasons whatsoever.

1.6

All the necessary certificates and licenses required to carry out this work are to be arranged by the Contractor expeditiously at his cost.

1.7

The work to be carried out under the scope of these specifications covers ,temporary storing of contractor's own construction material, using the same in the work, carrying out all other activities, as defined in the scope of work enumerated in chapter-2, Part-I of TCC document, Bill of Quantities and elsewhere till handing over of the entire work. The work shall conform to dimensions and tolerances specified in the various drawings, documents etc. That will be provided during the course of construction. If any portion of the work is found to be defective in workmanship or not conforming to drawings or other specifications, the Contractor shall dismantle and re-do the work duly replacing the defective materials at his cost failing which the work will be got done by BHEL at the cost and risk of the contractor.

1.8

The terminal points as decided by BHEL shall be final and binding on the Contractor.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-I General

1.9

During the course of execution of this work, certain rework/ modification/ rectification/ repairs/ fabrication/dismantling/reconcreting etc. will be necessary on account of feedback from customer/BHEL on account of design discrepancies and manufacturing defects and site operation/maintenance requirements. Contractor shall carryout such rework/ modification/rectification/fabrication/repairs etc., promptly and expeditiously. Claims of contractor, if any, for such works will be dealt as per relevant clauses of General Conditions of Contract.

1.10

Daily log sheets indicating the details of work carried out, man-hours, consumables used etc, shall be maintained by the Contractor and got signed by BHEL engineer every day.

1.11

All tools and tackles, fixtures, equipment, materials, manpower, supervisors/ engineers, consumables etc. required for this scope of work shall be provided by the Contractor. All expenditure including taxes and incidentals in this connection will have to be borne by him unless otherwise specified in the relevant clause.

1.12

The contractor shall make adequate security arrangements including employment of security personnel and ensure protection from theft, fire, pilferage, damage and loss of materials/equipments issued to him for the work. Special care will have to be taken to guard against pilferage / theft of cement, steel and/or other materials.

1.13

Contractor shall ensure proper housekeeping and remove all scrap materials periodically from various work area covered in the scope and deposit the same at the place earmarked for this purpose. In case of contractor's failure to do the same, BHEL reserves the right to remove scrap at contractor's cost and risk.

1.14

Access to site for inspection by BHEL and customer engineers shall be made available by the contractor at all times.

1.15

Site Inspection : The owner / employer or his authorized agents may inspect various stages of work during the currency of the contract awarded to him. The contractor shall make necessary arrangements for such inspection and carry out the rectification pointed out by the owner / employer without any extra cost to the owner / employer. No cost whatsoever such duplication of inspection of work be entertained.

1.16

BHEL will not supply any materials unless otherwise specified.

1.17

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-I General

Makes of supply of cement, steel and painting materials shall be as per approved material list by NTPC/BHEL.

1.18

The Contractor shall carry the work as per the Field Quality Plan issued by BHEL/NTPC.

1.19

Lab has to be established at site for carrying out testing as per Field Quality Plan, like Cube testing machine, cube mounds etc.

1.20

Weigh batcher with printing facility should be available as per the deployment of parallel gangs.

1.21

Calibration of equipment's should be done by NABL/NPL accredited laboratories.

1.22

Welding procedure to be followed as per Field Quality plan. (Welding procedure and prequalification of welder required to be produced)(If required).

1.23

Indicative Field Quality Plan attached with the NIT.

1.24

Contractor should submit the royalty certificates for quantity of Coarse and fine aggregates used at site.

1.25

Field Quality Assurance Formats: It is the responsibility of the contractor to collect and fill up the relevant concrete pour card/FQA Log sheets and present the same to BHEL after carrying out the necessary checks as per the log sheets and obtaining the signature of BHEL / Customer in token of their acceptance. Monthly Running Bill Payment to the contractor will be linked with the submission of these Log sheets.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter-II GENERAL TECHNICAL SPECIFICATION

2.0 SCOPE

Vendor scope includes:

Operations and maintenance of the complete plant for a period of 38 months

Coordination / liaison activities (related to clearance / approval) with concerned state / central authorities such as CEIG/CEA etc, including renewal of CEIG license every year as applicable.

2.1 DETAILED SPECIFICATION

Operation and maintenance of complete 50MW SPV plant for a period of 38 months

6.0 OPERATIONS AND MAINTENANCE:

6.1 DATE OF COMMENCEMENT OF OPERATIONS AND MAINTENANCE

Zero date for O&M shall be the actual date on which the successful trial run on the power plant is completed after commissioning of the 50MWp solar photovoltaic power plant with synchronization / export of power to the grid. (Note: Trial run is considered as an event with trouble-free operation for a cumulative period of 24 generation hours). Already completed.

6.2 O&M PERSONNEL:

1) Vendor shall deploy following minimum personnel:

(a) Technical / administrative / office personnel

- One technical-cum-administrative in-charge having graduation in electrical / electronics engineering and experience with overall responsibility for complete plant operations. The in-charge shall have competence to deftly handle technical and operational / crisis problems.
- Six working level staff with ITI / diploma level qualifications in engineering with competence for operating electrical / electronics / mechanical equipment, taking measurements, data logging / maintaining registers, preparation of reports in computer.
- Six unskilled persons for regular house-keeping (cleaning / mopping etc) and water cleaning of SPV modules.
- **Note:** At least one among the technical personnel shall essentially be a certified / licensed person for HT operations (33kV minimum). This is a mandatory requirement.

(b) Security personnel:

Deployment of security guards during O&M period shall be in scope of vendor.

2) Vendor shall provide uniforms for the O&M staff.

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- 3) Similarly, O&M personnel shall be provided with raincoats, toolsets, earthing rods, safety gloves, safety goggles, gumboots, helmets and all other personal protective equipment (PPE) that will be relevant to ensure human safety.
- 4) Names, qualification, work responsibility of personnel shall be listed on a display board within control room.
- 5) Attendance register shall be maintained for both the teams.
- 6) Vendor shall ensure statutory requirements such as ESI, PF and labour license for their O&M personnel posted at site.
- 7) BHEL / NTPC shall have right to disallow any O&M employee, if found unfit to perform. BHEL instructions issued in writing shall be binding on vendor who shall replace the person.
- 8) O&M personnel at site shall conform to general regulations in force at site and to any special instructions from local NTPC administration.
- 9) O&M personnel at site shall be deemed to be aware of damages and risks incidental to conditions of NTPC land & works from time to time and BHEL / NTPC shall not be responsible for any injury to personnel arising there from.
- 10) Training to O&M personnel It is the absolute responsibility of vendor to ensure imparting of necessary training to their O&M personnel to get them acquainted with the operations of various electrical and mechanical equipment of the power plant. For this purpose, vendor shall identify the O&M personnel well in advance and involve them during installation and commissioning stages so that they become well versed with various functional aspects of the power plant.
- 11) Availability of O&M personnel at power plant
 - Vendor shall ensure that operating staff are present in the power plant during 7:30 AM – 6:30 PM every day.
 - Vendor shall ensure that certain minimum operating staffs are present at the power plant even on festivals, public holidays and any other unique occasions so that the plant is run under competent supervision on all days.
- 12) O&M personnel shall, strictly, not use any part of the power plant for their personal /residential purposes. Their presence at the plant shall, strictly, be meant only for the purpose of operation and maintenance of plant.

TOOLS KITS, MEASURING INSTRUMENTS & INTERNET SERVICES TO BE PROVIDED:

Vendor should arrange following Measuring instruments and Tool kits as a part of O&M and handover to NTPC after completion of O&M period.

A. Measuring instruments

1	Digital Earth Resistance Tester (1 Ohm)	Reputed make	1 Nos
2	Digital multimeter 0-1000V	Reputed make	1 Nos
3	AC-DC Clamp Meter Amp range 0-100 A	Reputed make	1 Nos

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4	Megger – 1KV digital type	Reputed make	1 Nos
5	Megger – 5KV digital type	Reputed make	1 Nos

Note: Make / model number etc. shall be approved by BHEL prior to procurement.

B. Tool kits

1	Double ended spanner Set of sizes 10-11, 12-13, 14-15, 16-17, 17-18	1 Nos each
2	Screwdriver Set	1 Set
3	Allen Key set	1 Set
4	Adjustable spanner 2-inch size	1 No
5	Cutting Pliers	1 No
6	Nose Pliers	1 No

Note: Prior to procurement, vendor shall obtain approval from BHEL for the make and specification of the items.

Vendor should supply any another additional maintenance tools &Tackles required for O&M at no extra cost.to BHEL

Internet Services:

Internet lease line of 2 MBPS for remote connectivity of SCADA, with necessary hardware support items such as Modem / Router / Wifi facility etc and for a lease period of five years from the date of completion of trial run to be provided by vendor.

O&M OPERATIONS – DAILY BASIS:

- 1) Water cleaning of SPV modules
- 2) Inverter room / CMCS room cleaning – dry sweeping, wet mopping
- 3) Water wash cleaning of toilets, urinals, Gardening of landscaping areas: watering of plants, trimming of plants as applicable and necessary.
- 4) Logging of DC, AC, grid parameters (current, voltage, power, energy) at PCUs &VCB panels, transformer temperatures, equipment tripping/ breakdown, grid outage etc as per BHEL formats.
- 5) SCADA data station / PC operations for daily monitoring of weather parameters, trend
- 6) graphs and urgent reporting to BHEL/NTPC in case of any problems / anomalies observed with any of the parameters.
- 7) Drinking water to be arranged for O&M personnel at site.

O&M ACTIVITIES – WEEKLY BASIS:

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- 1) Removal of garbage from solar array field, switchyard, roads, drains, pathways, sand buckets; logging in registers with signatures of operating persons and in-charge.
- 2) Monitoring and logging of fire extinguisher levels / pressures as per BHEL formats

O&M ACTIVITIES – MONTHLY BASIS :

- 1) Inspection of fire extinguishers (weight, pressure indication, physical status etc) followed by refilling actions, if necessary, based on indications. Report to be submitted as per BHEL approved recording formats.
- 2) Earthing resistance measurements for solar array structures, control room equipment, switchyard equipment, lightning arrestors: measured values shall be recorded in registers and reported to BHEL as per BHEL approved recording formats.
- 3) Submission of values / status of plant parameters and events for the corresponding month, as below, as per BHEL approved formats:
 - a. Daily values of solar array strings (SMB parameters)
 - b. Daily values of weather parameters (solar energy, wind speed, ambient temperature)
 - c. Daily energy generation
 - d. Events (with date, time) of faults / tripping / breakdown of equipment
 - e. Events (with date, time) of grid outage
 - f. Events (with date, time) of equipment damages, accidents and thefts
 - g. Activities of module cleaning
- 4) Monthly reports shall be submitted to BHEL for all the above data.
- 5) Energy generation / meter reading report to be prepared and submitted to the concerned department. Signatures from NTPC representatives shall be obtained wherever required.

O&M ACTIVITIES - QUARTERLY BASIS:

- 1) Cleaning of PCUs, LT panels, VCB panels, UPS panels etc to remove accumulated dust.
- 2) Monitoring and status review, followed by rectification / calibration / replenishment /
- 3) replacement actions as necessary and applicable for following:
 - (a) Spare items of all electrical equipment
 - (b) First aid box items - medicines and accessories
 - (c) Safety gadgets
 - (d) Tool kits and measuring instruments
 - (e) Yard lights
 - (f) Pumps, starters
 - (g) Control room appliances: air conditioners, lights, fans, exhaust fans, switch boards etc
- 4) Pest control for control room (rats, snakes etc) – sprays, chemicals, medicines etc to be
- 5) applied wherever required.

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- 6) Submission of quarterly report on above activities to BHEL.

O&M activities – half yearly basis

- (1) Cleaning of water storage tanks.

O&M ACTIVITIES – YEARLY BASIS:

- 1) BDV measurements for oil samples from all the transformers and submission of report to BHEL / NTPC.
- 2) Filtration of oil to be arranged, if required, based on BDV measurement report.
- 3) Lubrication of moving contacts (VCBs etc) with appropriate grease etc
- 4) Cleaning of sewerage lines, septic tanks (if found necessary)
- 5) Painting of main gate, switchyard gate / fencing, earthing chambers, other steel structures within control room and switchyard if required based on conditions of rusting etc.
- 6) Checking tightness of hardware in solar array structures and tightening wherever required.
- 7) Checking tightness of power cable terminations in SPV modules (MC4), SMBs, electrical panels of control room and switchyard.

O&M ACTIVITIES - AS AND WHEN REQUIRED (CONTEXTUAL BASIS):

- 1) Monitoring and operation of plant electrical equipment as and when required:
 - a. VCB on/off: local operations from outdoor VCB panel and remote operations from SCADA system.
 - b. Settings of numerical relays in VCB panels: review and revision in consultation with BHEL.
 - c. ACB and MCCB on/off operations on LT side
 - d. PCU operations: emergency close, LCD displays (selection of settings, monitoring the DC/AC/event/fault status parameters), operation of duct fans
 - e. UPS panels and Battery bank operations
 - f. Bore well pump operations to fill the water storage tanks
- 2) Seasonal tilting of SPV modules from one angle to the other (5, 15 and 30 degrees) based on seasonal tilting chart that will be finalized by BHEL/NTPC during detailed engineering phase. This is a critical activity as energy generation is strongly affected by the angle.
- 3) Vendor shall deploy the necessary tools/tackles, machinery, number of skilled/unskilled
- 4) labour etc for this purpose.
- 5) Coordinating, on behalf of BHEL, and obtaining renewal of statutory licenses, clearances and approvals from state departments such as electricity boards, CEA/CEIG etc.
- 6) Repair and replacement of vendor supplied items, by vendor, with urgent action plans and implementation, when the items are found non-working / damaged. The same shall be

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- 7) reported to BHEL within 12 hours from time of observation.
- 8) Reporting, on an immediate basis (within max 2 hours) of functional problems / damages in BHEL supplied items to facilitate repair / replacement by BHEL. Further, vendor shall correspond / coordinate with respective equipment vendors / service centers, on behalf of BHEL, for getting the service engineers to the site. Later, coordinating with the service engineers during their visit to site, and assisting them in the trouble shooting process until the problem is resolved. Vendor shall report to BHEL (within max 2 hours) immediately after the problem is resolved.
- 9) Vendor shall keep updating the spares inventory at the site every time there is consumption of spare items towards replacement. In case of shortage of spares, the same shall be reported on an urgent basis (with max 2 hours) to BHEL.
- 10) Coordinating with sub-station upon grid failures, line problems etc and implementing the needful steps to restore the plant to normal operation.
- 11) Theft incidents: immediate reporting to BHEL, filing FIRs with police stations on behalf of BHEL, coordination for site inspection by insurance companies and clearance of insurance claims, logging of events (date, time) and maintaining records.
- 12) Accidents: immediate reporting to BHEL, coordinating with hospitals, logging of events (data, time) and maintaining records.

List of enclosure of Technical Condition of Contract:

- 1. Record of Daily O&M Activities.**
- 2. Check list of LT Switch Board.**
- 3. Check list of Auxiliary Transformers.**
- 4. Check list of battery bank.**
- 5. Check list of Transformers.**