

UNPRICED PRICED BID

SCHEDULE OF WORKS AND ESTIMATE FOR OPERATION AND MAINTENANCE OF GACL 20 MW SOLAR PV PLANT FOR 5 YEARS (Annexure-II)

Sl No	Activity description	Scope of Work & Remarks	Unit	Qty	Estimate Unit rate excluding GST (Rs)	Estimate Total Amount excluding GST (Rs.)
1	Water cleaning of solar modules of approximately 75,000nos. (Three cycles per month, each cycle shall consist of cleaning of entire 75,000 Nos modules).	(i) Water shall be supplied by GPCL and will be stored in underground sumps constructed at site. Water charges to GPCL shall be borne by GACL. Water from sumps shall be pumped through already installed pipeline network and pumps to facilitate water flow for modules cleaning. (ii) In case water is not provided by GPCL due to non-availability of water in local canal, vendor shall arrange water using tankers and payment for supply of water through tankers shall be made by BHEL. (iii) All the consumables for cleaning of modules such as cleaning brushes, mopping sticks etc. shall be arranged by vendor. (iv) In case of natural cleaning of solar modules by rains and cleaning not carried out, no payment will be done for that cycle within the month. (v) Three cycles of cleaning of entire solar modules has to be completed in a month by the vendor. In case, lesser quantity of solar modules are cleaned, proportionate payment will be made for quantity of solar modules cleaned up to last day of each month. (vi) Each solar module is of 2m x 1m size and 40 solar modules are mounted on each structure. .	Months	60	45000	2700000
2	Supply of water using tankers	Water shall be supplied using tankers from external source in case water is not provided by GPCL.	Kilo Litres	2,250	238.95	537637.5
3	Grass cutting - maintenance of plant without grass (One cycle per month)	(i) Minimum 2 labourers to be allocated for this activity. (ii) Activity to be carried out with 2 nos of Petrol / Diesed operated Motorized Grass cutting machines. Repair and maintenance of grass cutting machines shall be in vendor's scope. (iii) Petrol/Diesel/electricity expenses shall be in vendor's scope for operation of the grass cutting machine. (iii) In case if grass is not grown and cutting is not carried out, no payment will be done for the month.	Months	60	22410	1344600
4	Supply of Motorized Grass cutting machines of reputed make with repair and maintenance for complete O&M period	Make shall be BOSCH / HONDA or equivalent. Approval shall be taken from BHEL before procurement.	Nos	2	23895	47790
5	Deployment of Security persons for the entire plant in 3 shifts per day each of 8 hours with minimum 5 security persons in each shift (2 with arms and 3 without arms). One each of security persons with arms shall be deployed at main gates at all times. Other security persons shall be patrolling the entire area	(i) Securing approx. 90 acres of plant area. (ii) In case of theft, FIR to be lodged by O&M vendor. (iii) If theft incidents are due to negligence of O&M vendor such as shortage of security, the loss recovery shall be done from vendor. (iv) Two security cabins at main gates and 8 watchman cabins at corners are provided by BHEL in the plant.	Man Months	540	10035.9	5419386
				360	12043.08	4335508.8
6	Management of complete O & M activities by O&M incharge	One engineer (B.Tech in Electrical Engg.) with 66 kV working experience to be appointed who will be the overall O&M incharge of the plant. Major responsibilities of O&M incharge : (i) Allotment of work to all the O&M staff and supervision of O&M works as per schedule approved by BHEL. (ii) Sending Daily, weekly and Monthly report to BHEL by mail. (iii) Interaction with customer / GETCO / SLDC / GPCL etc. (iv) Coordinating with sub-station upon grid failures / cable faults and implementing the needful steps to restore the plant to normal operation. (v) Monthly downloading of data from ABT meter using CMRI / as instructed by GETCO. (vi) Maintaining plant records and log books, stock register and reporting to BHEL. (vii) Trouble-shooting and Updation of SCADA system if required as instructed by BHEL. (viii) Theft incidents: immediate reporting to BHEL, filing FIRs at police stations on BHEL behalf, coordination for site inspection by insurance companies and clearance of insurance claims, logging of events (date, time) and maintaining records. (ix) Accidents: immediate reporting to BHEL, coordinating with hospitals, logging of events (date, time) and maintaining records.	Months	60	23895	1433700
7	Plant Operation works such as (i) Logging of DC, AC, grid parameters (current, voltage, power, energy) at PCUs, HT panels, 66KV switchyard, transformer temperatures, equipment tripping/ breakdown, grid outage as per BHEL formats. (ii) SCADA data station / HMI PC operations/ CCTV operation for daily monitoring of weather parameters, trend graphs and urgent reporting to BHEL in case of any problems / anomalies observed with any of the parameters, resolving communication issues between SCADA and other equipment, healthiness of all equipment	Minimum 2 technicians (Diploma / ITI) to be allocated for this activity. The O&M works mentioned are indicative. All the activities required for O&M shall be carried out by technicians as instructed by BHEL. Monthly reports to be prepared and submitted by mail to BHEL for the various parameters including Earth resistance, String current, Energy exported etc. as per report formats finalized by BHEL. Atleast one technicians out of 2, shall be qualified for operating installations of 66KV and above. Certificate / license copy to be submitted to BHEL before commencement of O&M works. One technician to be posted in Night shift operation.	Months	60	22939.2	1376352
8	Carrying out Preventive and Breakdown maintenance as per O&M schedule / OEM guidelines / maintenance manual such as a) Cleaning, tightness checks, lubrication and other maintenance of equipment -PCUs, HT panels, 66KV Power transformers, Inverter transformers, C&R panels, Auxiliary transformers, ACDB, FCBC, UPS, Battery banks, OLTC, 66 KV Switchyard equipment, SMBs, SCADA, WMS, CCTV, Fire Alarm, ESE Lightning arresters, earthing, light fitting -indoor and outdoor etc. b) Replacement of Silica gel, gaskets, Rectification of Oil leakages in all transformers and 66KV Switchyard equipment. c) Repair/ replacement of failed 33KV cable inside plant and cable laid underground between plot B2 and plot C, replacement of failed 33 kV termination/ jointing kits. d) Trouble-shooting of solar array problems as DC earth fault, OFC/ communication cable faults, replacement of damaged PV modules, SMB components etc. e) Checking tightness of MMS and PV Modules (f) Monthly earth resistance measurement and recording value on the Earth chambers (g) Watering of earth pits	(i) Minimum 1 technicians (Diploma/ITI) and minimum 2 labourer to be allocated for this activity. (ii) List of equipment mentioned is indicative. Maintenance of all the equipments installed in plant is in vendor's scope. (iii) Periodic maintenance shall be preferably carried out during evening to avoid generation loss. (iv) Whenever a fault has occurred, the contractor has to attend to rectify the fault & the fault must be rectified within 48 hours from the time of occurrence of fault. (v) Major spares such as complete equipment failures of CT, PT, LA, Breaker, Isolator, SMB, PCU, transformer, cables, HT termination and jointing kits etc. if any will be supplied by BHEL. (vi) Minor spares and consumables such as MCBs, Fuses, peripheral and bulging Lights, fans, indication lamps, gaskets, silica gel, acid for battery, hardwares, lugs, glands, MC4 connectors, PCU dust filter, PEB room louver air filter, sanitary fittings etc. if required shall be supplied by vendor. (vii) In case of Maintenance activity / failure / damage / accident / replacement / repair required for any of the plant equipment such as Solar modules, 66KV Switchyard equipment, HT panels, all transformers etc. or for any other site related activities, unloading, erection, installation, charging, co-ordination with agencies involved, etc., shall be in O&M vendor's scope. Arrangement of Crane / hydra / JCB/ additional labour hiring / Ladder, etc., for arranging replacement of failed equipment shall also be in the scope of O&M vendor. (viii) All tools and tackles required for maintenance activities shall be arranged by O&M vendor.	Months	60	32497.2	1949832
9	General maintenance works such as Daily housekeeping activity for inverter rooms and Control room including toilets, Garbage removal from solar array area, repair of plumbing works, if required, minor civil repair works such as leakages, doors, windows, rolling shutters, ventilators, floor/ tiles/ wall cracks, cleaning of drains etc.	(i) Minimum 1 labourers to be allocated for this activity. (ii) All the buildings - Main Control room and Inverer rooms to be mopped daily and surroundings to be kept clean. (iii) All toilets to be cleaned daily. (iv) All consumables required for this activity shall be in vendor's scope.	Months	60	9450	567000
10	a) Annual maintenance of all transformers with respect to BDV measurement, Oil filtering as required, tightness of cables, earthing and hardwares, replacement of gasket, silica gel breather, paint touchup, arresting oil leakages and oil topup of all transformers (66KV, 33KV and aux transformers), CT, PT and other related electrical works. (B) Annual maintenance of underground water tanks, Sintex tanks, cleaning of sewerage lines, septic tanks, soak pits	Through OEM / competent testing agencies as approved by BHEL. All required tools, tackles, testing and measuring instruments, Oil filtration kit, DG set etc. to be arranged by vendor.	Years	5	134712	673560
11	Annual testing and calibration of 66 kV Switchyard equipment-SFG Breakers, Isolators, CTs, PTs, LAS, ABT energy meters, NIFPS etc.	Through OEM / competent testing agencies as approved by BHEL. All required tools, tackles, testing and measuring instruments, DG set etc. to be arranged by vendor.	Years	5	95580	477900

5 Security Persons

		(iii) Petrol/Diesel/electricity expenses shall be in vendor's scope for operation of the grass cutting machine. (iii) In case if grass is not grown and cutting is not carried out, no payment will be done for the month.
4	Supply of Motorized Grass cutting machines of reputed make with repair and maintenance for complete O&M period	Make shall be BOSCH / HONDA or equivalent. Approval shall be taken from BHEL before procurement.
5	Deployment of Security persons for the entire plant in 3 shifts per day each of 8 hours with minimum 6 security persons 5 Security Persons in each shift (2 with arms and 3 without arms). One each of security persons with arms shall deployed at main gates at all times. Other security persons shall be patrolling the entire area	(i) Securing approx. 90 acres of plant area. (ii) In case of theft, FIR to be lodged by O&M vendor. (iii) If theft incidents are due to negligence of O&M vendor such as shortage of security, the loss recovery shall be done from vendor. (iv) Two security cabins at main gates and 8 watchman cabins at corners are provided by BHEL in the plant.
6	Management of complete O & M activities by O&M incharge	One engineer (B.Tech in Electrical Engg.) with 66 kV working experience to be appointed who will be the overall O&M incharge of the plant. Major responsibilities of O&M incharge : (i) Allotment of work to all the O&M staff and supervision of O&M works as per schedule approved by BHEL. (ii) Sending Daily, weekly and Monthly report to BHEL by mail. (iii) Interaction with customer / GETCO / SLDC / GPCL etc. (iv) Coordinating with sub-station upon grid failures /cable faults and implementing the needful steps to restore the plant to normal operation. (v) Monthly downloading of data from ABT meter using CMRI / as instructed by GETCO. (vi) Maintaining plant records and log books, stock register and reporting to BHEL. (vii) Trouble-shooting and Updation of SCADA system if required as instructed by BHEL. (viii) Theft incidents: immediate reporting to BHEL, filing FIRs at police stations on BHEL behalf, coordination for site inspection by insurance companies and clearance of insurance claims, logging of events (date, time) and maintaining records. (ix) Accidents: immediate reporting to BHEL, coordinating with hospitals, logging of events (data, time) and maintaining records.
7	Plant Operation works such as(i) Logging of DC, AC, grid parameters (current, voltage, power, energy) at PCUs, HT panels, 66KV switchyard, transformer temperatures, equipment tripping/ breakdown, grid outage as per BHEL formats. (ii) SCADA data station / HMI PC operations/ CCTV operation for daily monitoring of weather parameters, trend graphs and urgent reporting to BHEL in case of any problems / anomalies	(i) Minimum 2 technicians (Diploma / ITI) to be allocated for this activity. The O&M works mentioned are indicative. All the activities required for O&M shall be carried out by technicians as instructed by BHEL. Monthly reports to be prepared and submitted by mail to BHEL for the various parameters including Earth resistance, String current, Energy exported etc. as per report formats finalized by BHEL. (ii) Atleast one technicians out of 2, shall be qualified for operating installations of 66KV and above. Certificate / license copy to be submitted to BHEL before commencement of O&M works. (iii) One technician to be posted in Night shift operation.

Arora
21/07/19

PRICE BID

SCHEDULE OF WORKS AND ESTIMATE FOR OPERATION AND MAINTENANCE OF GAEL 20 MW SOLAR PV PLANT FOR 5 YEARS

Sl No	Activity description	Scope of Work & Remarks	Unit	Qty	Estimate Unit rate excluding GST (Rs)	Estimate Total Amount excluding GST (Rs.)
1	Water cleaning of solar modules of approximately 75,000nos. (Three cycles per month, each cycle shall consist of cleaning of entire 75,000 Nos modules).	(i) Water shall be supplied by GPCL and will be stored in underground sumps constructed at site. Water charges to GPCL shall be borne by GAEL. Water from sumps shall be pumped through already installed pipeline network and pumps to facilitate water flow for modules cleaning. (ii) In case water is not provided by GPCL due to non-availability of water in local canal, vendor shall arrange water using tankers and payment for supply of water through tankers shall be made by BHEL. (iii) All the consumables for cleaning of modules such as cleaning brushes, mopping sticks etc. shall be arranged by vendor. (iv) In case of natural cleaning of solar modules by rains and cleaning not carried out, no payment will be done for that cycle within the month. (v) Three cycles of cleaning of entire solar modules has to be completed in a month by the vendor. In case, lesser quantity of solar modules are cleaned, proportionate payment will be made for quantity of solar modules cleaned up to last day of each month. (vi) Each solar module is of 2m x 1m size and 40 solar modules are mounted on each structure. .	Months	60	45000	2700000
2	Supply of water using tankers	Water shall be supplied using tankers from external source in case water is not provided by GPCL.	Kilo Litres	2,250	238.95	537637.5
3	Grass cutting - maintenance of plant without grass (One cycle per month)	(i) Minimum 2 labourers to be allocated for this activity. (ii) Activity to be carried out with 2 nos of Petrol / Diesel operated Motorized Grass cutting machines. Repair and maintenance of grass cutting machines shall be in vendor's scope. (iii) Petrol/Diesel/electricity expenses shall be in vendor's scope for operation of the grass cutting machine. (iii) In case if grass is not grown and cutting is not carried out, no payment will be done for the month.	Months	60	22410	1344600
4	Supply of Motorized Grass cutting machines of reputed make with repair and maintenance for complete O&M period	Make shall be BOSCH / HONDA or equivalent. Approval shall be taken from BHEL before procurement.	Nos	2	23895	47790
5	Deployment of Security persons for the entire plant in 3 shifts per day each of 8 hours with minimum 6 security persons in each shift (2 with arms and 3 without arms). One each of security persons with arms shall be deployed at main gates at all times. Other security persons shall be patrolling the entire area	(i) Securing approx. 90 acres of plant area. (ii) In case of theft, FIR to be lodged by O&M vendor. (iii) If theft incidents are due to negligence of O&M vendor such as shortage of security, the loss recovery shall be done from vendor. (iv) Two security cabins at main gates and 8 watchman cabins at corners are provided by BHEL in the plant.	Man Months	540	10035.9	5419386
				360	12043.08	4335508.8
6	Management of complete O & M activities by O&M incharge	One engineer (B.Tech in Electrical Engg.) with 66 KV working experience to be appointed who will be the overall O&M incharge of the plant. Major responsibilities of O&M incharge : (i) Allotment of work to all the O&M staff and supervision of O&M works as per schedule approved by BHEL. (ii) Sending Daily, weekly and Monthly report to BHEL by mail. (iii) Interaction with customer / GETCO / SLDC / GPCL etc. (iv) Coordinating with sub-station upon grid failures / cable faults and implementing the needful steps to restore the plant to normal operation. (v) Monthly downloading of data from ABT meter using CMRI / as instructed by GETCO. (vi) Maintaining plant records and log books, stock register and reporting to BHEL. (vii) Trouble-shooting and Updation of SCADA system if required as instructed by BHEL. (viii) Theft incidents: immediate reporting to BHEL, filing FIRs at police stations on BHEL behalf, coordination for site inspection by insurance companies and clearance of insurance claims, logging of events (date, time) and maintaining records. (ix) Accidents: immediate reporting to BHEL, coordinating with hospitals, logging of events (date, time) and maintaining records.	Months	60	23895	1433700
7	Plant Operation works such as (i) Logging of DC, AC, grid parameters (current, voltage, power, energy) at PCUs, HT panels, 66KV switchyard, transformer temperatures, equipment tripping/ breakdown, grid outage as per BHEL formats. (ii) SCADA data station / HMI PC operations/ CCTV operation for daily monitoring of weather parameters, trend graphs and urgent reporting to BHEL in case of any problems / anomalies observed with any of the parameters, resolving communication issues between SCADA and other equipment, healthiness of all equipment	Minimum 2 technicians (Diploma / ITI) to be allocated for this activity. The O&M works mentioned are indicative. All the activities required for O&M shall be carried out by technicians as instructed by BHEL. Monthly reports to be prepared and submitted by mail to BHEL for the various parameters including Earth resistance, String current, Energy exported etc. as per report formats finalized by BHEL. Atleast one technicians out of 2, shall be qualified for operating installations of 66KV and above. Certificate / license copy to be submitted to BHEL before commencement of O&M works. One technician to be posted in Night shift operation.	Months	60	22939.2	1376352
8	Carrying out Preventive and Breakdown maintenance as per O&M schedule / OEM guidelines / maintenance manual such as a) Cleaning, tightness checks, lubrication and other maintenance of equipment -PCUs, HT panels, 66KV Power transformers, Inverter transformers, C&R panels, Auxiliary transformers, ACDB, FCBC, UPS, Battery banks, OLTC, 66 KV Switchyard equipment, SMBs, SCADA, WMS, CCTV, Fire Alarm, ESE Lightning arresters, earthing, light fitting -indoor and outdoor etc. b) Replacement of Silica gel, gaskets, Rectification of Oil leakages in all transformers and 66KV Switchyard equipment. c) Repair/ replacement of failed 33KV cable inside plant and cable laid underground between plot B2 and plot C, replacement of failed 33 kV termination/ jointing kits. d) Trouble-shooting of solar array problems as DC earth fault, OFC/ communication cable faults, replacement of damaged PV modules, SMB components etc. e) Checking tightness of MMS and PV Modules (f) Monthly earth resistance measurement and recording value on the Earth chambers (g) Watering of earth pits	(i) Minimum 1 technicians (Diploma/ITI) and minimum 2 labourer to be allocated for this activity. (ii) List of equipment mentioned is indicative. Maintenance of all the equipments installed in plant is in vendor's scope. (iii) Periodic maintenance shall be preferably carried out during evening to avoid generation loss. (iv) Whenever a fault has occurred, the contractor has to attend to rectify the fault & the fault must be rectified within 48 hours from the time of occurrence of fault. (v) Major spares such as complete equipment failures of CT, PT, LA, Breaker, Isolator, SMB, PCU, transformer, cables, HT termination and jointing kits etc. if any will be supplied by BHEL. (vi) Minor spares and consumables such as MCBs, Fuses, peripheral and bulging Lights, fans, indication lamps, gaskets, silica gel, acid for battery, hardwares, lugs, glands, MC4 connectors, PCU dust filter, PEB room louver air filter, sanitary fittings etc. if required shall be supplied by vendor. (vii) In case of Maintenance activity / failure / damage / accident / replacement / repair required for any of the plant equipment such as Solar modules, 66KV Switchyard equipment, HT panels, all transformers etc. or for any other site related activities, unloading, erection, installation, charging, co-ordination with agencies involved, etc., shall be in O&M vendor's scope. Arrangement of Crane / hydra / JCB/ additional labour hiring / Ladder, etc., for arranging replacement of failed equipment shall also be in the scope of O&M vendor. (viii) All tools and tackles required for maintenance activities shall be arranged by O&M vendor.	Months	60	32497.2	1949832
9	General maintenance works such as Daily housekeeping activity for inverter rooms and Control room including toilets, Garbage removal from solar array area, repair of plumbing works, if required, minor civil repair works such as leakages, doors, windows, rolling shutters, ventilators, floor/ tiles/ wall cracks, cleaning of drains etc.	(i) Minimum 1 labourers to be allocated for this activity. (ii) All the buildings - Main Control room and Inverter rooms to be mopped daily and surroundings to be kept clean. (iii) All toilets to be cleaned daily. (iv) All consumables required for this activity shall be in vendor's scope.	Months	60	9450	567000
10	a) Annual maintenance of all transformers with respect to BDV measurement, Oil filtering as required, tightness of cables, earthing and hardwares, replacement of gasket, silica gel breather, paint touchup, arresting oil leakages and oil topup of all transformers (66KV, 33KV and aux transformers), CT, PT and other related electrical works. (B) Annual maintenance of underground water tanks, Sintex tanks, cleaning of sewerage lines, septic tanks, soak pits	Through OEM / competent testing agencies as approved by BHEL. All required tools, tackles, testing and measuring instruments, Oil filtration kit, DG set etc. to be arranged by vendor.	Years	5	134712	673560
11	Annual testing and calibration of 66 KV Switchyard equipment- SFG Breakers, Isolators, CTs, PTs, LAS, ABT energy meters, NIFPS etc.	Through OEM / competent testing agencies as approved by BHEL. All required tools, tackles, testing and measuring instruments, DG set etc. to be arranged by vendor.	Years	5	95580	477900

5 Security Persons