RAMAN RESEARCH INSTITUTE

C.V. Raman Avenue, Sadashivanagar

Bengaluru – 560080

Supply, Installation, Testing, Commissioning (SITC) of LT, 415V, Prime duty, 750KVA DG Set and DG Synchronisation Panel. Electrical Work towards Synchronisation of new one no. 750KVA DG Set with Existing two numbers of Stand-alone 320KVA and 500KVA DG Sets for Optimal Power distribution.

NIT No: L/256/EB/2022-2023 Dated 14.12.2022

TENDER DOCUMENT

ESTATES AND BUILDINGS – 2022-23

RAMAN RESEARCH INSTITUTE

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Bengaluru - 560080

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RAMAN RESEARCH INSTITUTE

C.V. Raman Avenue, Sadashiv Nagar
Bengaluru - 560080

NOTICE INVITING TENDER

Tender Notice Number: NIT No: L/256/EB/2022-2023 Dated 14.12.2022

The Raman Research Institute invites Sealed Tenders for **Supply, Installation, Testing, Commissioning (SITC) of LT, 415V, Prime duty, 750KVA DG Set and DGs Synchronisation Panel.**
Electrical Work towards Synchronisation of new one no. 750KVA DG Set with Existing two numbers of Stand-alone 320KVA and 500KVA DG Sets for Optimal Power distribution from the Eligible Bidders.
The execution of the work for this Tender shall be carried out simultaneously with another project by RRI i.e., Up-gradation of 11KV HT & 0.415KV LT Electrical Installation.

Sl. No	Description	Details
1	Title of Work	**Supply, Installation, Testing, Commissioning (SITC) of LT, 415V, Prime duty, 750KVA DG Set and DGs Synchronisation Panel.** **Electrical Work towards Synchronisation of new one no. 750KVA DG Set with Existing two numbers of Stand-alone 320KVA and 500KVA DG Sets for Optimal Power distribution.**
2	Estimated cost put to Tender	**Rs.160.00 Lakhs** (**Inclusive Of GST**)
3	Period of completion of work in months reckoned from the date of issue of work order.	**Five (5) Months**
4	Last date and time for receipt of Tenders	**04.01.2023 UPTO 02:00 P.M Only**
5	Tender Document fee	**Rs.1180/- (Inclusive of GST)** Tender Document Fee in the prescribed form mentioned under Point No. 1, Page 7, should accompany the Tender enclosed along with the Technical Bid (envelope).
6	Earnest Money Deposit (EMD)	**Rs. 3,20,000.00** (**Rupees Three Lakhs Twenty Thousand only**) Earnest Money Deposit in the prescribed form mentioned under Point No. 2 (a), Page 7, should accompany the Tender enclosed along with the Technical Bid (envelope).

Important Note: ***All the Tenderers are requested to attend the Pre-bid meeting to be held on 22.12.2022 at 11:00 A.M at the office of Raman Research Institute, Bengaluru – 560080.***

Eligibility Criteria:

Only those Tenderers fulfilling the following criteria should respond to the Tender.

Sl. No.	Eligibility Criteria	Documentary proof for the eligibility (Self attested copies to be submitted along with Technical Bid)
a.	Should have satisfactorily completed the works as mentioned below during the last **Seven years** from the last date of submission of bids. i. Three similar works each costing not less than **Rs.64.00 Lakhs** (Rupees Sixty Four lakhs only) (OR) ii. Two similar works each costing not less than **Rs.96.00 Lakhs** (Rupees Ninety-Six lakhs only). (OR) iii. One similar work costing not less than **Rs.128.00 Lakhs** (Rupees One Hundred twenty-eight lakhs only) (AND) iv. One Completed similar work of costing not less than the amount equal to **Rs.64.00 Lakhs** (Rupees Sixty Four lakhs only) with any Central / State Government Organization/ Central Autonomous Body/ Central Public Sector undertaking/State public sector undertaking/City development authority/ Quasi Central/ State government organisation /Municipal corporation of city formed under any Act by Central/State government and published in central/state Gazette.	i) Certified copy of work orders, Schedule of quantities (BOQ) and Completion certificates issued by the authority concerned to establish work experience. ii. Completion certificates for works issued by Private parties shall be supported by TDS (Tax Deducted at Source) certificates. Note: The above data to be furnished as prescribed under **FORM - C**
	Note: i). Similar work shall mean works of **Supply, Installation, Testing & Commissioning of One Number of minimum 320KVA DG capacity or higher with associated Electrical works.** **Also, Tenderer shall have One over all work in Supply, Installation, Testing & commissioning of DG Synchronisation panel irrelevant of DG Capacity, for eligibility.**	

	ii). The value of executed works shall be brought to current costing level by enhancing the actual value of work at simple rate of 7% per annum, calculated from the date of completion to last date of submission of bids. iii). **Work executed as sub-contract or joint-venture will not be considered for eligibility/evaluation.**	
b.	Should have had average Annual Financial turnover not less than **Rs.80.00 Lakhs (Rupees Eighty Lakhs only)** in the last three years ending 31st March 2022.	Certified copy from Chartered Accountant for the Annual Financial turnover and balance sheet showing Profit & Loss as per the format under **FORM – A**.
c.	Should not have incurred any loss in more than two years during the last five years ending 31st March 2022.	
d	Should have a solvency of **Rs.64.00 Lakhs (Rupees Sixty-Four Lakhs only)**	A valid solvency certificate for this particular Tender to be submitted for the said value, issued by any scheduled bank as prescribed under **FORM – B** addressed to the **RAMAN RESEARCH INSTITUTE** in this Current Financial year 2022-2023.
f	**Electrical License** The Bidder shall possess valid Electrical Contractors License of appropriate class and category issued by Central or State Electricity Authority. (OR) **OEM/ OEA of DG Sets** If any of the OEM/ OEA of DG sets, who otherwise meet all the other eligibility criteria specified in the NIT but not having valid electrical license, intent to participate they should get the work executed through a standing tie-up with an established electrical Contractor with valid electrical license in appropriate class.	Certified copy of valid Electrical Contractor's License of the bidder. (OR) i) Copy of Valid OEM/OEA Certificate. ii) Copy of the License of Contractor who will be executing the work in the event of an order. iii) Proof of established tie-up
h	The bidding capacity of the Tenderer should be more than that of the estimated cost of the work put to Tender. The bidding capacity shall be worked out and declared by the	i. Statement showing the value of existing commitment and on-going works as well as the stipulated period of completion remaining for

	Tenderer and enclosed with the Tender (Technical Bid) based on the formula: **(AxNx2)-B** **N=01** Where, **A**- Maximum value of work executed in one year during last 5 years at current price level taking into account the work completed as well as work in progress. **B**- Value of existing commitments and ongoing work to be completed during the next 'X' years at current price level. **N**- Number of years prescribed for completion of the subject contract for which bids are invited. **It should be considered as ONE (01)**	each of the works listed to be furnished as per **FORM – D** ii. The value of executed works shall be brought to current costing level by enhancing the actual value of work at simple rate of 7% per annum, calculated from the date of completion to last date of submission of bids.

EVALUATION OF BIDS:

- A duly constituted Technical Evaluation Committee (TEC) will shortlist Tenderers based on the eligibility criteria of this Tender. The bids conforming to the eligibility criteria will be considered for further evaluation.
- The Technical Evaluation Committee (TEC) will technically qualify the bids based on detail scrutiny of all the documents furnished by the Tenderers complying the Technical Specifications and checklist criteria stipulated in the Tender Document. At this stage, the committee may inspect the selected works carried out by Tenderers.
- The Financial/price bid of only those Tenderers who have been qualified during the scrutiny and Technical Evaluation will be opened separately on a specified date in the presence of Tenderer or their authorised representatives (with due intimation to the qualified Tenderers) and further processed as per Tender procedure/stipulations.

OTHER TERMS AND CONDITIONS:

The Institute is eligible to issue Central Excise Duty Exemption Certificate or Customs Duty Concession Certificate. The Institute is not eligible to issue Central Goods and Service Tax Concession Certificate.

1. Bid documents may be obtained from the Estate office, RRI, Bengaluru on payment of **Rs.1180/- (Inclusive of GST)** in the form of DD drawn in favour of **Raman Research Institute, Bengaluru**. Those who download the Tender Document from Central

Public Procurement Portal (CPPP)/ RRI website, should submit a DD for **Rs.1180/- (Inclusive of GST)** towards the cost of bid document along with Technical Bid. Submission of DD for **Rs.1180/- (Inclusive of GST)** towards the cost of bid document is mandatory. The Bid submitted without the Tender Document fee will be rejected.

2. **Earnest Money Deposit (EMD)**
   a) Tenders should be accompanied with Earnest Money Deposit (EMD) for value of **Rs. 3,20,000.00** (**Rupees Three Lakhs Twenty Thousand only**) in the form of Deposit at Call receipt/ Term Deposit Receipt/ Demand Draft/ Bankers Cheque of any Scheduled Bank issued in favour of **"Raman Research Institute, Bengaluru"**. Earnest Money Deposit should be valid for 180 days from the due date of receipt of Tenders. In Case, EMD is furnished in the form of DD, the same will be encashed immediately on opening of Tenders (Technical Bid) and refund of EMD for unsuccessful Tenderers will be made through Cheque /Electronic mode within a month after the expiration of our bid validity period or any extension to it.
   b) The MSME Units/Enterprises claiming exemption of EMD should submit MSME UDYOG AADHAAR MEMORANDUM or registration certificate issued by District Industries Centre (DIC) / Khadi & Industries board (KVIB) / Coir board / National Small Industries Corporation (NSIC) / Directorate of Handicrafts and handlooms or any other body specified by Ministry of MSME. The memorandum / certificate submitted should be for the scheduled work and shall be valid as on due date /extended due date of the Tender. **However, MSME Unit/Enterprises must submit a duly signed Bid Security Declaration in lieu of EMD as per the format under Annexure – II**

Note: It will be applicable for only those bidders who shall produce their own goods or provide their own services and not applicable for trading purpose. No entrepreneur or memorandum of application form is acceptable.

3. The Tender should be divided into two parts.
   The Tender should be submitted as Technical Bid and Financial bid, in separate sealed envelopes and indicate their contents as:
   a) Sealed Cover 1: Technical Bid:
   Superscribed on the Envelope as *Name of the Work, NIT number and Technical Bid* and shall contain the following documents:
   Detailed literature including Data Sheets of quoted products supporting documents as per the Eligibility Criteria & Checklist and duly signed Tender Document except financial aspects of the Tender by the Authorised Signatory before submission of Bid along with DD towards Tender Document Fee of Rs.1180/- and EMD (In the prescribed format – as mentioned at Point -2 (a) and/or Copy of MSME certificate along with a duly signed Bid Security Declaration as per the format under **ANNEXURE – II**

   b) Sealed Cover 2: Financial bid
   Superscribed on the Envelope as *Name of the Work, NIT number and Financial bid* shall contain detailed financial outlay with List of deliverables / Bill of materials/ Bill of

Quantities and services, unit price of items as per the schedule of Quantity in the Tender Document.

c) Both the covers (a) & (b) mentioned above shall be put in another sealed cloth lined cover *super-scribing the name of work, NIT number and Name of Tenderer*. Tenders submitted in any other manner will be rejected.

4. The Tenders should be complete in all respects and the details specified in this request should be adhered to before submission. Otherwise, Tenders are liable to be rejected.
5. Tenders should be valid for **180 days** from the date of **opening of Technical Bid.** Bid submitted with a shorter validity period will be rejected.
6. Work Completion period should be **Five Months (5)** from the date of issue of Work order.
7. The Unit Price should be mentioned legibly and clearly. Taxes and other levies should be indicated separately.
8. The Institute will have the right to issue the addendum to Tender Documents to clarify, amend, modify, supplement or delete any of the conditions, clauses or items/specifications stated therein, each addendum so issued shall form part of original invitation to Tender and will be duly notified in the Institute's website
9. After awarding the work, the final work order quantity may vary than that mentioned in the Tender Document, depending on the site condition. Up to 25% deviation in quantity, the Tenderer has to execute the work as per the quoted rates in the Tender. If the deviation in quantity varies between 25% to 50%, then market rates with Contractor's profit & overhead charges of 15% will be considered.
10. The Institute reserves the right to postpone/extend the due date for submission/opening date of the Tender without assigning any reason.
11. The work should be completed within the stipulated time as per the work order. While the Institute reserves the right not to accept work in part or full, beyond this date, liquidated damages at 1% per every week of delay for incomplete works will be levied. Exceptions: Force Majeure.
12. Successful Installation, Testing and Commissioning (SITC) should be made at the site as per the Tender Document at RAMAN RESEARCH INSTITUTE, Sadashivnagar, Bengaluru – 560 080, at suppliers cost and risk.
13. Tenders will be **accepted up to 2.00 PM on 04.01.2023,** the deadline mentioned and Technical Bids will be **opened at 4.00 PM on 05.01.2023**. Those Tenderers and/or their Authorised Representatives desirous can be present at the time of Tender opening.
14. **Performance Guarantee:** Successful Tenderer has to provide 3% of performance security in the form of Bank Guarantee within 15 days after receiving of purchase/ work order. It should be valid through the period of completion of work, plus six months as claim period.
15. **Security Deposit:** Successful Tenderer must submit 3% PBG immediately as Security Deposit from the date of successful installation and commissioning, valid through the warranty period, plus six months as claim period.

16. **The opening of the Financial Bid depends on the unconditional clearance given by the Technical Evaluation Committee** after satisfying with the clarifications sought if any, and such Financial Bid/s will be opened on informing Tenderer/s in due course in their presence.
17. Any technical clarification required towards submission of offer may please be mailed to **estate@rri.res.in**
18. The acceptance or rejection of the bids should vest with RRI, Bengaluru, India. RRI also reserves the right to reject any or all Tenders in part or in full without assigning any reasons thereof.
19. Canvassing in connection with Tender will result in disqualification.
20. In the event, no rate has been quoted for any of the item or items, leaving space both in figure(s), word(s) and amount blank, it will be presumed that the Contractor has included the cost of this / these item(s) in other items and rate for such item(s) will be considered as zero and will be required to be executed accordingly.
21. Rates quoted by the Tenderer against each item should be mentioned in figures and words, which shall be accurately filled in so that there is no discrepancy in the rates written in figures and words. However, if any discrepancy is found, the rates which correspond with the amount worked out by the Tenderer shall be taken as final.
22. Even though the Tenderers meet the qualifying criteria, they are subject to be disqualified if they have made misleading or false representations in the forms, statements and attachments submitted in proof of the qualification requirements.
23. A self-declaration towards not having record of poor performance such as abandoning the works/ not properly completing the contract, inordinate delays in completion, litigation history, or financial failures etc., has to be provided.
24. The Tenderer along with his team, at the Tenderer's own cost, responsibility and risk is encouraged to visit and examine the Site of Works and its surroundings and obtain all information that may be necessary for preparing the Bid and entering into a contract. Nature of the site, means of access to the site and in general shall themselves obtain all the necessary information as to risks, contingencies and other circumstances which may influence or affect their Tender. The Tenderer shall be deemed to have full knowledge of the site whether he inspects or not and no extra charges consequent on any misunderstanding or otherwise shall be allowed. (Timings 2.00 pm to 5.00 pm – Monday to Friday) For any clarification, Tenderer may discuss with the Engineer-in-Charge.
25. The Unit rates and prices should be quoted by the Tenderer entirely in Indian Rupees only.
26. The offer price shall include Transportation, Insurance, Delivery, supply & Installation, Testing and Commissioning of the complete unit.
27. Any bids received by the Institute after the due Date & Time will be rejected.

28. **Payment terms** for the work is as follows:
    a. 60% on supply of DG Sets
    b. 30% on Successful Installation, Testing, Commissioning, and handing over the Entire project.
    c. 10% on Submission of PBG.
29. The Tenderer, on award of work is expected to enter into an agreement with the Institute on Rs. 100/- stamp paper as per **Annexure – VIII.**
30. The Tenderer has to comply with the labour laws while executing the work.
31. The Tenderer will be responsible for the safety and health of all the workers during the execution of work.
32. The Institute will have no liability to the Tenderer, if he/she incurs loss on account of stoppage of work or delay due to violation with respect to safety & quality procedure.
33. For specialised items, the work shall be carried out completely as per the manufacturer's specifications and recommendations/CPWD specifications/IS specifications, if the item specifications are incomplete.
34. The work to be carried out under the Contract shall, except as otherwise provided in these conditions, include all labour, materials, tools, plants, equipment and transport which may be required in preparation of and for the full and entire execution and completion of the works. The descriptions given in the Schedule of Quantities shall, unless otherwise stated, be held to include wastage on materials, carriage and cartage, carrying and return of empties, hoisting, setting, fitting and fixing in position and all other labours necessary in and for the full and entire execution and completion of the work as aforesaid in accordance with good practice and recognized principles.
35. All disputes, arbitration, if any are subject to jurisdiction of courts in Bengaluru only.
36. In addition to the above mentioned all terms & conditions the Tenderer shall execute the work as per the latest CPWD General Conditions of Contract (GCC).
37. **Preference to Make in India**

    This invitation is only for Class "1" and Class "2" Suppliers as prescribed in "Public Procurement (Preference to Make in India) order 2017 of GOI. Dept of DIPP" (OM No. P-4502/2/2017-PP(BE-II) dated 04th June, 2020. Necessary certification for local content must be submitted by the prospective Tenderers strictly as per Annexure – VII attached with the Tender Document.

    For indicating the price, the Tenderers may choose any/all of the following: The 'Class-I Local Supplier' / 'Class-II Local Supplier' at the time of Tender, bidding or solicitation shall be required to indicate percentage of local content and provide self-certification that the item offered meets the local content requirement for 'Class-I Local Supplier'/ 'Class-II Local Supplier' as the case may be.

PRIOR REGISTRATION AND/OR SCREENING OF TENDERERS:

As per O.M No. F.No.6/18/2019-PPD, dt.23/07/2020, the following condition to be fulfilled and the Tenderer to submit the following declaration on their Letter head.

I. Any Tenderer from a country which shares a land border with India will be eligible to bid in this Tender only if the Tenderer is registered with the Competent Authority. A proof of supporting document should accompany such claim.

II. **"Tenderer" (including the term 'Tenderer', 'consultant' or 'service provider' in certain contexts)** means any person or firm or company, including any member of a consortium or joint venture (that is an association of several persons, or firms or companies), every artificial juridical person not falling in any of the descriptions of Tenderers stated hereinbefore, including any agency branch or office controlled by such person, participating in a procurement process.

III "Tenderer from a country which shares a land border with India" for the purpose of this Order means: -

a. An entity incorporated, established or registered in such a country; or
b. A Subsidiary of an entity incorporated, established or registered in such a country; or
c. An entity substantially controlled through entities incorporated, established or registered in such a country; or
d. An entity whose beneficial owner is situated in such a country; or
e. An Indian (or other) agent of such an entity; or
f. A natural person who is a citizen of such a country; or
g. A consortium or joint venture where any member of the consortium or joint venture falls under any of the above.

Special Terms and conditions:

1. Site Engineer (Preferably Electrical Engineer) with experience in similar projects has to be deployed for this project and the details of the person has to be attached along with the Technical Bid.
2. The after-sales service has to be provided by the Contractor with support from the OEM. The support contact details and escalation matrix has to be provided.
3. In the case of Extra items (items that are completely new, and are in addition to the items contained in the contract), the Contractor may within 15 days of receipt of order or occurrence of the item(s), claim rate supported by proper analysis, for the work and the Engineer-in-charge shall within prescribed time limit of the receipt of the claims supported by analysis after giving consideration to the analysis of the rates submitted by the Contractor, determine the rates on the basis of market rates and the Contractor shall be paid in accordance with the rates so determined. All extra item/substitution item will be derived on the basis of condition of contract of CPWD.
4. Price escalation clause is not applicable.
5. **Safety codes and labour regulations**
   In respect of all labour employed directly or indirectly on the work for the performance of the Contractor's part of work, the Contractor at his own expense will arrange for the safety provisions as per the statutory provisions, B.I.S recommendations, factory act, workman's compensation act, CPWD code and instructions issued from time to time.
   The Contractor shall provide necessary barriers, warning signals and other safety measures while executing the work of DG Set installation, cables etc. or wherever necessary so as to avoid accident. He will also indemnify CPWD against claims for compensation arising out of negligence in this respect. Contractor shall be liable, in accordance with the Indian Law and Regulations for any accident occurring due to any cause. The Institute will not be responsible for any accident occurred or damage incurred or claims arising there from during the execution of work. The Contractor shall also provide all insurance including third party insurance as may be necessary to cover the risk. No extra payment would be made to the Contractor due to the above provisions thereof.
6. **Supply of Electricity: -** Electricity required for construction shall be arranged by the Contractor himself. Electricity if supplied to the Contractor by the Institute, will be metered and amount will be recovered in the Bills as per actual at rates fixed by the Institute. Supply of electricity from the Institute is not mandatory. Non-supply of electricity by the Institute cannot be held as reason for shortfall in progress.
7. **Machinery for Erection:**
   All tools and tackles required for unloading / handling of equipment's and materials at site, their assembly, erection, testing and commissioning shall be the responsibility of the Contractor.
8. **Care of the Campus & Building:**
   The Contractor shall ensure the work area of the campus is kept clean and the movements are controlled so as to avoid disturbance to working departments. The waste shall be handled in environmentally friendly way. Any damage to the existing service lines during execution of the work shall be got rectified by the Tenderer at his own cost & risk.

CHECKLIST

SELF ATTESTED COPY OF THE FOLLOWING DOCUMENTS SHALL BE SUBMITTED ALONG WITH TECHNICAL BID, FAILING WHICH THE TENDERS ARE LIABLE TO BE REJECTED

SL NO	CRITERIA / SPECIFICATION / CONDITION		YES / NO
1.	a) Earnest Money Deposit (EMD) for value of **Rs.3.20 Lakhs (Rupees Three lakhs Twenty Thousand only)** in the form of Deposit at Call receipt/ Term Deposit Receipt/ Demand Draft/ Bankers Cheque of any Scheduled Bank issued in favour of "Raman Research Institute, Bengaluru". b) Bid Security Declaration submitted on the letter head as per **ANNEXURE – II** for the EMD exempted bidders along with a Copy of Valid MSME Registration Certificate.		
2.	Enclosed Tender Document Fee of **Rs.1180/- (Inclusive of GST**) in the form of DD, drawn in favour of Raman Research Institute, Bengaluru		
3.	Certified copy of valid Electrical Contractor's License of the bidder **(OR)** i) Copy Valid OEM/OEA Certificate ii) Copy of the License of Contractor who will be executing the work in the event of an order iii) Proof of established tie-up		
4.	Tenderers should furnish Self Certified Copies of original documents defining the constitution or legal status, place of registration, and principal place of business, PAN/GST, EPF and ESI registration certificates.		
5.	The Tenderer must not be blacklisted by Central Government, State Government or any Organization in India. A certificate or undertaking to this effect must be submitted.		
6.	A self-declaration towards not having record of poor performance such as abandoning the works/ not properly completing the contract, inordinate delays in completion, litigation history, or financial failures etc., has to be provided – as per **ANNEXURE - III**		
7.	Self-certification that item offered meets the local content requirement for Class-I local supplier'/ 'Class-II local supplier' as the case may be. They shall also give details of the location(s) at which the local value addition is made. Self-attested copy of Annexure-VII about Make in India - as per **ANNEXURE - VI**		
8.	Tenders should be valid for **180** days from the opening of Bid.		
9.	Should have had average annual financial turnover not less than **Rs.75.00 Lakhs (Rupees Seventy-Five Lakhs only)** in the last three years ending 31st March 2022.	Certified copy from chartered Accountant for the Annual financial turnover and balance sheet showing Profit & Loss as per **FORM 'A'**	
	Should not have incurred any loss in		

	more than two years during the last five years ending 31st March 2022		
10.	Should have a solvency of **Rs.58.00 Lakhs (Rupees Fifty-Eight lakhs only)**	A valid solvency certificate for this particular Tender to be submitted for the said value, issued by any scheduled bank as per **FORM 'B'** addressing to **RAMAN RESEARCH INSTITUTE** in this current financial year 2022-2023.	
11.	Documentary proof for having executed the work of similar nature and comparable magnitude as per the list below		
	Should have satisfactorily completed the works as mentioned below during the last **Seven years** from the last date of submission of bids. i. Three similar works each costing not less than **Rs.58.00 Lakhs** (OR) ii. Two similar works each costing not less than Rs.**87.00 Lakhs** (OR) iii. One similar work costing not less than **Rs.116.00 Lakhs**. (AND) iv. One Completed similar work of costing not less than the amount equal to Rs.58.00 Lakhs with any Central/ State Government Organization/Central Autonomous Body/Central Public Sector undertaking/State public sector undertaking /City development authority /Quasi Central / state government organisation /Municipal corporation of city formed under any Act by Central/State government and published in central/State Gazette.	i) Certified copy of work orders, Schedule of quantities (BOQ) and completion certificates issued by the Authority concerned to establish work experience. ii. Completion certificates for works issued by Private parties shall be supported by TDS (Tax Deducted at Source) certificates.	
	Note: i). Similar work shall mean works of **Supply, Installation, Testing & Commissioning of One Number of minimum 320KVA DG capacity or higher with associated Electrical works.** **Also, Tenderer shall have One over all work in Supply, Installation, Testing & commissioning of DG Synchronisation panel irrelevant of DG Capacity, for eligibility.**		

	ii). The value of executed works shall be brought to current costing level by enhancing the actual value of work at simple rate of 7% per annum, calculated from the date of completion to last date of submission of bids. iii). Work executed as sub-contract or joint-venture will not be considered for eligibility/evaluation.	
12.	Details of similar works completed in the last seven years as per **FORM 'C'**	
13.	Details of on-going/awarded works as per **FORM 'D'**	
14.	Guaranteed Technical Particulars of 750KVA DG set and Synchronization panel as per the **Annexure IV.**	
15.	Project commitment letter submitted on the letter head as per the **Annexure VII** format.	
16.	The bidding capacity of the Tenderer should be more than that of the estimated cost of the work put to Tender. The bidding capacity worked out and declared (as per Point h of Eligibility Criteria) and enclosed with the Technical Bid	
17.	Additional Documents, if any.	

FORM 'A'

FINANCIAL INFORMATION

1. Financial Analysis – Details to be furnished duly supported by figures in balance Sheet/profit and loss account for the last five years duly certified by the Chartered Accountant, as submitted by the applicant to the Income Tax Department (copies to be enclosed)

Particular	Financial Year				
	2017-18	2018-19	2019-20	2020-21	2021-2022
(i) Gross Annual Turnover					
(ii) Profit / Loss (Standalone)					
(iii) Certified by					

2. Financial arrangements for carrying out the proposed work.

3. The following certificates are to be submitted:

   (a) Profit & loss account certified by CA & as submitted to Income Tax Department for the Financial Years as indicated above table.

Signature of Chartered Accountant with seal

FORM 'B'

DATE:

FORM OF BANKER'S CERTIFICATE FROM A SCHEDULED BANK

This is to certify that to the best of our knowledge and information that M/s._____(with address) a customer of our bank are/ is respectable and can be treated as good for any engagement up to a limit of

Rs._____(Rupees_____).

This certificate is issued without any guarantee or responsibility on the bank or any of the officers.

(Authorized Signature)

For the Bank

NOTE: Banker's certificate should be:

(1) On the letter head of the Bank.
(2) Addressed to Raman Research Institute & for this particular Tender

FORM 'C'

DETAILS OF ALL SIMILAR WORKS COMPLETED IN ALL RESPECT DURING THE LAST SEVEN YEARS ENDING PREVIOUS DAY OF LAST DATE OF SUBMISSION OF TENDERS (STARTING WITH LATEST WORK)

Sl No	Name of Work	Nature Of Work	Value of Work	Date of completion as per Work Order	Actual Date of Completion	Whether extension of time of contract was availed		Name of client and full address
						With levy Of Compensation	Without Levy of Compensation	

Notes:

i) The Tenderer may submit separate form for giving details of work (completed) for each year to fill up the details as above. Separate sheets if any shall be numbered in sequence.

ii) The copies of the work orders for each work should be enclosed.

iii) Certified that the above list of works is complete and no work has been left-out and the information given is correct to my knowledge and belief.

iv) The hard copy of all similar works completed during the last seven years ending previous day of last date of submission of Tenders (starting with latest work) shall also be submitted along with the Technical Bid.

v) Completion certificates for works issued by Private parties shall be supported by TDS (Tax Deducted at Source) certificates

FORM 'D'

DETAILS OF ALL WORKS OF ANY NATURE UNDER EXECUTION OR AWARDED
(No works shall be left out)

Sl No	Name of the Work	Nature of Work	Value of the Work	Date of completion As per Work Order	Present Status	Expected date Of Completion	Expected commitment During…	Name of the client and full address

Notes:

(i) The copies of the work orders for each work be enclosed.

(ii) Certified that the above list of works is complete and no work has been left-out and the information given is correct to my knowledge and belief.

I. Technical Specifications

Scope of Work:

Scope of work covers Supply, Installation, Testing and Commissioning of Silent Type, LT Diesel Generating (DG) Set along with DG control panel/AMF-cum-synchronizing panel, loading and unloading of DG set at site with associated switchgears, Earthing, Fuel and all items, auxiliaries and exhaust piping as per the latest CPCB norms with all allied civil works.

1.0 Diesel Generator Set Specification:

Duty	: Prime
Power Rating KVA / KW	: 750/600
No. of Phases	: 3 Phase, 4 wire
Output Voltage and Frequency	: 415 V, 50 Hz
Power Factor	: 0.8 (lagging)
Speed	: 1500 rpm

2.0 Prime Mover/Diesel Engine conforming to ISO 8528 specifications:

2.1. Diesel engine, 4 stroke, water cooled, electric start, of suitable BHP at 1500 RPM suitable for above output of alternator at 40 Degree C, 50% RH & at 1000 Meter MSL and conforming to BS 5514, BS 649, IS 10000, capable of taking 10% over-loading for one hour in every 12 hours of continuous operation. The engine will be fitted complete with all the required accessories.

The engine shall be capable for delivering specified Prime Power rating at variable loads for PF of 0.8 lag. The average load factor of the engine over period of 24 hours shall be 0.85 (85%) for prime power output

The engine shall conform to IS: 10000/ ISO 3046/ BS: 649/ BS 5514 amended up to date.

2.2. Necessary certificate indicating the compliance of the above capacity requirement for the engine model so selected along with compliance of Noise and Emission norms as per latest CPCB guidelines for DG set, shall be furnished from the manufacturers along with the Technical Bid. However, manufacturers shall furnish certificate that the Engine for the DG set complies with the Latest CPCB Emission norms.

2.3. The engine shall be fitted with following accessories subject to the design of the manufacturer:

(a) Dynamically balanced Fly wheel
(b) Necessary flexible coupling and guard for alternator and engine.
(c) Dry type air filter with clogged condition indicator.
(d) Cooling Radiator.
(e) An Electronic governor to maintain engine speed at all conditions of load.
(f) Daily fuel service tank of minimum capacity of 990ltrs, fabricated from M.S.

sheet with inlet, outlet connections air vent tap, drain plug and level indicator (gauge) M.S. fuel piping from tank to engine with valves, unions, reducers, flexible hose connection and floor mounting pedestals, twin fuel filters and fuel injectors. The location of the tank shall depend on standard manufacturers design & site condition.

(g) Dry exhaust manifold with suitable exhaust residential grade silencer to reduce the noise level.
(h) Suitable self-starter for 12 V/ 24 V DC and battery charging alternator.
(i) Battery charging alternator unit and voltage regulator, suitable for starting batteries, battery racks with interconnecting leads and terminals.
(j) Naturally aspirated/ turbo charger (as per manufacturer standard)
(k) Lube oil pump, oil cooler and Lube oil filter.
(l) Crank case heater as per manufacturer recommendations.
(m) Fuel injection: Engine should have suitable fuel injection system in order to achieve low fuel consumption.
(n) Fuel control solenoid.
(o) Fuel pump with engine speed adjustment.
(p) Dual Fuel filters with replacement elements.
(q) Engine control panel should be fitted with following accessories/indicators and should have display: -
    i. Start/stop key switch (Either Key / Push Button)
    ii. Lube oil pressure indicator.
    iii. Water temperature indication.
    iv. Tachometer for speed indication with WH meter.
    v. Engine Hours indications
    vi. Battery charging indicator.
    vii. High water temperature indication
    viii. Over speed indication
    ix. Low lube oil trip indication
    x. The unit shall be communication capable for its integration with BMS.
(r) All moving parts of the engine shall be mechanically guarded in such a manner that a human finger cannot touch any moving parts.

2.4. Governor:

The engine shall be having electronic governor as per ISO 3046/BS 5514 and suitable for AMF operating with Auto synchronizing, load sharing, load bearing, load dependent starting etc. using with digital controllers, relays & control modules.

2.5. Frequency Variation:

The engine speed shall be so maintained that frequency variation at constant load including no load shall remain within a band of 1% of rated frequency. i.e., from no load to full load is 1%.

2.6. Fuel System:

It shall be fed through engine driven fuel pump. A replaceable element of fuel filter shall be suitably located to permit easy servicing. The daily service tank shall be complete with necessary supports, gauges, connecting pipe work etc. In case of Top Mounted tanks, non-return valves are must in fuel supply and return line of specified value. Pipe sealant should be used for sealing for all connections. No Teflon tape to be used. If piping length is more than 10 meters, detail engineering is required in consultation with OEM/ Manufacturers.

2.7. Lubricating Oil System:

It shall be so designed that when the engine starts after a long shut down lubrication failure does not occur. Necessary priming pump for the lub. oil circuit as per recommendation of manufacturer shall be installed, to keep bearings primed. This pump shall be normally automatically operative on AC/ DC supply available with the set.

2.8. Accessories:

The following accessories shall be supplied with the DG set.

a) Common base frame for engine and alternator
b) Anti-vibration mounts of requisite capacity
c) Residential silencer.
d) Protective guards for all rotating parts
e) Galvanized sheet trays beneath the engine and day tank to collect the leakage of oil.

2.9. Starting System:

This shall comprise of necessary set of heavy-duty batteries 12V/ 24V DC (as per manufacturer standard), and suitable starter motors, axial type gear to match with the toothed ring on the Fly wheel. A timer in the control panel to protect the starter motor from excessively long cranking runs shall be suitably integrated with the engine protection system and shall be included within the scope of the work. Battery capacity shall be suitable for meeting the needs of starting system (as three attempts starting), as well as the requirements of control panel, indications and auxiliaries such as priming pump as applicable etc. The system shall be capable of starting the DG set within 20-30 sec., even in winter condition with an ambient temperature down to 0°C.

The battery shall be supplied complete with electrolyte and accessories like battery stand, battery leads with terminal ends acrylic top cover and inter battery connectors. Each battery shall be provided with static battery charger for charging the batteries when DG set is not running. The charger shall get disconnected while the DG set is running.

2.10. Battery Charger:

The 24V DC, 3-phase Battery charger shall be provided at LT panel room. It is SMPS based suitable of Trickle & Boost type, and suitable to charge required numbers of batteries at 24V complete with, transformer, rectifier, charge rate selector switch, indicating ammeter, voltmeter, and battery over charging protection with audible alarm. Connections between the battery charger & batteries should be provided with suitable copper leads with lugs.

2.11. Common Base Plate:

Engine and alternator shall be coupled by means of flex plate/flexible coupling as per manufacturer standard design and both units shall be mounted on a common base plate together with all auxiliaries to ensure perfect alignment of engine and alternator with minimum vibrations. The base plate should be suitable for installation on suitable anti-vibration mounting system comprising of 6/8 anti-vibration pads duly provided as per the manufacturers standard.

2.12. Exhaust System:

2.12.1 Exhaust Piping:

All M.S. Pipes for exhaust lines shall be conforming to relevant IS. The runs forming part of factory assembly on the engine flexible connections up to exhaust silencer shall be exclusive of exhaust piping item. The work includes necessary cladding of exhaust pipe work using 50 mm thick/ mineral wool/ Rockwool, density not less than 120 kg/m3 and aluminium cladding (0.6 mm thick) for the complete portion. The exhaust pipe work includes necessary supports, foundation etc. to avoid any load & stress on turbo charger / exhaust piping. The exhaust pipe shall be run on freely supported frame work duly clamped/supported on independent structure for which, the design and Drawing for such structure shall be got approved from the Technical Evaluation committee.

a) Exhaust system shall create minimum back pressure.
b) Number of bends shall be kept minimum and smooth bends should be used to minimize back pressure.
c) Pipe sleeve of larger dia. should be used while passing the pipe through concrete wall & gap should be filled with felt lining.
d) Exhaust piping inside the Acoustic Enclosure/ Genset room should be lagged with asbestos rope along with aluminum sheet cladding / insulated to avoid heat input to the room.
e) Exhaust flexible shall have its free length when it is installed.
f) The exhaust outlet should be in the direction of prevailing winds and should not allow exhaust gases to enter air inlet/ windows etc.
g) When tail end is horizontal, 45 Degree downward cut should be given at the end of the pipe to avoid rain water entry into exhaust piping.
h) When tail end is vertical, there should be rain trap to avoid rain water entry. If rain cap is used, the distance between exhaust pipe and rain cap should be higher than diameter of pipe. Horizontal run of exhaust piping should slope downwards away from engine to the condensate trap. Silencer should be installed with drain plug at bottom.
i) Care should be taken to ensure that no carbon particles emitted due to exhaust leakage enters and deposits on alternator windings and on open connections.
j) Lightning arrester shall be fixed above the exhaust top and it shall be connected to earth pit.
k) Aviation lamp should be installed at above the exhaust top with view of 360 degree and control shall be provided in the plant room as required by Technical Evaluation Committee.
l) **The Tenderer needs to confirm with compliance from state/central Pollution Control Board for Stake exhaust height during execution stage of work.**
m) **The metallic structure along with civil foundation for the exhaust stake height of new one no. of 750kVA DG set shall be designed to accommodate two more exhaust pipes for future DG sets. However, the Tenderer needs to quote the rates for the stack as per the BOQ. The actual quantity may vary depends upon the actual executed of the Piping works/Exhaust stack work.**

2.12.2 Support to Exhaust Piping:

Exhaust piping should be supported in such manner that load of exhaust piping is not exerted to turbocharger.

3.0. Alternator Specification

3.1. Synchronous Alternator:

Continuous rating, Self-excited, screen protected, self-regulated, brush less alternator, Horizontal foot mounted in Single/Double bearing construction (specify one only) suitable for the following:

Rated power factor	: 0.8 Lagging
Rated voltage	: 415 volts
Rated frequency	: 50 Hz
No. of Phases	: 3 Phase, 4 wire
Enclosure	: SPDP
Degree of protection	: IP-23
Ventilation	: Self ventilated air cooled
Ambient Temperature	: 40° C Maximum
Insulation Class	: H
Temperature Rise	: Within class H limits at rated load
Voltage Regulation	: +/1%
Voltage variation	: +/- 5%
Overload duration/capacity	: 10% for one hour in every 12 hours of Continuous use
Frequency variation	: As defined by the Engine Governor (+/- 1%)
Excitation	: Self excitation
Type of AVR	: Electronic
Type of Bearing and Lubrication arrangement	: Self Greased, Anti-friction bearings
Standard	: IS 4722 & IEC: 34 as amended up to date.

3.2 Alternator should be able to deliver output rating at actual site conditions.

3.3 The alternator shall be fitted with suitable nos. Resistance Temperature Device (RTD) & Bearing Temperature Device (BTD) along with space heaters. The terminal of space heaters will be wired to terminal box and the temperature scanner shall be provided in control panel for scanning the winding and bearing temperature.

3.4 Excitation:

The alternator shall be brushless type and shall be self-excited, self-regulated having static excitation facility. The exciter unit be mounted on the control panel or on the alternator assembly. The rectifier shall be suitable for operation at high ambient temperature at site.

3.5. Automatic Voltage Regulators (AVR)

In order to maintain output terminal voltage constant within the regulation limits i.e., +/- 0.5%, Automatic voltage Regulator (AVR) unit shall be provided as per standard practice of manufacturer. Also, it shall be compatible for auto synchronization.

3.6. Fault tripping

In the event of any fault e.g., over voltage/ high bearing temperature/ high winding temperature or an external fault, the AVR shall remove the excitation voltage to the alternator. An emergency trip shall also be provided.

3.7. Standards

The alternator shall be in accordance with the following standards as are applicable.

i) IS 4722/BS 2613: 1970- Performance of rotating electrical machine.
ii) IS 4889/ BS 269 rules for method of declaring efficiency of electrical machine.

3.8. Performance:

Voltage dip shall not exceed 20% of the rated voltage for any step load or transient load as per ISO 8528 (Part-1). The winding shall not develop hot spots exceeding safe limits due to imbalance of 20% between any two phases from no load to full load.

The generator shall preferably be capable of withstanding a current equal to 1.5 times the rated current for a period of not more than 15 seconds as required vide clause 14.1.1 of IS 4722:1992

The performance characteristics of the alternator shall be as below:

(a) Efficiency at full load 0.8 P. F : not less than 93.5%
(b) Total distortion factor (%THD) : Less than 3 %
(c) 10% overload : One hour in every 12 hrs. of continuous use
50% overload : 15 seconds

3.9. Terminal Boxes:

Terminal boxes shall be suitable for U.G. cables/ Bus Trunking. The terminal box shall be suitable to withstand the mechanical and thermal stresses developed due to any short circuit at the terminals.

3.10. Earthing Terminals:

Two Nos. of earth terminals on opposite side with vibration proof connections, nonferrous hardware etc. with galvanized plate and passivated washer of minimum size 12 mm dia. hole shall be provided.

3.11. Space Heaters:

Alternator shall be provided with suitable space heaters with thermostats to maintain the winding temperature automatically such that it does not absorb moisture during long idle periods. The heater terminals shall be brought to a separate terminal box suitable for 230 V AC supply and a permanent caution notice shall be displayed.

4. DG Control Panel:

Control panel shall be front-operated cubicle type, free standing, floor mounted panel shall comply with **IS/IEC 61439 Part 1:2011**, controlled by suitable rated,

microprocessor based **1250A, 3/4pole, ACB EDO** type suitable for operation on 415V, 3-phase, 4-wire, 50Hz AC supply system, and to withstand a short circuit level of 50kA RMS symmetrical. The panel shall be fabricated out of 14SWG CRCA sheet steel with necessary anti-corrosive treatment and shall be dust and vermin proof construction suitable for installation on pedestal with following facilities: -

a) Fire and corrosion resistant coating applied in two coats with necessary primer.
b) Fire retardant DMC/SMC fillings for opening around bus bar near the sectional barriers
c) Facilities in the terminals to have direct termination with aluminum cables
d) Shall have high mechanical strength.
e) Door interlocking facility
f) Shall have fiber barriers
g) Switch body shall be made of fire-retardant materials
h) Shall be mountable in any position in vertical plane for operation and suitable for horizontal expansion in the future
i) Surface treatment to panel, frame and all steel parts shall be carried out through seven tank processes.
j) After surface treatment, panel shall be painted through powder coating process with two coats zinc chromate primer and two coats of powder painting.

4.1.1Metering

Multi-function meter shall be of digital type and possess the following features: -

a) Shall be of size 96 x 96mm
b) Display shall be LED/LCD.
c) Record and read Voltage (V), Current (I), Frequency(f), Power factor(Φ), Active power (P), Reactive power (Q), Apparent power (S), Energy (kWh), kVAh, kVARh & THD etc.
d) AC/DC auxiliary supply
e) Real-time clock (RTC)
f) Facility to read individual harmonic up to 21st order.
g) Shall have four outputs/ports: RS 485, analog, digital and pulse.
h) Shall be with RS 485 based Serial Communication with MODBUS RTU protocol
i) Meters shall have type tested certified by NABL accredited lab.

4.1.2 Protections

a) 1 no. Combined three-element overcurrent and earth-fault relay IDMT characteristics.
b) 1 no. under Voltage relay.
c) 1 no. over voltage relay.
d) 1 no. emergency STOP push button outside the enclosure.

4.1.3. Annunciations /Alarm:

The annunciation panel shall be integral to DG panel and shall have trip /alarm and visual indication features in the event of the following:

a) Low lube oil pressure
b) High water temperature
c) Engine over speed

d) Earth fault
e) Over current
f) Under voltage
g) Over voltage
h) Winding temperature high
i) Bearing temperature high
j) Low fuel level
k) Earth fault on alternator
l) Fail to start
m) Battery charger fault

Under the above conditions, the breaker of alternator shall trip, on engine over speed, low lube oil pressure, high water temperature, prime mover also shall trip.

5. Acoustic Enclosure:

The acoustic enclosure shall be designed and manufactured confirming to relevant standards suitable for outdoor installation exposed to weather conditions, and to limit overall noise level to 75 dB (A) at a distance of 1 mtr. from the enclosure as per Latest CPCB norms under free field conditions.

The construction shall be such that it prevents entry of rain water splashing into the enclosure and allows free & quick flow of rain water to the ground in the event of heavy rain. The detailed construction shall conform to the details as under:

a) The enclosure shall be fabricated out the CRCA sheet of thickness not less than 1.6 mm on the outside cover with inside cover having not less than 0.6 mm thick perforated powder coated CRCA sheet.
b) The hinged doors shall be made from not less than 16 SWG (1.6 mm) thick CRCA sheet and will be made air tight with neoprene rubber gasket and heavy-duty locks.
c) All sheet metal parts should be processed through 7-tank process.
d) The enclosure shall be powder coated.
e) The enclosure shall accommodate the daily service fuel tank of the D.G. Set to make the system compact. There should be provision of fuel gauge, which should show the level of the fuel even when the DG Set is not running. The gauge should be calibrated. The fuel tank should be filled from the outside as in automobiles and should be with a lockable cap.
f) The batteries shall be accommodated in the enclosure in battery rack.
g) The canopy shall be provided with high enclosure temperature safety device.
h) The acoustic lining should be made up of high-quality insulation material i.e., rockwool/ glass/ mineral wool/ PU foam of appropriate thickness & density for sound absorption as per standard design of manufacturers to reduce the sound level as per CPCB norms. The insulation material shall be covered with fine glass fiber cloth and would be supported by perforated M. S. Sheet duly powder coated / GI sheet/aluminum sheet.
i) The enclosure shall be provided with suitable size & No. of hinged type doors along the length of the enclosure on each side for easy access inside the acoustic enclosure for inspection, operation and maintenance purpose. Sufficient space will be provided inside the enclosure on all sides of the D.G. set for inspection, easy maintenance & repairs.
j) The canopy should be as compact as possible with good aesthetic look.
k) The complete enclosure shall be of modular construction.

l) The forced ventilation shall be as per manufacturer design using either engine radiator fan or additional blower fan(s). If the acoustic enclosure is to be provided with forced ventilation, then suitable size of axial flow fan (with motor and auto-start arrangement) and suitable size axial flow exhaust fan to take the hot air from the enclosure complete with necessary motors and auto start arrangement should be provided. The forced ventilation arrangement should be provided with auto stop arrangement to stop after 5 minutes of the stopping of D.G sets.

m) The acoustic enclosure shall be suitable for cable connection through UG cable. Such arrangements on acoustic enclosure should be water proof & dust-proof conforming to IP-65 protection.

n) The inside of enclosure shall be provided with at least two nos. Suitable LED light luminaire controlled by a 5A switch for adequate lighting during servicing etc. of the DG Set. The power supply to this luminaire should be from the load side of the AMF Panel so that it can remain energized under all conditions.

o) The acoustic enclosure shall be designed to meet the total air requirement for the D.G. Set at full load at site conditions as recommended by the engine manufacturer

p) To avoid re-circulation of hot air, durable sealing between radiator and canopy is must.

5.1. Installation:

a) Acoustic enclosures are supplied with built in Anti Vibration Mountings (AVMs) as Such Gen-set can be installed directly on the leveled surface.

b) Exhaust piping outlet should not be turned towards window / ventilator of home or occupied building. Provision of rain cap should be ensured.

c) The acoustic enclosure placement should be such that there is no restriction in front of air inlet and outlet from canopy.

5.2. Service Accessibility:

a) Genet / Engine control panel should be visible from outside the enclosure.

b) Routine / periodical check on engine / alternator (filter replacement and tappet setting etc.) should be possible without dismantling acoustic enclosure.

c) For major repairs / overhaul, it may be required to dismantle the acoustic enclosure.

d) Sufficient space should be available around the Genset for inspection and service as per standard.

6.0. Earthing:

This section covers the earthing requirement of DG Set installations. Copper plate earthing as per standard dimension shall be provided for Neutral Grounding, The GI strip earthing shall provide for body earthing.

The generating set and all associated equipments control and switch gear and switch gear panels must be earthed before the set is put into operation.

a) Copper Plate Earthing (for Neutral Earthing)

Providing standard plate earth for earth station with 600x600x3.15mm electrolytic tinned copper plate at 3.0 Meter depth, conforming to IS:3043 & NBC-2016 with latest amendments including excavation and refilling of earth and supply of all materials and providing chamber with necessary civil works using good quality bricks, sand etc. with a cover plate made of GI for the chamber with all necessary materials complete as required.

b) Body Earthing

Providing Maintenance Free Earth (MFE) Station with solid earth electrode comprising of 1 nos. of 20.0 mm dia., 3.0 Mtrs. long copper bonded stainless / nickel steel alloy rod, molecularly bonded copper of 99.9% purity with minimum copper coating thickness of 250 microns including supply of copper coated steel rod. Supply of suitable high grade copper alloy Rod to tape Clamp - Type "A" with extra grip / U-bolt Rod Clamps - Type 'E' with Double Plate for connecting earthing strip to earth electrode. The rod has been tested for Dimension, Marking, Tensile Strength, Salt mist, coating thickness, Electrical resistivity test before and after corrosion test as per IEC 62561-2 & UL 467 meets the requirements of IS:3043 and IEC 60364-5-54, tested for short circuit current withstanding capacity. The other materials and tools required for excavation of earth hard/ soft soil and driving rod in earth with augured hole dia. of 75-100mm in ground including civil works like excavation & refilling of earth, also including supply and filling conductivity / earth enhancement compound (confirming to IEC:62651-7 with latest amendments) filled around the copper bonded steel rod to a minimum depth of 3.0 Mtrs. from ground level including civil works like excavation & refilling of earth & also providing precast RCC inspection chamber- with RCC cover slab for each electrode complete with all interconnections as required.

7. AMF-cum-Synchronizing Panel

Scope:

Design, Fabrication, Supply, Transportation, Testing & successful Commissioning of LT, 415V, DG synchronizing panel for a newly proposed one no. 750KVA DG Set and existing 1 no. 320KVA & 1 no. 500KVA DG Sets in following operating mode (necessary fabrication works with civil works for foundation, trenches etc., included in the scope of work)

Supply, Installing, Testing and Commissioning of Synchronizing panel, indoor type as per **SLD** (mentioned as DG Vendor scope) suitable for the following as per the IS/IEC 61439-1: 2011 standard with the following Major Components like power switchgears (ACB) & PLC details:

1. Incomer: 1250A, 3P ACB – 3 Nos., EDO type (50 KA)

2. Outgoing-2500A, 4P ACB – 2 Nos., EDO type (50 KA)

3. Bus Coupler-2500A, 4P ACB – 2 Nos., EDO Type (50KA)

4. 800A Neutral Contactor – 4 Nos.

5. PLC Panel & HDMI and DG Synchronous controller and relays etc. as per the SLD

Operation:

1. Utility fails, DG ON automatically.
2. Synchronize the DG Sets
3. Optimize the DG set operations for conserving the fuel as per the load conditions.
4. Manual and Auto Synchronizing of the DG sets shall be provided.
5. DGs shall be operated individually in case, either of the respective TC fails, this shall be provided in Manual and Auto Mode.

In this case as well, all the interlocks should hold good to avoid back feeding.

7.1. Operating Modes Detailed:

Augmentation of the DG capacity to the existing 320KVA and 500KVA through the addition of new one no. 750KVA DG set is proposed for the reliable power supply to the campus in event of utility failure. RRI through various departments is into extensive research and hence, power reliability plays an important part while conducting various experiments.

Power reliability is addressed through two modes that are as follows –

a) Synchronization Mode
b) Stand-alone-Auto Mode
c) Stand-alone Manual Mode

Both the modes should operate in Auto and Manual modes. Provision of Test mode is needed so as to operate the DG sets during maintenance. In all the modes it has to be ensured there is no back feeding of the power either to utility.

a) **Synchronizing – Auto mode:** The panel shall be monitoring the health of the incoming power supply and in event of any alarm like – phase failure, phase reversal (after the power is restored), over or under voltage, the 750KVA DG set shall kick into operations and the power shall be immediately restored. The load shall be monitored and based on the loading of the DG set, the second and third shall be operated to avoid overloading of the single or set of DG that are in sync and supply the power. As mentioned in the specifications of the DG sets, the operations shall execute. In this mode, all the protections like over load, short circuit, reverse power, etc. all complete will be present the details are mentioned in the DG specifications. Care has to be addressed to avoid circulating currents in the DG sets.
b) **Stand-alone-Auto Mode**: The selected DG set (One of the DG-1,2 & 3) shall kick into running operation as soon as failure of the Utility that shall be sensed through a centrally installed VMD – (over-voltage, Single Phasing, Phase reversal – Unhealthy condition).
c) **Stand-alone-Manual Mode**: The selected DG set (One of the DG-1, 2 & 3) shall be manually switched ON from the Synchronizing Panel. Option to start the DG set from the local DG panel.
d) In Stand-alone auto/manual modes of operations, it shall be ensured that only the ACB of selected DG is switched ON and other two ACBs are in OFF conditions. (Eg.750KVA is switched ON, if and only if the 320KVA and 500KVA ACBs are in OFF condition). However, the other two DGs may run dry in case needed for trial purpose, however the ACBs won't switch ON as the DG-750KVA is selected through **HMI (Human Machine Interface).**

The stand-alone and Synchro. modes of operations are depicted in the SLD through the power flow diagrams for additional reference to the positions of the ACBs.

The operations of the DG sets should be as mentioned in the Operating Modes in forgoing pages and the table to be referred indicated in the attached **SLD** and on the last page.

7.2. Material:

The Panel shall consist of the following:

a) Control and Metering module: Line voltage monitor. Generator voltage monitor, Ammeter, 3 times attempt to start facility.
b) ACBs as per the SLDs attached and marked DG set vendor scope of for auto/manual operation.
c) Auto/manual switch for AMF and Synchronization. The sequence is explained in the operations of the DG in auto and manual modes.
d) Emergency stop push buttons.
e) Manual start push button
f) Frequency meter.
g) Engine hour and RPM meter. (Taco meter)
h) Two earthing studs.
i) Protection module: The engine shutdown in the unlikely event of low lube oil pressure, high water temperature (For liquid cooled engine)
j) Indicators with alarm for Full/ Maximum Load on generator.
k) Indicators for Load on mains, Load on D.G. set, Engine fails to start, Emergency stop.
l) Battery charger complete with transformer/ rectifier, D.C Voltmeter and Ammeter, selector
m) Switch for trickle, off, and boost charging and current adjustment, Main supply failure monitor.
n) Timers.
o) Fault reset push button with 8 window Annunciator for each DG set.

All the operations of the DG sets – new – 750KVA & existing – 320KVA and 500KVA. should be monitored and controlled using PLC interfaced to the Synchronization controller.

8. PLC Panel

Operation of DG sets shall be monitored, supervised and controlled by PLC panel i.e. programmable logic controller-based logic panel. In case of mains failure, this logic panel shall control auto changeover from mains to DG Sets supply and interlocking of ACBs, auto synchronizing and auto load management functions along with annunciation for alternator control and protection.

The logic panel shall be provided with a total manual over ride facility. There shall be Smooth transfer of DG set operation from PLC to manual system & vice versa without any interruption/tripping. The logic panel shall be complete with all Auxiliary Relays, Timers, Contactors, Programmable logic controller, control wiring, interconnections etc. with 2.5 sq.mm FRLS. PVC insulated, 1.1 KV grade FRLS copper conductor wires.

Control Philosophy

8.1. Automatic Start & Stop of Engine

The system should come in operation after sensing of grid failure and automatically control the start & stop of engines, depending on the predefined load setting in the PLC. In case engine does not start in the first cranking, two more auto commands should be given with proper intervals. Even then if engine fails to start, indication must appear on MMI (Man Machine interface). In the event the engines are under loaded i.e. load sensed is capable

of being catered by less than the capacity of running DG sets then command must be given to stop required number of excess DG sets after running idle for short duration. Provision to select no. of DG sets to be started and synchronized at no load to cope up with sudden load without tripping the DG's should also be inbuilt into the system.

8.2. Automatic Synchronization

The facility of synchronization will be available in both Auto & Manual mode. In normal circumstances the auto synchronization will work, however if due to any reason auto synchronization fails repeatedly the facility for closure of ACB must be available automatically. In manual mode ACB will be closed by panel push button.

8.3. Automatic Load Sharing

The load sharing will also be automatic, by sensing both active & reactive power.

8.4. Back up Protection

The system should also have followed inbuilt protection other than external relays in synchronization panel:

Reverse power, Reverse KVAR, Over Current, Under voltage, Over voltage, Under frequency, Over frequency, synchro-check & earth fault relay except differential relay. Due to any electrical fault PLC shall trigger the master trip relay.

These PLCs will be state of the art equipment using latest technology and of most rugged and reliable design. Since they shall be operating in the harsh & unfriendly environment of DG room, they will be suitable to operate trouble free in those conditions. The chosen equipment should be able to withstand high temperature, humidity & voltage fluctuations, thus making it suitable for the operating conditions described above.

8.5. SEQUENCE OF OPERATION

The following sequence of operation shall be achieved through PLC based logic panel in addition to hardware interlocks as well as software interlocks:

(i) Selection of any generator as a lead generator to achieve the uniform running hours of all generators.

(ii) Three attempts to start the engine of lead generator. In case the engine fails to start or does not achieve the requisite speed within the predetermined time, PLC system declares engine of generator faulty. In this event PLC automatically selects next generator as the lead generator.

(iii) The PLC system automatically selects starting sequence of other generators on the basis of the lead generator being selected by the operator.

(iv) Before issuing close command to lead generator air circuit breaker, PLC checks that ACB of any other generator is not in close position. Then PLC system gives close command to lead generator ACB. The PLC system tries two times with interval of 5 secs. To close the ACB. Simultaneously, it also gives starting command to next generator engine in queue depending upon load.

(v) The speed, excitation, frequency and voltage of incoming generator is controlled identically as per the lead generator starting sequence described above, except closing of ACB.

(vi) When the lead generator KW crosses more than the 85% of rated capacity of

DG set, the PLC system performs synchronization sequence for paralleling of generator prior to switching on of the ACB of 2nd generator. When the KW of 2nd generator crosses 80% of rated capacity of DG set then the PLC system performs synchronization sequence for paralleling of next generator prior to switching on the ACB of 3rd generator and similar sequence to be followed for other DG sets.

(vii) The last incoming generator ACB is tripped when PLC system senses that the total load on the system is less than the specified load and stops the engine after 5 minutes of idle running.

(viii) DG sets will start and stop automatically depending on the pre-defined load setting in the PLC & also all DG sets will operate in load sharing mode.

Apart from this operation modes the PLC shall be able to run the synchronizing system in smooth manner.

9. Specification of Sandwich Busduct system

9.1. Scope:

Design, Transportation, Supply, Installation, testing and commissioning of the Sandwiched type compact bus duct as per the approved make, extending the DG emergency supply from DG Synchronizing Panel to Main LT Power Control Centre (PCC) Panel as per the SLD.

9.2. Material:

A pre-fabricated trunk consisting of Aluminium (AL.) bus bar rated at 2500A, 3-Phase, 3L+N (100%) + PE (integral earth) and Sandwich type insulated Trunking system and conforming to IS/IEC 61439-6:2011, reference temperature is 40 degree centigrade and IP55. The busbar trunking shall be designed and constructed suitable for operational Voltage of 415V/690V/1000V with supply frequency of 50Hz system. The minimum rated insulation voltage shall be 1.1KV and Impulse withstand voltage of 8KV or higher.

Each rating of busbar trunking shall be ASTA type tested and certified or obtained complete type report from approved CPRI/NABL lab as per the IS/IEC 61439-6:2011 for short circuit ratings for one second covering phase, neutral, earth conductor and the housing as an additional protective conductor.

9.3 Standards:

The Busbar Trunking System shall be designed to comply in accordance with the following international standards:

IEC 61439-Part 1	: Low voltage switchgear & control gear assembly-General Rules
IEC 61439-Part6	: Busbar Trunking Systems (busways)
IEC 60529	: Degree of protection
IS 1893-Part 1	: Criteria for Earthquake Resistant Design of Structures.
IEEE 693:2005	: High Seismic Qualification Level

Wherever required and specified, the Busbar Trunking System shall conform to Fire Rating of 600 deg C for 2 Hours.

Busbar Trunking System should also have Seismic Zone-5, Flame Propagation and Fire Resistance certification.

9.4 Design & Construction requirements:

9.4.1. General:

The Busbar Trunking System shall be of sandwich construction, non-ventilated and natural cooled design. It shall be possible to mount the Busbar Trunking System in any orientation without affecting the current rating.

9.4.2. Busbars:

a. The busbars should be made of high conductivity electrical grade Aluminium.
b. Purity of Aluminium conductor should not be less than 99.6%.
c. Aluminium busbars should be Tin plated at the joint area
d. Where an earth conductor is required, it shall be possible to provide internal earth conductor of the same high conductivity material as the phase conductors and at least of 50% cross section of the phase conductor. Provision for mounting external earth strip to be provided on both side of busduct if required.
e. It should be possible to provide a 100% Neutral where specified in BOQ.

9.4.3 Insulation:

a. Each bus bar shall be individually insulated by means of Multi-layer Class-F Insulation, each layer shall have withstand breakdown voltage of minimum 8KV.
b. The insulation material used shall be of minimum Class F (155 deg. C).
c. The insulation should be UL certified.
d. Insulation must be Halogen free & RoHS compliance.

9.4.4 Housing:

a. The housing shall be made of 1.6mm electro-galvanized sheet steel, epoxy powder coated with RAL7032 shade.
b. Enclosure must be dust & vermin proof
c. IP rating of indoor busduct must be IP-55

9.4.5 Joints:

a. The joint design shall have inbuilt provision of absorbing expansion & contraction of 12mm per joint during operation.
b. The joint insulation must be of single piece moulded design of thermoset material for longer life and higher temperature withstand & better insulation property.
c. The joint construction must allow +/-3mm adjustment at the time of installation, for ease of adjusting to site measurement variations.
d. The joint bolt must be insulated with a bolt insulator. The bolt insulator must be of moulded one piece.
e. The joint design shall have inbuilt provision to prevent excessive insertion of busduct which can damage the bolt insulator.
f. The busbar ends shall not have holes or slots at the joints to avoid reduction in cross section area which will lead to temperature increase. The electrical continuity shall be through pressure plates, achieving a high contact area of joint cross section and expansion capability.
g. It shall be possible to install and remove the joints without disturbing the adjacent feeder section.
h. Joint set should have insulators with temperature withstand capacity of class-F. insulation.

9.5. Co-ordination for Busbar Trunking System

a. The Contractor shall ensure detailed co-ordination of installation and compatibility of busbar trunking, Main Power distribution panel and switchgear as appropriate. The Contractor shall supply, installation, testing and commissioning the busbar trunking system including **flanges, elbows, tap-off boxes, supports** etc., of the type and size as indicated in the drawings and locations designated on the drawings. All busbar and associated installation shall be in accordance with the following requirements. The busbar shall carry its rated current without exceeding the temperature rise of 55°C over an ambient of 50°C at 90% relative humidity in any plane without de-rating and without effecting the local power supply requirements.
b. Connections to Switchgear shall be with flanged end units and exit bars and connections to either the PCC or Sync Panel shall be with flanged end units, flexibles, shall be of specific design and manufactured by the busbar trunking manufacturer.
c. The sync panel Contractor shall co-ordinate with the PCC panel Contractor and ensure the openings provided match to the bus trunk flange units.
d. Busbar layouts indicated in the drawings are based on dimensions of a generic nature. The Contractor shall include for ensuring the selected busbar system can be installed in all locations without increase to room size or encroachment to other areas.
e. The Contractor shall carry out all necessary site measurements to ensure the busbar system is compatible with site dimensions and conditions.
f. Confirm installed weight of busbar trunking with structural engineer.
g. Two runs of earthing strip of suitable size minimum 50mmx6mm
GI strips or as per the standard procedure of IS 3043 shall be continuously run along with the Bus Trunking system.
h. The busbar trunking shall be properly aligned, and securely fixed, not exceeding 1.5m (or as recommended by the manufacturer) centres with support adequate to take the weight of the busbar by means of galvanized fixing brackets; comprising hanger clamp, fixing channel and damping screw, supplied by the busbar trunking manufacturer. Additional supports shall be supplied where required and where recommended by the trunking manufacturer.

9.6 Storage of Bus bar Trunking System

Store bus duct at site continuously in warm dry locations. Bus bars or bus duct will be rejected if they have been roughly handled or marked at joints or connection points, or plating is damaged in any way. Do not install bus duct until that portion of the building is enclosed and dry.

9.7. Method of Construction & Installation

a. The design, manufacture, testing and performance of the busbar trunking system shall be in accordance with the latest edition of IS/IEC 61439-6:2011 shall be applicable.
b. Vendor shall ensure the BBT Integrator shall study the requirement, prepare the shop drawings and after getting the approval the manufacturing shall commence.

c. The busbars shall be totally enclosed in a non-ventilated, low impedance sandwich design. The busbar trunking shall be sandwiched throughout its entire length, busbar trunking flared at tap-points are not acceptable.
d. The enclosure shall comprise a non-magnetic aluminium housing with minimum metal thickness of 5mm top and bottom and 3mm sides. The aluminium housing shall be unpainted natural finish and fully fault rated and provide additional protection by ASTA certified integral earthing (PE protective conductor).
e. The housing shall be made of 1.6mm electro-galvanized sheet steel, epoxy powder coated with RAL7032 shade.
f. Each piece of busbar trunking shall be labelled E, L1, L2, L3, N at both ends to identify conductor phasing.
g. Minimum enclosure protection shall be IP54 and must be ASTA certified in both horizontal and vertical positions.
h. Copies of ASTA certificates for enclosure PE short-circuit and IP ratings shall be submitted to the Engineer for approval.
i. All horizontal runs of the busbar trunking shall be designed for IP55 operation and IP54 for the vertical runs within risers.
j. The Installation manuals detailing handling, storage, installation, energisation, maintenance and joint assembly must be provided by the manufacturer. The Contractor shall ensure that the busbar trunking is stored on site in accordance with the manufacturer's installation manual, in a clean and dry environment.
k. Use a torque wrench to ensure uniform tension on bus duct joints. After completion of installation, and before system is turned over to Owners, re-check each bolted joint with a torque wrench in an approved manner. Torque adjustment shall be as recommended by **Bus Duct Manufacturer**.
l. Cover ventilated bus with a weatherproof heavy-duty plastic envelope as soon as it has been installed. Do not remove this cover until the building is clean and dry and bus ready to test and energise.
m. Insulation test of each bus duct in an approved manner before it is energised.
n. The Contractor shall include for ensuring that the bus duct selected can be installed in locations indicated without any increase in contract price and without any increase to room size or encroachment of other areas.
o. Ensure that adequate Special provision and/or allowance is made for pouring resin compound when making joints on cast resin busbar.
p. Provide protective sleeves around bus ducts as they pass through walls and floors prior to making good.

9.8. TESTS TO BE DONE AT FACTORY/WORKS PRIOR TO DESPATCH:

The Bus-duct system shall be tested for the following acceptance/ routine tests as specified in the relevant standards, before despatch in the presence of Technical evaluation committee at the works of the supplier, and the test certificates shall be furnished in triplicate.

a. Operation tests.
b. Measurement of resistance of the main circuits/millivolt drop test for the joints/interface units.

c. One minute power frequency voltage dry with stand tests on the circuit breaker (High Voltage Test).
d. One minute power frequency voltage dry with stand tests on the auxiliary circuits.

Subject to the clearance from TEC after the satisfactory completion of above tests at factory/works shall only can be dispatched.

9.9. Measurements

The vertical and horizontal run shall be measured in running meter and rest all accessories in units mentioned in the bill of quantity.

9.10. Testing:

a. The busduct shall be type tested at a reputed test laboratory (certified by ASTA or ERDA) for the tests as per IEC-61439 Part-1 (Low voltage switchgear & control gear assembly-General rules) & Part 6(Bus bar trunking systems & bus ways)
b. Insulation Resistance test (Before & after power frequency Test)
c. Short circuit testing of busduct should be for duration of 1 Sec. Neutral &Earth conductor should also be tested for 60% short circuit rating of phase conductor
d. Degree of ingress protection (IP rating) shall also be tested at any reputed independent laboratory as per IEC-60529
e. Busduct should be tested for Seismic Zone-5 & High Seismic Qualification level as per IEEE: 693
f. Visual inspection of protective checks.
g. Aluminium Purification test certificate.
h. Physical verification & dimensional check.
i. Continuity checks for main bus-bars and Earth continuity checks.
j. All joints shall be checked for their proper tightening shall be done as per the directions by EIC

9.11. General conditions for Sandwich Busduct System: -

1. General arrangement drawings of Bus-duct system with all details such as accessories, interface units, supporting arrangement, etc. shall be submitted to the Department and prior approval shall be obtained from the Department before taking up the fabrication works of the bus-duct.

2. Bus-duct system complete with all accessories/interfaces shall be guaranteed for a period of 24 months from the date of commissioning. Defects if any noticed during this period shall be attended by the supplier including replacement of the defective materials/equipment at free of cost.

3. Following documents shall be essentially furnished in triplicate during supply.

i. Detailed installation/maintenance manual of sandwich bus-duct system.
ii. Final GA/schematic drawings and other drawings as necessary.
iii. Type test certificates in respect of the bus-duct system.
Factory test reports for bus-duct system.

10. Specification for Cable Tray:

Steel Wire Mesh Cable Tray

Cable tray manufactured from steel wires, welded together and bent into final shape prior to surface treatment accordance with the IEC standard 61537.

Hot Dipped Galvanised to EN ISO 1461(formally BS 729 since 1999). Cable tray dimensions are all internal. Steel Wire Cable Tray will be produced from lateral and longitudinal sidewall steel wires, with minimum diameters of 4mm for trays of width up to 100mm, 4.5mm for trays of widths of 300mm, 6.0mm for trays of widths of 400mm,450mm, 500mm, and 600mm. Trays will be manufactured with a longitudinal 'T-welded' safety edge along the top wire of the sidewall (excluding 30x50).

Trays will be constructed with a 50mm x 100mm mesh configuration. All tray fittings (e.g., changes in direction, level and size) shall be constructed on site, to the manufacturer's instructions, using side action bolt croppers and fastened using 25mm and 30mm counter clamps with M6 bolts and nuts, all surface treated as the tray. Trays will be coupled together using either a fast-spring coupler or a 25mm/30mm counter clamp combination with supporting lateral splice plate on trays over 300mm width. The coupling will have the same surface finish as the tray.
Trays can be supplied with cover and suitable cover clips. Trays shall be supported at a maximum span of 2.5m by the trapeze, wall, floor or channel mounting methods and will not exceed maximum loads as specified by the manufacturer.

The fixture of the cable trays to the supported systems shall be fast fixing type bolt free system. Traditional nuts and bolts shall not be used in coupling and fixture of cable baskets to the support systems. Fire test certification should be published in accordance with the E30/E90 standard. Loading and deflection characteristic of the tray should be tested and the results published in accordance with the European standard IEC 61537. Suitable size of two runs of wire of GI of suitable size shall be provided & running along with cable tray.

10.1. Testing & Inspection:

Cable tray/Ladder, bend, T bend, cross and all supports are to be tested for Safe Working Load (SWL), Load Bearing Test, Deflections, Impact Resistance, Physical Test, Chemical & Mechanical test, salt spray & Electrical continuity test according to IEC 61537. The cable tray/ladder should not be deflected more than $1/100^{th}$ of the span length at SWL in Mid span and the transverse deflection of all mounting accessories at SWL shall not exceed $1/20^{th}$ of the length. The temperature classification of cable tray system should be -5 degree to +150Degree Celsius.

11. Dispatch Materials to site and their safe custody:

The Contractor shall dispatch materials to site in consultation with the Engineer-in- Charge. Suitable lockable storage accommodation shall be made available free of charge temporarily. Watch & ward however, shall be the responsibility of Contractor.

Programme of dispatch of material shall be framed keeping in view the building progress. Safe custody of all equipment/ items supplied by the Contractor will be the responsibility of the Contractor till final taking over by the Institute.

12.Site Information:

The Tenderer should, in his own interest, visit the site and familiarize himself with the site conditions before Tendering.

Works to be done by Contractor:

Unless otherwise mentioned in the Tender Documents, the following works shall be done by the Contractor and therefore, their cost shall be deemed to be included in their Tendered cost-whether specifically indicated in the schedule of work or not: -

a) Foundations for equipments including vibration isolation springs/ pads.

b) Making good all damages caused to the structure during installation and restoring the same to their original finish.

c) Minor building works necessary for installation of equipments, foundation trench for fuel line & cable, making of opening in walls or in floors and restoring them to their original condition/ finish and necessary grouting etc. as required.

d) All supports for exhaust & water pipes, chimney (if included in scope of contract), cables, anti-vibration pads etc. as are necessary.

e) All electrical work and neutral earthing, body earthing, required for engine & alternator, main board/ control panels, and control wiring including loop earthing, if specified in Schedule of Work.

f) All pipes, cable trench and/ or cable connections.

g) Painting of all exposed metal surfaces of equipments and components with appropriate colour.

Clearance/ Approval of the complete installation from CPCB/ State Pollution Control Board, Central Electricity Authority (CEA)/ Local Bodies and other licensing authorities, wherever required are the responsibility of Contractor.

13.Inspection & load testing of DG SET:

TESTING AT FACTORY

RAMAN RESEARCH INSTITUTE reserves rights for inspection and testing at the work of manufacturer before despatching the goods. **The travelling / transportation arrangement for inspection and testing should be borne by the Contractor**.

The DG set with all components shall undergo all acceptance tests and routine tests as per relevant IS/BS standards at the Manufacturer's work in the presence of our Engineer-in-charge before dispatch. Minimum period of **4 hrs. load test** shall be conducted at factory. Manufactures type test certificates for engine and alternator should be submitted at the time of pre-dispatch inspection.

The tests shall essentially include the following tests:

(a)Alternator:

(i) Insulation Resistance of windings
(ii) Winding resistance tests

(b)Engine:

(i) Vibration Tests

(ii) Sound Level

(c) DG Set shall undergo Load test with following loads and duration continuously

1. 25% load for 30 minutes

2. 50% load for 1 Hour

3. 75% load for 1 Hour

3. 100% load for 1 Hour.

4. 110% load for 30 mins.

DG set should be tested with loads (Heater/ Water load).

Test shall include transient load test at various load levels with verification of voltage dip.

Manufactures type test certificates for engine and alternator should be submitted at the time of pre-dispatch inspection. **All required materials instruments, tools, etc. and consumable like diesel, lubrication oil and loads (Heater/ Water loads), etc., shall be provided by the agency/supplier for conducting the load test.**

TESTING AT SITE:

i. The DG set shall be tested with all required acceptance and commissioning tests in the presence of Engineer-in-charge after installation at site Raman Research Institute Campus.
Full load test shall be carried out for 12 hours continuously and 110% of load test shall be carried out any one hour in the 12 hours' time.
Note:
All required materials instruments, tools, etc., and consumable like diesel, lubrication oil and loads with required cables (Heater/ Water loads), etc., shall be provided by the agency/supplier for conducting the load test at Site.

ii. Primary and secondary injection tests of all the relays to be conducted at site before commissioning the DG set and the test results to be submitted. Any other site test insisted by the CEA Authorities to be conducted.

iii. The Engine shall be filled with of first filling of lubricating oil.

After satisfactory commissioning of the system the following documents shall be submitted.

a) Maintenance manual for Engine and alternator - 3 Set.
b) Control Panel wiring Diagram - 3 Set.
c) Factory acceptance & site acceptance test reports - 3 Set.

18. Safety Measures:

All equipments shall incorporate suitable safety provisions to ensure safety of the operating personnel as per manufacturers" standard practice.

19. Statuary Clearance(s):

All liaison services for obtaining necessary approval/authorization required for handling/transportation/ process methodology/ equipment and complete Installation etc. from CPCB/State Pollution Control Boards/ Local Bodies/ Central Electricity Authority (CEA)/ Other licensing authorities wherever required is included in the scope of the Tenderer. All necessary cost of such services for this approval is included in the scope of the Tenderers.

However, Government fees in actuals would be reimbursed by the Institute, against documentary evidences. All local issues for such service would be in the scope of the Contractor and Institute in no way would be involved in the same.

In case of intermediate inspection by the statutory body for such approval, the Contractor/ agency should co-ordinate the same with Institute engineers and ensure themselves available during the inspection.

20. Guarantee:

All equipments shall be guaranteed, against unsatisfactory performance and/ or break down due to defective design, workmanship or material, for a period of **24 months** from the date of taking over the installation by the department. The equipments or components, or any part thereof, so found defective during guarantee period shall be forthwith repaired or replaced free of cost, to the satisfaction of the Technical Evaluation committee. In case it is felt by the Institute that undue delay is being caused by the Contractor in attending the defect/ fault removed, the same will be got done by the Institute at the risk and cost of the Contractor. The decision of the Technical Evaluation committee in this regard shall be final.

21. Completeness of the Tender, Submission of program, Approval of Drawings and Commencement of work:

Completeness of the Tender

All sundry equipments, fittings, assemblies, accessories, hardware items,foundation bolts, supports, termination lugs for electrical connections, cable glands, junction boxes and all other sundry items for proper assembly and installation of the various equipments and components of the work will be deemed to have been included in the Tender, irrespective of the fact that whether such items are specifically mentioned in Tender Documents or not.

Submission of programme

Within **Fifteen days (15)** from the date of receipt of the letter of acceptance, the successful Tenderer shall submit his program for submission of drawings, supply of equipment, installation, testing, commissioning and handing over of the installation to the Technical

Evaluation committee. This program shall be framed keeping in view the building progress.

Submission of Drawings

The Contractor shall submit the drawings to the Technical Evaluation committee as per the specification for approval before the start of work.

Commencement of Work

The Contractor shall commence work as soon as the drawings submitted by him are approved. The drawings are to be submitted by the Contractor within 15 days of stipulated date of start, and shall be approved by the **Technical Evaluation committee** within 10 days of receipt in their office.

21.1. Drawings for Approval on Award of the work:

The Contractor shall prepare & submit three sets of following drawings and get them approved from the Technical Evaluation committee before the start of the work. The approval of drawings however does not absolve the Contractor not to supply the equipments/ materials as per agreement, if there is any contradiction between the approved drawings and agreement.

i) Lay out drawings of the equipments to be installed including control cables, fuel/ lube oil pipes and supports/ structure for exhaust piping, Chimney and bus ducts/ cable trays.

ii) Drawings including section, showing the details of erection of entire equipments.

iii) Electrical wiring diagrams from engine-alternator set to Electrical control panel, Electrical control panel to essential LT board including the sizes and capacities of the various electrical/ control cables and equipment.

iv) Dimensioned drawings of Acoustic enclosure/ Engine-Alternator set and Electrical control panel.

v) Drawings showing details of supports for pipes, chimney cable trays, ducts etc.

vi) Structural and Foundation Drawings for the Civil works of Stack need to submitted before commence of work.

vii) Any other drawings relevant to the work.

21.2. Drawings/Documents to be furnished on completion of Installation:

Two sets of the following laminated drawings shall be submitted by the Contractor while handing over the installation to the Institute. One set shall be laminated

On a hard base for display in the DG set room/room where AMF panel is installed and another set will be displayed in Estate Office. In addition, drawings will be given on Compact Disc (CD).

i) DG set installation drawings giving complete details of all the equipments, including their foundations.

ii) Line diagram and layout of all electrical control/AMF panels giving switchgear ratings and their disposition, cable feeder sizes and their layout.

iii) Control wiring drawings with all control components and sequence of operations to explain the operation of control circuits in AMF panel/PCC.

iv) Manufacturer's technical catalogues of all equipments and accessories.

v) Operation and maintenance manual of all major equipments, detailing all adjustments, operation and maintenance procedure.

22. After Sales Service:

The Contractor shall ensure adequate and prompt after sales service free of cost during guarantee period, and against payment after the guarantee period is over, in the form of maintenance, spares and personnel as and when required during normal life span of the equipments and shall minimize the breakdown period. In case of equipment supplied by other manufacturers the firm shall furnish a guarantee from the manufacturer for the same before the DG Set installation is taken over.

TEST CERTIFICATE AND REPORTS

On completion of an electrical installation (or an extension to an installation), following test certificates are to be provided by the vendor Contractor, countersigned by the certified supervisor under whose direct supervision the installation was carried out. All the certificates and test reports shall be accompanied by calibrated test reports of the instruments that were used for testing along with the serial numbers of the instruments and all the accessories used with the instrument. (e.g.: Power analyser – Serial number, CT and PT used along with the analyser)

a) Earth test certificate
b) Insulation Resistance test of all the power cables
c) Quality test certificate of manufacturers of the Glands, Lugs, MCB
d) Routine test report of the Panel
e) Test report of the DG Inspection at Manufactures place and at Site
f) Final commissioning test report of the entire installation after successful commissioning and before handing over to the **Technical Evaluation committee**.

All the test certificates and reports shall be addressed to –
The Technical Evaluation committee
RRI, Bengaluru.

FINAL TEST REPORT

Date:

Ref.:

To,

Raman Research Institute

Sadashivanagar

Bengaluru-80

Sir,

Sub.: Final Test Report of the Project "**Supply, Installation, Testing, Commissioning (SITC) of LT, 415V, Prime duty, 750KVA DG Set and DGs Synchronisation Panel. Electrical Work towards Synchronisation of new one no. 750KVA DG Set with Existing two numbers of Stand-alone 320KVA and 500KVA DG Sets for Optimal Power distribution.**

Ref.: 1. Work Order –

Tender –

We have completed the entire work "Up-gradation of Electrical Installation (Supply, Installation, Testing, Commissioning (SITC) of LT, 415V, Prime duty, 750KVA DG Set and DGs Synchronisation Panel. Electrical Work towards Synchronisation of new one no. 750KVA DG Set with Existing two numbers of Stand-alone 320KVA and 500KVA DG Sets for Optimal Power distribution.)" as per the Tender specifications.

During the course of execution of the project, all the latest IE rules, guideline, BIS standard and regulations were followed, due permissions of concerned authorities before and after completion of the project were obtained.

The work is commissioned after receiving the permissions of concerned authorities and we state that the work is successfully completed and we will be responsible for its performance till the defect liability period is complete.

For and on behalf of M/s._____

Address:

Signature

Name

In the capacity of

(DULY AUTHORISED TO SIGN THE BID)

Schedule of Quantities

Name of the work:

Supply, Installation, Testing, Commissioning (SITC) of LT, 415V, Prime duty, 750KVA DG Set and DGs Synchronisation Panel. Electrical Work towards Synchronisation of new one no. 750KVA DG Set with Existing two numbers of Stand-alone 320KVA and 500KVA DG Sets for Optimal Power distribution.

Sl. No	Description of Work	Unit	Qty	Rate (Supply and Installation)	Amount In Figures
1.	Supply, Installation, Testing and commissioning of 750 KVA Diesel Generator set as per the detailed Tender specifications including allied civil works etc. The price/ cost shall include for delivery, Transportation, Insurance, supply & Installation, testing and commissioning of 'Silent type' Diesel Generating set having Prime power rating of 750 KVA, 415 Volts at 1500 RPM, 0.8 Lagging power factor at 415 Volts suitable for 50 Hz, 3 Phase system and for 0.85 load factor and consisting of the followings: **(Note: Condition for load test at Factory and at RRI site shall be included)**	SET	01		
	Diesel Engine offered shall be as per specification and with following accessories:				
1(a)	Diesel Engine 4 stroke Radiator based water cooled, electric start, of suitable BHP at 1500 RPM suitable for above output with alternator at 40-degree C, 50% RH & at 1000-meter MSL and conforming to BS 5514, BS 649, IS 10000, capable of taking 10% over loading for one hour in every 12 hours of continuous operation. The engine will be fitted complete with all the required accessories.				

1(b)	**Engine mounted Instrument Panel fitted with and having digital display for the following:**				
	(i) Start- Stop switch with key/Either Push Buttons				
	(ii) Water Temperature indication				
	(iii) Lubrication oil pressure indication				
	(iv) Lubrication oil temperature indication				
	(v) Battery charging indication				
	(vi) RPM Indication				
	(vii) Over speed indication				
	(viii) Low lubrication Oil trip indication.				
	(ix) Engine running Hour's indication				
1(c)	The engine shall be having electronic governor and suitable for AMF operating with Auto synchronizing, Load sharing, Load bearing, Load dependent starting etc. using with digital controllers, relays & control modules.				
1(d)	**Alternator:**				
	Synchronous alternator rated at 750 KVA/600KW, 415 Volts at 1500 RPM, 3 Phase, 4 wire, 50 Hz, AC supply with 0.8 lagging power factor at 40 Degree C, 50% RH & at 1000-meter MSL. The alternator shall have SPDP enclosure, brushless, continuous duty, self-excited and self- regulated through electronic AVR conforming to IS: 4722 / BS 2613 suitable for tropical conditions and with class H insulation. AVR should be compatible for auto synchronization.				
1(e)	**Base Frame and Foundation**				
	Both the engine and alternator shall be mounted on suitable base frame made of MS channel with necessary reinforcement which shall be installed on suitable cement concrete foundation and vibration isolation arrangement as per recommendations of manufacturer. Necessary civil work is in the Contractor scope.				

1(f)	**Fuel Tank:** Daily service fuel tank of 990Litres capacity fabricated out of 5mm thick MS sheet complete with all standard accessories and fuel piping between fuel tank and diesel engine with MS class 'C' pipes of suitable diameter etc. Complete with valves, level indications & accessories as required as per specifications.				
1(g)	**Starting system:** 12V / 24V DC starting system comprising of starter motors: voltage regulator and arrangements for initial excitation complete with suitable nos. of batteries as required as per specifications.				
1(h)	Acoustic and weather proof enclosure with arrangements for fresh air intake for cooling of the engine & alternator, extraction, discharging hot air in to the atmosphere as per specifications.				
1(i)	**DG Control Panel:** SITC of DG Control panel shall be front-operated cubicle type, free standing, floor mounted panel shall comply with IS/IEC 61439 Part 1-2011, controlled by suitable rated, microprocessor based 1250A, 4-pole ACB EDO ACB suitable for operation on 415V, 3phase, 4wire, 50Hz AC supply system, and to withstand a short circuit level of 50KA RMS symmetrical. The panel shall be fabricated out of 14SWG GRCA sheet steel with necessary anticorrosive treatment and shall be dust and vermin proof construction suitable for installation on pedestal all complete as per the specification. The panel fabrication shall be 7 tanks processed and powder coated. After surface treatment, panel shall be painted through powder coating process with two coats of zinc chromite process and two coats of powder painting complete as required.				

1(j)	Unloading, shifting & positioning of DG set.				
	RATE IN WORDS				
2	**Battery Charger** Supply and Installation of 24V DC, 3-phase Battery charger with battery leads with boost & trickle charging facilities and also with 2 nos. of 12Volts, 180AH batteries, DC distribution board, battery stand, and battery leads necessary cabling and supply of all fixing materials as required and as directed in order to provide control power supply to HT panel, control panel and synchronizing panel.	Each	1		
	RATE IN WORDS				
3	**DG Exhaust System** Residential type silencer with necessary supporting arrangements with spring support, wherever applicable, as per the latest CPCB norms with all necessary civil works. MS pipes as per IS 3589 shall be supplied. The exhaust system including the silencer must be sized to ensure that back pressure on system does not exceed the back pressure recommended by engine manufacturer. Silencers and Horizontal runs shall be supported on spring exhaust pipe to the recommended height with thermal insulation. The exhaust pipe shall be clamped and adequately supported on independent structure including civil works for preparing the suitable foundation, necessary excavation and refilling and making the site good. The height of the stack shall be as per the latest norms with auto control aviation lamp, Lighting Arrestor and Earth pit etc. all complete.				

3(a)	Supply, and Fixing of Exhaust pipe with a suitable diameter (as per the OEM standard) of MS ERW 'B' class pipe confirming to IS: 3589, with necessary bends, supports and clamps, antivibration mounting, insulation with mineral wool of 50mm thick with wire mesh binding & 0.6mm thickness of aluminium cladding and 2 coats of Heat resistance paint suitable to exhaust temperature etc. complete as per the detailed specifications.	Mtrs.	30		
	RATE IN WORDS				
3(b)	Supply, Fabrication, Erection and Installation of Exhaust stack (Single Stack system to accommodate of three exhaust pipes of three DG sets) for Exhaust pipe, Residential silencer using ISMC, ISA steel sections complete including painting with zinc chromate primer and 2 coats of enamel paint Including construction of suitable foundation with necessary excavation and refilling and making the site good. The height of the stack shall be as per the latest norms with auto control aviation lamp and earthing pit for Lighting Arrestor for Self-Supporting Structure. The weight mentioned is indicative, however actual measurement will be done during execution. The Design and Drawings for the structure work shall be submitted for approval before commencement of the work.	KG	5250		
	RATE IN WORD				

4	**Synchronization Panel**				
4(a)	Supply, Installing, Testing and Commissioning of Synchronizing panel Indoor type **as per SLD** (mentioned as DG Vendor scope) suitable for the following as per the IS/IEC 61439-1: 2011 standard and following major components of **1. Incomer:1250A, 3P, ACB-3Nos, EDO type (50 KA)** **2.Outgoing-2500A, 4P, ACB-2Nos, EDO type (50 KA)** **3.Bus Coupler-2500A, 4P ACB-2Nos, EDO Type (50KA** **4.800A Neutral Contactor-3 Nos** **5.PLC Panel and HDMI, DG Synchronous controller, and relays etc. as per the SLD** Along with required control MCB's, Indicating Lamps, Digital Multi-Function Meters with communication capable port, CTs of various ratings **as per the SLD**. **Note:** In the DG Synchronising panel, all ACBs shall be Capable to communicate all parameters using SCADA Switching with (S/W) MOD BUS RTU/TCP, Compatible to IEC 61850 protocol along with inbuilt RS485 ports. All ACBs shall have breaking capacity specified as Ics = Iwu= Icu.	Set	1		
4(b)	The Panel should be free standing on 100mm C-channel, fabricated of 14SWG Gland plate and rest in 16SWG with suitable strengthening and powder coated in 7-tank process and colour matching to the other panels in the power house. RAL7035. All the doors shall be earthed using 2.5sqmm copper wires, flat earth strip shall run along the length of the panel. - ***Approval of all the details is necessary before installation at site.***				

	Suitable instrumentation shall be provided to each of ACBs for all the individual outgoing ACBs. The meters – Multi function meter displaying the electrical parameters like – Voltage (V), Current (I), Frequency(f), Power factor(Φ), Active power (P), Reactive power (Q), Apparent power (S), Energy (kWh), kVAh, kVARh & THD etc. shall be communication capable with RS485 provision.				
4(c)	**Please refer the Mode of Operation with logic & control with PLC is indicated in SLD & Detailed specification (Sl. No. 7& 8 in the Detailed Specifications)** **Note:** The works towards Installation & commissioning of all Hardware and Software along with suitable control & communication cabling including all interconnections & associated work related to electrical Interlock & communication between from proposed DG Synchronising Panel to existing Main PCC panel will be under the DG vendor scope of work. Installation and Commissioning of All Logic as directed by EIC will be under DG vendor scope.				
	RATE IN WORDS				
5	**Earthing System**				
5(a)	**Copper Plate Earthing for Neutral Earthing** Providing standard plate earth for earth station with600x600x3.15mm electrolytic tinned copper plate at 2.5m depth, conforming to IS:3043 & NBC-2016 with latest amendments including excavation and refilling of earth and supply of all materials and providing chamber with necessary civil works using good quality bricks, sand etc. with a cover plate made of GI for the chamber with all necessary materials complete as required**.**	Each	2		
	RATE IN WORDS				

5(b)	**Body Earthing:** Supply & installation of Maintenance Free Earth (MFE) Station in solid earth electrode comprising of 1 nos. of 17.0 mm dia., 3.0 mtr long copper bonded stainless / nickel steel alloy rod, molecularly bonded copper of 99.9% purity with minimum copper coating thickness of 250 microns including supply of copper coated steel rod. Supply of suitable high grade copper alloy Rod to tape Clamp - Type "A" with extra grip / U-bolt Rod Clamps - Type 'E' with Double Plate for connecting earthing strip to earth electrode. The rod has been tested for Dimension, Marking, Tensile Strength, Salt mist, coating thickness, Electrical resistivity test before and after corrosion test as per IEC 62561-2 & UL 467 meets the requirements of IS:3043 and IEC 60364-5-54, tested for short circuit current withstanding capa. The other materials and tools required for excavation of earth hard/ soft soil and driving rod in earth with augured hole dia. of 75-100mm in ground including civil works like excavation & refilling of earth, also including supply and filling conductivity / earth enhancement compound (confirming to IEC:62651-7 with latest amendments) filled around the copper bonded steel rod to a minimum depth of 3.0 Mtrs. from ground level including civil works like excavation & refilling of earth & also providing precast RCC inspection chamber-with RCC cover slab for each electrode complete with all interconnections as required & as directed by EIC.	Each	10		
	RATE IN WORDS				
5(c)	Supply and laying of electrolytic GI strip/ GI Wires of following sizes including supply and fixing using MS/Aluminium spacers ,saddles ,welding with all fixing materials required when laid inside the building and inclusive of excavation & refilling				

	of earth, when laid outside the building and tinning of all the joints & terminations interconnections with earth pit and equipment, terminations / interconnections in an approved manner as per IS 3043 (with latest amendments) inclusive of supply of all hardwares complete as required.				
	50x6mm GI Strip (Hot dipped Galvanized)	Mtrs.	200		
	RATE IN WORDS				
	25x3mm GI Strip (Hot dipped Galvanized)	Mtrs.	250		
	RATE IN WORDS				
	8 SWG (Hot dipped Galvanized) Wire	Mtrs.	100		
	RATE IN WORDS				
5(d)	Supply and laying of following electrolytic Copper strip including supply and fixing using MS/Aluminium spacers ,saddles ,welding with all fixing materials required when laid inside the building and inclusive of excavation & refilling of earth, when laid outside the building and tinning of all the joints & terminations interconnections with earth pit and equipment, terminations / interconnections in an approved manner as per IS 3043(with latest amendments) inclusive of supply of all hardwares complete as required.				
	50x6mm Copper Strip with black colour heat shrinkable PVC sleeves	Mtrs.	50		
	RATE IN WORDS				
	LT Control Cable				
6	Supply of 1.1 KV grade, XLPE insulated, and FRLS-PVC overall sheathed, stranded **copper conductor**, flat steel strip / wire armoured cables conforming to IS:7098/Part - I (with latest amendments) and of following sizes. The cables/drum shall bear ISI				

	certification mark and including the cost of making connections, glands, lugs, ferrules, cable tags complete and as per the instruction from Engineer in charge.				
6(a)	24C x 1.5 Sq.mm For AMF RTD BTD & Other Controlling of DG set	Mtrs.	150		
	RATE IN WORDS				
6(b)	3C x2.5 Sq. mm for AC auxiliary power supply to cabinet & other small unit inside dg set.	Mtrs.	100		
	RATE IN WORDS				
6(c)	2CX4 Sq.mm for Battery Charging	Mtrs.	60		
	RATE IN WORDS				
6(d)	2CX2.5 Sq.mm for Remote Operation of DG set	Mtrs.	60		
	RATE IN WORDS				
6(e)	Laying of 2C, 3C & 24 core, 2.5/4/1.5 Sq.mm 1.1 kV grade FRLS XLPE cables armoured Copper conductor cable in HDPE pipe including supply and laying of 100mm outer Diameter HDPE pipe at 750mm below Ground level including transportation of cable and HDPE pipe to site, excavation refilling of earth and drawing the Cable through the HDPE pipe as per specification and as directed by EIC. **laying of 2C, 3C & 24 core, 2.5/4/1.5 Sq.mm 1.1 kV grade** FRLS XLPE cables armoured Copper conductor cable **from 750KVA, 500KVA & 320KVA DG sets to Synchronising panel (12 Runs of cables laid in HDPE pipe)**	Mtrs.	50		
	RATE IN WORDS				
7	**<u>Cable Tray</u>**				
7(a)	Supply of 300 mm width x 60mm Height cable Tray Prefabricated hot dip galvanised perforated cable tray with covers including all necessary horizontal & vertical bends, tees, reducers, coupler plates, fasteners, supports etc as per IEC 61537. Cable	Mtrs.	50		

	tray shall have necessary provision for clamping the cables on the tray. The cable tray shall be galvanised for corrosion protection conforming to DIN EN 10346/ ISO 1461. the tray should be tested for safe working load with a span distance of 1.5m and the deflection shall be within the limit as per standards. The cable tray shall be fixed on wall / trench by providing support with ISA 40x6 mm thick at an interval of 900mm including angular support as an additional support of horizontal angle including fabrication, grouting to wall, cutting, welding, painting etc. / using 10mm dia threaded rod with socket fixed at ceiling for supporting the cable tray and all other accessories required and as directed by the Engineer-in-charge. Note: Drawing of the cable tray and support arrangements shall get cleared by engineer in charge before supply / fabrication.				
	RATE IN WORDS				
7(b)	Installation of the 300 mm width x 60mm Height of cable Tray Pre-fabricated hot dip galvanised perforated cable tray with covers, interconnection and earthing complete as required and as directed by EIC.	Mtrs.	50		
	RATE IN WORDS				
8	**LT Power Cable**				
8(a)	Supply of 300 sq.mm x 3.5 Core 1.1 KV grade, XLPE insulated, and FRLS-PVC overall sheathed, stranded Aluminium conductor, flat steel strip / wire armoured cables conforming to IS:7098/Part - I (with latest amendments). The cables/drum shall bear ISI certification mark.	Mtrs.	300		
	RATE IN WORDS				
8(b)	Laying of 300sq mm x 3.5core 1.1 kV grade XLPE cables, armoured, aluminium conductor cables in existing trench including transportation of cable to site,	Mtrs.	20		

	removing of trench covers and reclosing the covers after laying the cables in good condition with supply of all necessary materials such as brackets, clamps, MS/GI spacers complete as required and as directed by EIC.. **Note:** **laying of 3.5C x 300 sq.mm XLPE Aluminium cable: From 750KVA DG sets to Synchronising panel (3 Runs of cables laid in ground)**				
	RATE IN WORDS				
8(c)	Laying of 300sq mm x 3.5core 1.1 kV grade XLPE cables, armoured, aluminum conductor cables in existing trench including transportation of cable to site, removing of trench covers and reclosing the covers after laying the cables in good condition with supply of all necessary materials such as brackets, clamps, MS/GI spacers complete as required and as directed by EIC. **Note: Laying of 3.5C x 300 sq.mm XLPE Aluminium cable: From 500KVA & 320KVA DG sets to Synchronising panel (6 Runs of cables laid in ground)**	Mtrs.	25		
	RATE IN WORDS				
8(d)	**Cable End Terminations:** Providing end terminations for 300Sqmm, 3.5 core ,1.1kV grade FRLS XLPE insulated armoured, Aluminium conductor cables including supply of Double compressor gland, aluminium lugs, neoprene bushes and other materials and using one's own tools required complete with terminal connections required complete with terminal connections, earthing of glands complete as required and as directed by EIC.	Each	20		
	RATE IN WORDS				

9	**Sandwich Busduct system**				
	Design, Fabrication, Supply, Transportation, Installation, testing and commissioning of 2500A, 1.1kV, 50Hz, 75kA for 1 Sec, 3P+N-100%+PE Sandwich type Aluminium Busbar Trunking system as per IEC:60439-6: 2011. Outer casing of system consists of four C-ribbed section bars, bordered and riveted with excellent mechanical, electrical and heat loss efficiency. The sheet metal is shall be made of hot galvanized steel 1.5mm thick having degree of protection IP55. The busbar conductor shall have a rectangular cross-section with rounded corner, Aluminium alloy with Tin Plating. The Insulation between the bars is ensured by a double sheath made of polyester film Class F. The junction contact shall be ensured for each phase, insulated with Class F. Enclosure shall be painted with RAL7035 resins with a high resistance to chemical agents. (130x130mm). Including Fabrication of brackets, flange ends etc. all Complete.				
9(a)	Straight Length Horizontal Feeder without Tap Off Provision (*Panel to Riser)*	Mtrs.	29		
	RATE IN WORDS				
9(b)	Flexible Braid Connections -2500A-(Length-300-450mm) @PCC OR SYNC PANEL End	Each	4		
	RATE IN WORDS				
9(c)	Flange end	Nos	4		
	RATE IN WORDS				
9(d)	Horizontal Elbow	Nos	4		
	RATE IN WORDS				
9(e)	Vertical Elbow with exit bar	Nos	4		
	RATE IN WORDS				

10	**Miscellaneous Works**				
10(a)	Modification in existing DG sets (500KVA AND 320KVA) for making it suitable to synchronize with the new 750KVA DG set.	Set	LS		
	RATE IN WORDS				
10(b)	Supply, Installation of cable markers in proper concrete pedestal of size 750mm x 300mm x 50 mm (H x W x D) for identifying the cable loop, cable route etc.	Nos	10		
	RATE IN WORDS				
				TOTAL	
				GST (As applicable)	
				GRAND TOTAL	
	Office Use:				
	Particulars			**Remarks**	
	Total Number of corrections in the Schedule of Quantities				Signature of the Tenderer
	Total Number of over writings in the Schedule of Quantities:				
	Total Number of additions in the Schedule of Quantities				

ANNEXURE-I

LIST OF APPROVED MAKES

Sl. No.	Item Description	Suggested Makes
1	Diesel Engine	Cummins / Perkin/KOEL/MTU
2	Alternator	Stamford /TOYO DENKI / Leroysomer (NIDEC)
3	PVC wires Copper (FRLS/FRLSH)	Finolex/Havells/KEI/RR/ Polycab – **FRLS**-Zero Halogen grade
4	Glands – (Test Certificate)	Jainson / Comet / Dowells
5	Lugs – (Test Certificate)	Dowells /Jainson / Polycab – long barrel for Al. cables
6	LT Switchgear/LT Breakers (ACB, MCB, MCCB)	L&T / Schneider / Siemens / ABB /Legrand
7	Measuring Instrumentation	Schneider / Siemens/ABB/L&T/ SATEC
8	Relays (digital)	Schneider / Siemens / L&T / ABB
9	Lead acid batteries	Exide / Amco/ OEM standard Suppliers
10	Armoured LT power cable	XLPE Armoured – Finolex / Polycab / Universal / RR / KEI/RPG/Havells
11	Protective relays	ABB/Siemens/L&T/ Schneider/PROK Dv's
12	DG set Controller for Auto synchronisation panel	Woodward /DIEF/Bermini
13	PLC Unit	Schneider/Siemens/Rockwell automation /ABB
14	Sandwich Bus trunking	L&T/Legrand/ Schneider Electric/ABB
15	Body Earthing Maintenance free earthing kit with solid earth electrode & Earth enhancing	OBO-Bettermann / Erico / Cape Electric
16	SPDs	OBO- Bettermann/Raycap/ DEHN/ABB
17	Multifunction Meters	L&T, SATEC, Elmeasure, Secure
18	Cable Trays	Legrand, OBO, Patny system
19	Fire extinguisher	Firex or approved by Local Fire Safety Authorities
20	HDPE Pipe	Dura Line/Carlon/Emtelle/ Rishi

ANNEXURE II

FORM OF BID-SECURITY DECLARATION

[The Tenderer should fill in this Form on Letter Head in accordance with the instructions indicated]

To

The Administrative Officer (i/c)
Raman Research Institute
C.V. Raman Avenue, Sadashivanagar,
Bengaluru – 560 080.

Ref: Tender Document No. NIT No: L/256/EB/2022-2023 Dated 14.12.2022

We, the undersigned declare that:

We know that the bid should be supported by a Bid Security Declaration in accordance with your conditions.

We hereby declare that the prices offered by us against RRI Tender Document No NIT No: L/256/EB/2022-2023 Dated 14.12.2022 for **Supply, Installation, Testing, Commissioning (SITC) of LT, 415V, Prime duty, 750KVA DG Set and DGs Synchronisation Panel. Electrical Work towards Synchronisation of new one no. 750KVA DG Set with Existing two numbers of Stand-alone 320KVA and 500KVA DG Sets for Optimal Power distribution** will be firm for a period of **180 days** from the opening of the bid.

We accept to automatically be suspended from being eligible for bidding in any contract in RRI for a period of 3 years from the date of opening of Bid. If we are in breach of our obligation(s) under the bid conditions, because we:

After having been notified of the acceptance of our bid by the Contracting Authority within the period of bid validity:

1) We failed or refused to furnish a Performance Security in accordance with the Condition of the Tender Document No. L/256/EB/2022-2023 Dated 14.12.2022 OR

2) We failed or refused to sign the contract.

We know that this Bid – Security Declaration will expire, if contract is not awarded to us, upon:

1) Our receipt of your notification to us of the name of the successful Tenderer or
2) Twenty -eight days after the expiration of our Bid or any extension to it

Dated this _____ day of_____

For and on behalf of M/s._____

Address:

Signature

Name

(DULY AUTHORISED TO SIGN THE BID)

ANNEXURE -III

FORMAT OF UNDERTAKING, TO BE FURNISHED ON COMPANY LETTER HEAD WITH REGARD TO BLACKLISTING/ NON- DEBARMENT AND NOT HAVING ANY POOR RECORDS, BY ORGANISATION

To

The Administrative Officer (i/c)
Raman Research Institute
C.V. Raman Avenue, Sadashivanagar,
Bengaluru – 560 080.

Ref: Tender Document No. NIT No: L/256/EB/2022-2023 Dated 14.12.2022

Sub: Tender for **Supply, Installation, Testing, Commissioning (SITC) of LT, 415V, Prime duty, 750KVA DG Set and DGs Synchronisation Panel. Electrical Work towards Synchronisation of new one no. 750KVA DG Set with Existing two numbers of Stand-alone 320KVA and 500KVA DG Sets for Optimal Power distribution**

We hereby confirm and declare that we, M/s ----------, is not blacklisted/ De-registered/ debarred and not having any poor performance records by any Government department/ Public Sector Undertaking/ Private Sector/ or any other agency for which we have Executed/ Undertaken the works/ Services during the last 5 years.

If above declaration found wrong in later stage, our offer this Tender may please be rejected and work order may be cancelled at any stage of the work. We may also be barred for participation of further Tenders in your organisation for three years.

For and on behalf of M/s._____
Address:
Signature
Name
(DULY AUTHORISED TO SIGN THE BID)

ANNEXURE -IV

TECHNICAL PARTICULARS OF 750kVA DG SET

The technical particulars requirement/ compliance needs to be filled by Tenderer. The following details aremandatory requirement, if any columns are not filled, such Tenders are liable for rejection.

I. Generator Set Specification:

Sl. No.	Technical Particulars	Requirement	YES/NO
1.	Model No.	To be furnished	
2.	Power rating kVA/kW	750/600	
3.	No. of Phases	Three	
4.	Output Voltage and Frequency	415V, 50Hz	
5.	Power Factor	0.8 Lagging	
6.	RPM	1500	
7.	BHP	To be furnished	
8.	Governor	Electronic Governor	

II. Engine Specification:

Sl. No.	Technical Particulars	Requirement	YES/NO
1.	Make	To be furnished as per Approved List	
2.	Model No.	To be furnished	
3.	Number and arrangements of cylinder	To be furnished	
4.	Inbuilt Fuel tank & Capacity	To be furnished	
5.	Fuel	High Speed Diesel	
6.	Fuel Consumption @ 75% load with radiator and fan (litre/hr)	To be furnished	
7.	Fuel Consumption @ 100% load with radiator and fan (litre/hr)	To be furnished	
8.	Starting system	24V DC Electrical	
9.	Cooling	Liquid cooled	
10.	Aspiration	Turbocharged, Charge air cooled	

III. Alternator Specification:

Sl. No.	Technical Particulars	Requirement	YES/NO
1	Make	To be furnished as per Approved List	
2	Frame	To be furnished	
3	Rating & Type	To Be Furnished/ 750KVA at 415V, 3Phase, 0.8PF, 3Phase,	

		50Hz, 1500RPM brush less type	
4	Enclosure	IP 23	
5	Voltage regulation (Max)	± 0.5%	
6	Class of Insulation	H class	
7	Excitation	PMG or equivalent	
8	Winding pitch	2/3	
9	Wave form distortion/ Total Harmonic Distortion	No load < 1.5%, Non distorting balanced linear load < 5 %	
10	Sub transient reactance	To be furnished	
11	Maximum unbalanced load across phases	Less than or equal to 25%	
12	Terminal Box	Shall be suitable for terminating 3 Runs of 3.5C X 300 Sq.mm Aluminium cable.	

IV. Acoustic Enclosure:

Sl. No.	Technical Particulars	Requirement	YES/NO
1	Make	To be furnished	
2	Model No.	To be furnished	
3	Compliance to CPCB Norms	GSR 371(E) dated 17.05.2002, GSR 520(E) dated 01.07.2003, GSR 448(E) dated 12.07.2004, GSR 771 (E) dated 11.12.2013 & GSR 232 (E) dated 31.03.2014, Gazette Notification No. 167 dated. 31.03.2014 and Gazette Notification No. 578 dated. 11.11.2014 amended up to date.	

V. *Certificate to be enclosed:*

Sl. No.	Technical Particulars	YES/NO
1	*Technical Data sheet of offered DG set.*	
2	*Copy of Dealership/ authorization from Original Equipment Manufacturer referring to this particular Tender.*	

ANNEXURE -V

Conformance Standards:

"IS 4722, BS 7500, IEC 34 / 1, ISO 8528-Part-1 to IX, BS 5514, ISO 3046 (Part-I to V) IEC 34-1, IEC 298, IEC439, IS 13364 Part – II, IS 4899, IS 2147, IS 4722.

(A)Generating Set		
ISO 8528	Part - I	Application, rating and performances.
	Part - II	Engines
	Part - III	A.C. Generator for generating set
	Part - IV	Control gear & switch gear
	Part - V	Generating Sets
	Part - VI	Test methods
	Part - VII	Technical declaration for specification and design
	Part - VIII	Low power general purpose generating sets
	Part - IX	Measurement and evaluation of mechanical vibration
	Part - X	Measurement of Airborne Noise - Enveloping surfacemethod
	Part - XI	Security generating sets with uninterruptible power system
(B)Engines		
IS 10000 (Naturally Aspirated)	Part - I 1980	Methods of tests for I.C. Engines Part - I - Glossary of terms relating of test method
	Part - II 1980	Standard reference condition
	Part - III 1980	Measurements for testing units and limits of accuracy.
	Part - IV 1980	Declaration of Power, Efficiency, fuel consumption, lubricating oil consumption.
	Part - V	Preparation for tests and measurement of wear
	Part - VI	Recording of test results.
	Part - VII	Governing test for constant speed engines and selection of engines for use with electrical generators.
	Part - VIII	Performance tests
	Part - IX	Endurance test
	Part - X	Tests for smoke level, limit and correction for smoke level for variable speed.
	Part - XI	Information to be supplied by the purchaser to the manufacturer and information to be supplied by the manufacturer along with the engine.

	Part - XII	Specimen test certificates
	Part - XIII	Recommendations on nature of tests required for functional changes in critical components.
BS 5514	Part 5 - 1979	Reciprocating Internal Combustion engines,
ISO-3046	Part V 2001	Performance, torsional vibrations.
	Part - I 2002	Declaration of powers, fuel and lubrication oil consumption and test methods.
	Part - 3 - 1989	Test measurement
	Part - 4 - 1997	Speed Governing
	Part - 6 - 1990	Overspeed protection.
BS 649		Reciprocating Internal Combustion engines, performance, torsional vibrations.
(C)Alternator		
IS 4889/BS - 269		For declaring efficiency of electrical machines.
IS 4722 - 1992		Capability of machine to withstand over current/overload.
IS – 13364	Part I 1992	Alternator - Voltage Regulation up-to 20 KVA
IS – 13364	Part II 1992	Alternator - Voltage Regulation above 20 KVA to 80 KVA
IEC 34 -1 - 1983		Rotating Electrical machines - Rating & Performance
IP – 21	IS-4691/85	Alternator (Degree of Protection)
(D)Acoustic Enclosure		
IS – 8183		Insulation material for sound absorption.
ISO 3744	1998 (E)	Acoustics - Determination of sound power levels of noise sources.
ISO 8528	Part – 10 1998 (E)	Measurement of Air borne noise by enveloping surface method.
ISO 9614 -	1993 Part - I	Requirement of grade - II. Accuracy for insulation.
ISO 9614 -	1996 Part - II	Requirement of grade - II. Accuracy for insulation.
(E)Control Panel/ AMF Panel		
IS -2147 1962		Degree of protection.
IS – 4722		H.V. testing for panel

ABBREVIATIONS:

i. In the 'Item of work/ description of work' column 'unit' column, the various abbreviations shall mean as below.
ii. MTR/M/m/Rm/Mtrs. shall mean 'Metre' in length or breadth or depth.
iii. SQM/Sqm/SM/sqm/M2 /m2 shall mean 'Square Metre' in area
iv. Cu.m/cu.m/Cum/M3 /m3 shall mean 'Cubic Metre' in volume.
v. Kg/kg/KG shall mean 'Kilogram' in weight.
vi. ACB -Air circuit Breaker
vii. EDO -Electrically operated Draw-out type
viii. PCC -Power Control Centre.
ix. MSL-Mean Sea Level
x. SPDP -Screen Protected Drip Proof
xi. BHP- Brake Horse Power

DEFINITIONS:

1. CONTRACT: The 'Contract' means the documents forming the Tender and acceptance thereof and the formal agreement executed between the Raman Research Institute and the Contractor, together with the documents referred to therein including these conditions, specifications, design, drawings and instructions issued from time to time by the Engineer-in-charge and all these documents taken together shall be deemed to form one contract and shall be complementary to one another.

2. TENDERER/CONTRACTOR: The 'Contractor' means the individual or firm or company, whether incorporated or not, undertaking the work and shall include the legal personal representatives of such individual or the persons composing such firm or the successors of such firm or company and the permitted assignee of such individual or firm or firms or company.

3. MARKET RATE: 'Market Rate' shall be the rate as decided by the Engineer-in-charge on the basis of the cost of materials and labour at the site including applicable taxes, duties and also the transportation charge to where the work is to be executed plus the percentage mentioned in schedule `F' to cover all overheads and profits.

4.TENDERED VALUE: 'Tendered Value' means the value of the entire work as stipulated in the letter of award or work order.

ANNEXURE-VI

Certificate for Local Content

"We (name of manufacturer) hereby confirm in respect of quoted item(s) that Local Content is equal to or more than 50% and come under "Class-I Local Supplier" Category. As being "Class – I Local Supplier", we are eligible for Purchase Preference under "Make in India" Policy vide GOI Order Number P45021/2/2017-PP (B.E.-II) dated 15.06.2017 (subsequently revised vide orders dated 28.05.2018, 29.05.2019 and 04.06.2020)

OR

"We (name of manufacturer) hereby confirm in respect of quoted item(s) that Local Content is more than 20% but less than 50% and come under "Class-II Local Supplier" Category.

The details of the location (s) at which the local value addition made is/are as under:

1.

2.

3.

*Strike out whichever is not applicable

Date:
Seal & Signature of the Tenderer

NOTE:
1. Self-Certification that the item offered meets the minimum local content (as above) giving details of the location(s) at which the local value addition is made in case the Tenderer wishes to avail the benefits under the Make in India policy, if applicable.
2. In cases of procurement for a value in excess of Rs.10 crores, the local supplier shall be required to provide a certificate from the statutory auditor or cost auditor of the company (in the case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) giving the percentage of local content to avail the benefits under the Make in India Policy, if applicable.

ANNEXURE -VII

PROJECT COMMITMENT LETTER

To

Raman Research Institute

Sadashivanagar

Bengaluru-80

Title of the Work: **Supply, Installation, Testing, Commissioning (SITC) of LT, 415V, Prime duty, 750KVA DG Set and DG Synchronisation Panel. Electrical Work towards Synchronisation of new one no. 750KVA DG Set with Existing two numbers of Stand-alone 320KVA and 500KVA DG Sets for Optimal Power distribution.**

NIT No: L/256/EB/2022-2023 Dated 14.12.2022

Dear Sir,

We hereby confirm and commit with the detailed technical inputs mentioned in the Tender specifications and abide by the provisions/terms and conditions of the contract/Tender

For and on behalf of M/s._____

Address:

Signature

Name

In the capacity of

(DULY AUTHORISED TO SIGN THE BID)

ANNEXURE - VIII

AGREEMENT FORM

This agreement is executed on this day ……. of ……., 2023 by and between Raman Research Institute, Bengaluru, a premier research Institute located in Sadashivanagar, Bengaluru, (hereinafter called as the Institute) of the First Part and

_____

(Name of the Contractor)
having its registered office at …… hereinafter called as the Contractor (which includes its successors, executors and permitted assigns) of the Second Part.

WHEREAS, Raman Research Institute (RRI) has issued Tender No - …… for the …… (Name of the Tender) …… and invited bids for this propose.

The RRI has accepted the bid by the Contractor for the execution and completion of such works and rectification of any defects therein, at a contract price of
Rs. ……

NOW THIS AGREEMENT WITHNESSETH as follows:

1. In this Agreement, words and expression should have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to, and they should be deemed to form and be read and construed as part of this Agreement.

2. In consideration of the payments to be made by RRI to the Contractor as hereinafter mentioned, the Contractor hereby covenants with RRI to execute and complete the works and rectify any defects therein in conformity in all aspects with the provisions of the Contract.

3. RRI hereby covenants to pay the Contractor in consideration of the execution and upon completion of the works and rectifying the defects wherein the Contract Price or such other sum as may become payable under the provisions of the Contract at the given time and in the manner prescribed in the Contract.

4. The following documents are deemed to form and be read and construed as part of this Agreement.

IN WITNESS WHEREOF THE PARTIES ABOVE NAMED HAVE EXECUTED AND DELIVERED THIS AGREEMENT AS OF THE DATE FIRST ABOVE WRITTEN.

SIGNED, SEALED AND DELIVERED	SIGNED, SEALED AND DELIVERED
FOR AND ON BEHALF OF RRI (FIRST PART)	FOR AND ON BEHALF OF THECONTRACTOR (SECOND PART)
NAME: DESIGNATION: ADDRESS:	NAME: DESIGNATION: ADDRESS:

ANNEXURE – IX

Drawings

https://wwws.rri.res.in/procurements/DRAWING1-SLD-750KVA-22-23.pdf

https://wwws.rri.res.in/procurements/DRAWING2-BBT-and-SYNC-750KVA-22-23.pdf