GUJARAT ENERGY TRANSMISSION CORPORATION LTD.

Sardar Patel Vidyut Bhavan, Race Course, Vadodara: 390 007

(Tender No: CE (TR)/SE (PLCC)/7/GIS/1)

TECHNICAL SPECIFICATION

FOR

GIS Mapping of 400 KV & 220 KV Transmission lines using modern GPS survey techniques.

(PART-II)

Seal & Signature of Bidder
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Seal & Signature of Bidder
TECHNICAL SPECIFICATIONS FOR GIS MAPPING OF TRANSMISSION LINES USING MODERN GPS SURVEY TECHNIQUES.

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TECHNICAL SPECIFICATION FOR
GIS MAPPING OF 400 KV & 220 KV TRANSMISSION LINES USING MODERN GPS SURVEY TECHNIQUES.


1. OBJECTIVES

GIS can be defined in simple terms as “An organized collection of computer hardware, software, geographical data and personal design to efficiently capture, store, update, manipulate, analyze and display all forms of geographically reference information.

GIS essentially composed of two components Software tools & Data base. The database of a GIS stores all information pertaining to a map from which different views or projections can be drawn from time to time meet specific requirement and it links spatial data with geographic information about any particular feature on map.

Creation of digital map is the first step in building GIS for transmission network. Modern GPS technology is the best way to survey and create an accurate map of the network. This specification includes proposed methodology of providing GIS Mapping using modern GPS survey techniques for GETCO’s all existing 400 KV & 220 KV transmission lines, towers & its connected Substations. Intent of this specification is to appoint agencies to carry out Geographical Information System (GIS) mapping using modern GPS survey techniques. The field data collection for the 400KV & 220KV lines, towers & S/s shall be given from the corporate office at the time of issuing A/T.

1.1 Modern GPS survey technique covers physical survey or satellite imagery or both (hybrid).

2. Scope of work:

The scope of work for GIS Mapping of 400KV & 220KV Transmission Lines, Towers & its connected substations using modern GPS survey techniques will be as under:

(1) The bidder has to supply & install multi user, customized, licensed, proper open GIS format Software for GIS mapping of 400 KV & 220 KV lines, towers and its connected substations.

(2) The hardware (server, printer, storage devices, OS, client machines etc.) for accessing GIS software & its relevant database shall be provided by the GETCO. However, the bidder has to submit basic requirement of suitable hardware for showing digital map & database with the technical bid.

(3) To visit location of each line & its connected substations and collect its co-ordinates. Every 5 kms. of line or part there of 1 no. nearest permanent structure, identification, locations (co-ordinates) should be taken & locate the same on topo-Sheet.

(4) Plotting of collected co-ordinates on digital map.

(5) Creation of digital map of GETCO transmission network using the modern GPS survey technique.

(6) Superimposing of route map of lines, towers & location of sub stations on topo-sheet i.e. superimposing of digital map of GETCO transmission network. The mapping should be to a nominal scale of 1:50000.

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(7) Creation of background map based on latest satellite imagery, town maps and GPS survey. The background map for the GETCO transmission network is map of entire Gujarat state covering all the details like villages, towns, cities, approach roads, National highways, express high way, rivers, terrain, hills, coastal area, forest area, desert, dams etc. How ever the bidder has to procure the latest satellite images of true color (32-bit) of relevant areas of Gujarat state at its own cost from the concerned agency not older than August -2010.

(8) Integration/superimpose of GETCO transmission network is to be done on background map with all coordinates & relevant data (attributes). The mapping should be on scale of 1:50000. The substations, lines, & towers should be clearly visible in satellite image having resolution of 2.5 meter with corridor mapping of 18 meter for 220 KV & 26 meter for 400 KV of either side of lines.

(9) The bidder has to maintain relative accuracy of ± 3 (three) meter or better on ground for entire GPS surveying work.

(10) The successful bidder shall supply 5 nos. of GPS instruments free of cost of the specifications superior or equal to specifications given as per attached sheet A. Also bidder has to provide demonstration & training of GPS instrument as per the requirement of GETCO. The instrument should have following essential features.

(a) Capability of receiving minimum satellite signal – 12 nos.
(b) Accuracy: - All co-ordinates are to be measured with accuracy of better than or equal to 3.0 meter by GPS.
(c) Memory capacity: 128 MB RAM
(d) Compatible to various software like AutoCAD, PLS CADD along with ZOOM feature.
(e) In built maps for navigation purpose.
(f) All accessories to up load & down load documents using USB or parallel port.

(11) Indexing of 400 & 220 KV Lines, towers & S/s. Ex. Name of S/s, Name of line, KV class etc.

(12) The Topo-sheet required for timely completion of GPS survey work shall be arranged by contractor at its own cost.

(13) The original topo sheet & satellite images used for GPS survey work is property of the GETCO & same should be submitted to GETCO on completion of project.

2.1. The description given here is broad scope of work to be carried out by the contractor. However, any work even if not specifically mentioned but reasonably implied for the successful implementation and good performance of the system are deemed to be included.

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The scope of work of the bidder shall include following but not limited to:

1. Bidder has to prepare the indexing of all 400 & 220 KV Substation, 400 & 220 KV lines, towers & has to get approval from GETCO. Ex. Name of S/s, Name of line, KV class etc.

2. Bidder has to collect co-ordinates for existing lines & new charged lines, create digital map & superimpose the same on toposheet & base map (Existing Satellite based image of Gujarat state) for any modification, addition in GETCO Transmission network (tower, lines, S/s etc.) during project implementation phase and thereafter up to 1 year. The GPS Survey is to be carried out of each of the Tower of 400kV and 220 KV Transmission Lines & its connected sub stations comprising of approximately 31600 Towers.

3. Surveyors shall walk along the each locations of transmission lines with a GPS rover & capture the co-ordinates of the location (Tower). Wherever the line crosses the 400 KV line, Railway line, Express highway, National Highway, the contractor shall record co-ordinates on the points of crossing, wherever line route passes over permanent land marks.

4. During the Physical survey, the concern officer of the GETCO related to the concern line being surveyed will guide the contractor for identification of the Towers nearby to the entry / exit of the line from the respective Sub Station. The intermediate Towers where only one line is there, the contractor has to complete the survey based on the guidance provided by the concerned GETCO officer. Wherever multiple lines are combining or crossing, the GETCO officer will guide the contractor for identification of the each of the Tower of each of the Lines, as per the timing schedule. The contractor has to keep continuous liaisoning with the concerned GETCO officer so that he is available for providing guidance for identification of the Towers. The contractor will be provided with all the details of the Transmission Lines to be surveyed and the contact details of the respective GETCO officers of the respective lines so that maximum co-ordination can be achieved and the survey can be completed without any errors and in the stipulated time.

5. The complete job is to be completed within 10 months from the date of issuance of AT. The request for extension of the completion time will generally will not be entertained however, if the reasons are justified and written request is received, the extension may be granted if the GETCO officer is satisfied with the reasons given to him. The decision of the GETCO officer regarding this will be final and binding to the contractor.

6. The contractor has to submit the reports for completed work for the number of lines every month. The bidder shall collect work completion certificate (WCC) with number of locations carried out, Name of line & Name of S/s from the Executive Engineer (Telecom), corporate office. The payment will be made within 60 days on pro-rata basis based on the work completed during this 1 month.

7. The GPS Survey Equipment shall be from well known & reputed brand.

8. The owner reserves the right to split the total work and award the work for different transmission lines mentioned above to more than one bidder without any change in terms & conditions as applicable for the complete work.

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9. The provisional quantities for the scope of work are indicated at point no.3. The final quantities will be the actual quantities for which GIS mapping using GPS survey is done.

10. The contractor must note that the owner shall not be responsible for loss or damage to properties, trees etc due to contractor works during GPS survey. The contractor shall indemnity the Owner of any loss or damage to properties, trees etc during the modern GPS survey.

11. The contractor should note that owner will not furnish the NRSA satellite imageries or topographical map prepared by survey of India but will make available assistance that may be required in obtaining these providing letters of recommendation to the concerned authorities. Further in case the contractor opts for use of ALTM (Airborne Laser terrain Mapping) techniques for detail GPS survey, he shall be responsible for obtaining necessary clearances/permission by providing letters or recommendations to the concerned authorities.

12. All the bidders shall present their proposal methodology for execution of the work as per specifications and details of the equipment & facilities including software available with them within 20 days from date of invitation of bid, based on which the owner may issue suitable amendments. A pre-bid conference shall also be held within 20 days from date of invitation of bid.

13. The work shall be carried out by the contractor using modern GPS surveying techniques. The bidder shall indicate in his offer, the detailed description of the procedure to be deployed. The details of the equipment & facilities including softwares for image processing, computer aided tower spotting etc. available with the bidder or his associates shall also be furnished with the bid.

14. The contractor shall also engage services of a reputed geo-technical consultant or experts from independent educational/research institutions for examining stability aspects of the selected transmission line route/locations in hilly terrain and ualacreble wherever required.

15. No Technical deviation whatsoever to certain conditions of the bidding documents permitted by the Owner and therefore, the bidders are advised that while making Bid proposals and quoting prices these conditions may appropriately be taken into consideration.

The bidder shall complete all the schedules & annexure in the Bid proposal sheets, Technical data sheets and specification elsewhere.

This specification covers the detailing, of survey of 400/220KV Transmission lines, towers & its connected S/s and handing over to GETCO including a complete data base.

16. The above transmission lines are in the entire State of Gujarat. Bidders may visit the site to acquaint themselves with the terrain etc. For this purpose, they are requested to contact at the following address.

Chief Engineer (TR),
Gujarat Energy Transmission Corporation LTD.
Regd Office: Sardar Patel Vidyut Bhavan,
Race Course, Vadodara-390007.
Telephone no.:0265-2353089, Fax No.: 0265-2351218
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Multi User Software specifications for 400 KV & 220 KV Line Tower location & its connected substations displays:

1. Customizing GIS application software, on which the maps and data would have to be loaded in the proper Open GIS format.
2. The software should be OGC (Open Geospatial Consortium) compliant.
3. The software should support standard Intel PC platform for all hardware, the Microsoft windows XP/2000 or higher version as an operating system, and standard & stable commercial relational database system (RDBMS).
4. The software should support client –server architecture.
5. The preparation of database should be common for the entire GETCO system.
6. The system should allow easy integration with the electric industry's implementation of Enterprise Resource Management (ERP solutions).
7. The system should support standard object oriented methodology. E.g. OLE/Com etc.
8. The software should use or support intranet based thin client application & if possible with zero foot print.
9. The system should support creation and editing land base and related geographic information and support geo-spatial analysis.
10. The multi user software will be used to display / locate the 400 kV /200 kV Line Towers & its connected substations on the map.
11. Application and data base will be installed on server. Application can be run on Client machines using intranet/internet.
12. Tower details, S/s data base & other relevant database shall be stored in the data base server. User with specific rights will be able to add/edit/delete relevant details.
13. The software should support enabling Interface with standard DBMS like Access, Fox pro etc.
14. The software should have facility to exchange the GIS data with other window based applications like MS office, MS –Excel, Access etc.
15. The software should support all standard formats of images like. tif, jpeg, bmp etc. The software should support scanned photographs & images, raster & Satellite images.
16. The Software should support true color, 32 bit or higher bit images with good Resolution for displaying.

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17. The GIS application software should be capable of digitizing transmission network. On completion of digitization the system should be ready for study without any further interventions.

18. Multi Circuit Representation: On a tower more than one OH line may be running. These lines will be of same voltages. The application programme should provide for the digitizing and the display of this multi circuit lines. On Clicking of multi circuit line, the configuration of a line should be displayed.

19. The Tower data, S/s data, line data other than co-ordinates (longitude, latitude, altitude) shall be provided by the GETCO which GETCO intended to display on map. (See Annexure- T)

20. The software should support Raster & vector type of data models.

21. The bidder has to supply & install multi user, customized, licensed, proper open GIS format Software for GIS mapping of 400 KV & 220 KV lines, towers and its connected substations conducting field acceptance test (FAT) & acceptance of system.

22. The software should upload & analyze any satellite image taken in future without any change in the supplied or existing software. The owner is able to map the new captured satellite image in their existing digital map of transmission network.

23 Software should have industry based tools specifically designed to facilitate the use of valuable spatial data throughout the enterprise the list following features & toolbars is partial; bidders should explicitly bring out additional features available. :

- View the Grid in digital Map, whenever any operation takes place, a message should appeared on the screen guiding the user how to proceed further or to indicate the current status of his selection.
- Help feature on every function used in software.
- Once data is entered, user can view complete grid on the digital map.
- Navigation tool will allow user to view complete map.
- User can also view/find a specific Tower on the map. The customized find/search feature should be available for any information available on map.
- Find out the distance between two Towers / lines.
- Using this feature user can find distance between two selected Towers / lines.
- Addition / deletion / modification of additional Towers shall be possible only by the authorized persons i.e. password protected.
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• Import & export facility should be available.
• Sectional snap of any part on the map, print out on normal paper of printing (A3, A4, letter etc.). The hard copy & softcopy on the same scale & size of original map, copy of the image & data should be available.
• Customized & standard filter & search tool bar.
• Software has standard drawing tools, color toolbar, font toolbar, capture & editing toolbar.
• Web administration & enabling tool bar.
• System should allow user to customize the representation for each of the entities/objects/elements i.e. point, line, polygon, text, color, hash pattern, line style (dashed, dotted), font, point shape (round, square etc.)
• Should be able to open /attach all standard format files like power point, Visio, .dwg, .pdf, .doc, .xls, without importing in to the mapping system.
• It is mandatory that the proposed system's security and access control facility restrict individual authorized users to read only or read /update functions within the system. The system should use existing LDAP of GETCO.
• The software can automatic upgrade
• Software should have life time validity.
• The software should have adequate back up & recovery facility.

**Other Functional requirement for software:**
• The bidder is able to create hyperlink on digital map for any existing database of GETCO. The bidder's software is capable to fetch the database on click from the existing GETCO server.
• The bidder is bonded to provide adequate software as per matched specification of GETCO. Also bidder has to remain ready to upgrade, modify, and correct any of the features of software as per requirement of GETCO.
• The software should have facility to show detail like longitude, latitude, altitude etc., & relevant attributes for GETCO system at any of the point on the digital map.

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3.0 Conditions of contract

3.1 The bidder shall be an Indian private or public limited Company registered under Indian Companies Act 1956.

3.2 The bidder shall give the full technical details and write up for the GPS equipment to be used for GPS Survey work.

3.3 The successful bidder shall have to give training to the GETCO’s personnel at their works to at least 5 persons at free of cost. Training shall be arranged at the works of bidder & at GETCO sites. The training shall cover following requirements:

1. Complete description of GPS equipment regarding the use of it for the GPS Survey work and getting the GIS Co-ordinates to and from the PC.
2. Integrating the GIS Co-ordinates in the GIS Software for 400kV & 220kV Lines.
3. The bidder has to provide training for collecting co-ordinates using GPS receiver or methodology used by the surveyor for collecting co-ordinates. The training also covers database creation, modification & addition in database using software, digitization of map, up load & down load techniques & all other relevant features of software. The bidder has to train the participants in such a way they get expertise in the above mentioned work & able to fulfill the requirement of GETCO.

3.4 The bidder must have done GPS Survey job in any of the SEB’s of India, or utilities like power grid, NTPC etc., or any power transmission or distribution company of India. The bidder shall give full details of order executed. The copy of the work order for GPS Survey work done is to be enclosed with the offer in the EMD cover. Technical bids of bidders, who have not enclosed copy of the work Orders as mentioned above in EMD cover, will not be opened.

3.5 The bidder shall clearly indicate the optional items/charges offered.

3.6 A detailed technical literature shall be provided by the bidder with full technical particulars and technology used without which offer shall not be accepted. The technical particulars shall be furnished in the form of schedule and deviation in the form of separate statement.

3.7 It is the responsibility of bidder to co-ordinate & obtain approval of statutory authorities like forest, aerodrome etc. to get clearance for work.

3.8 No compensation for ROW shall be paid by GETCO.

3.9 The completed Map of all transmission lines & its connected substations on topo-sheet & relevant Data should be property of GETCO. The utilization of same will be the right of GETCO.

3.10 The successful bidder has to provide technical as well as administrative service back up to the GETCO for 1 year after successful completion of Project without demanding extra cost. The bidder has to resolve the quarries within 3 days.

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4. Qualifying Requirements:

i.) In order to qualify and be eligible to submit Bid Proposals, the bidders shall have requisite resources in terms of professional competency (including adequately qualified staff and Electrical/IT Engineers and financial soundness to complete the whole package within the stipulated time period. To this extent, the bidder(s) shall enclose the necessary documentary evidence with the bid.

ii.) The Bidder shall not be anticipating any ownership change or change of consortium partners during the period from Bid submission to at least two years after successful commissioning of the contracted job and acceptance of the same by the GETCO.

iii.) The bidder must have done GPS Survey job in any of the SEB’s of India, or utilities like power grid, NTPC etc., or any power transmission or distribution company of India. Also, the bidder shall give full details of order executed. The bidder should have done at least 2 jobs involving not less than 2500 locations per job of any voltage class within last 5 years including modern GPS survey & plotting of collected co-ordinates on map, & creation of digital map, superimposing of route map of line on topo-sheet and base map.

iv.) The bidder should produce certificate of successful utilization regarding project implementation and application is to be produced invariably.

Functional Requirements:

The bidder shall have requisite resources in terms of professional competency, qualified staff and shall be fully conversant with electricity rules & regulations to ensure that adequate safety measures are adopted while carrying out the above work.

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**ANNEXURE- A**

**DOCUMENTS TO BE SUBMITTED WITH TECHNICAL BID.**

<table>
<thead>
<tr>
<th>Sr No</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Details of software provided to be used for viewing 400 KV &amp; 220 KV lines, tower locations &amp; Sub stations with relevant data after creation of digital map of GETCO transmission network &amp; superimposing the same on base map.</td>
</tr>
<tr>
<td>2</td>
<td>Methodology proposed for detailed GPS survey along with list of equipments.</td>
</tr>
<tr>
<td>3</td>
<td>Training programme details</td>
</tr>
<tr>
<td>4</td>
<td>List of GPS survey work done and sample documents</td>
</tr>
</tbody>
</table>

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# ANNEXURE – B

## LIST OF OUTPUT

<table>
<thead>
<tr>
<th>Sr No</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Final GETCO transmission network map after integration/superimpose of GETCO transmission network (digital map) on back ground map with all coordinates &amp; relevant data.</td>
</tr>
<tr>
<td>2</td>
<td>Plotting coordinates, Superimposing of route map of lines, towers, S/s on a topo sheet</td>
</tr>
<tr>
<td>3</td>
<td>Supply of multi user licensed Software for locating 400 KV &amp; 220 KV line towers &amp; its connected substations.</td>
</tr>
<tr>
<td>4</td>
<td>All observations which the contractor thinks would be useful to the future planning of the transmission lines are to be reported</td>
</tr>
<tr>
<td>5</td>
<td>EHT line consisting name of line, voltage class and crossing section and type of towers of all existing line</td>
</tr>
<tr>
<td>6</td>
<td>Wherever the line crosses of the 400 KV line, Railway line, Express highway, National Highway, line route passes over permanent land marks &amp; superimposed the same on toposheet &amp; on base map (digital map)</td>
</tr>
<tr>
<td>7</td>
<td>Forest area: Details of forest area through which transmission line is passing</td>
</tr>
</tbody>
</table>

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### TECHNICAL SPECIFICATIONS FOR HAND HELD GPS

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>SPECIFICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>General: (1) Should have position format in Lat/Lon, UTM/UPS, Maiden head, MGRS &amp; user grid. (2) GPS receiver should be high sensitivity receiver, WAAS enable.</td>
<td></td>
</tr>
<tr>
<td>GPS</td>
<td></td>
</tr>
<tr>
<td>Channels</td>
<td>12 (L1 Code only)</td>
</tr>
<tr>
<td>Integrated Real time</td>
<td>SBAS</td>
</tr>
<tr>
<td>Update Rate</td>
<td>1 Hz</td>
</tr>
<tr>
<td>Time to first Fix</td>
<td>30 seconds (typical)</td>
</tr>
<tr>
<td>Protocols</td>
<td>SiRF, NMEA -0183</td>
</tr>
<tr>
<td>Antenna</td>
<td>Inbuilt</td>
</tr>
<tr>
<td>Casing</td>
<td>GPS, Antenna and Controller in Single Casing</td>
</tr>
<tr>
<td>Acquisition time:</td>
<td></td>
</tr>
<tr>
<td>Warm: Approximately 15 sec.</td>
<td></td>
</tr>
<tr>
<td>Cold: Approximately 45 sec.</td>
<td></td>
</tr>
<tr>
<td>Auto Locate: Approximately 5 Minutes.</td>
<td></td>
</tr>
<tr>
<td>ACCURACY</td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>3 meter or better</td>
</tr>
<tr>
<td>SYSTEM</td>
<td></td>
</tr>
<tr>
<td>Operating System</td>
<td>Microsoft Windows Mobile V 6.1 for Pocket PC includes: - word mobile, excel mobile, internet explorer, outlook mobile.</td>
</tr>
<tr>
<td>Processor</td>
<td>533 MHz processor 128MB RAM</td>
</tr>
<tr>
<td>Data Storage</td>
<td>128 MB non-volatile flash data storage/2GB Expandable with SD CARD (2 GB SD Card should be supplied by supplier.)</td>
</tr>
<tr>
<td>Camera</td>
<td>Integrated Digital Camera (color, 3 megapixel)</td>
</tr>
<tr>
<td>Display</td>
<td>Outdoor color display</td>
</tr>
<tr>
<td>Bluetooth</td>
<td>Bluetooth Wireless</td>
</tr>
<tr>
<td>LAN</td>
<td>802.11 b/g wireless LAN</td>
</tr>
<tr>
<td>Battery Life</td>
<td>All-day internally rechargeable battery</td>
</tr>
<tr>
<td>PHYSICAL</td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td></td>
</tr>
<tr>
<td>Low (no GPS or backlight)</td>
<td>14 hrs</td>
</tr>
<tr>
<td>Normal (with GPS and backlight)</td>
<td>8 hrs</td>
</tr>
<tr>
<td>Battery</td>
<td>Internal 2600 mAh lithium-ion, rechargeable in unit</td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
</tr>
<tr>
<td>Operating Storage</td>
<td>0 Deg to +60 Deg C -20 Deg to +70 Deg C</td>
</tr>
<tr>
<td>Back Ground Maps</td>
<td>Include high resolution photos with your GIS data collection, Uploading &amp; Downloading of direct AutoCAD drawing.</td>
</tr>
<tr>
<td>Seal &amp; Signature of Bidder</td>
<td></td>
</tr>
</tbody>
</table>
Annexure –T

- Asset Data & attributes

(A) Creation of Attributes for Tower (Height of tower, Type of tower etc.), Line (name of Line, Voltage class, Conductor etc.), Line maintenance Schedule, Tower maintenance schedule, Drg. etc. all relevant databases shall be provided by GETCO.

(B) Substation: - Creation of S/s database, equipment operation database, Maintenance data base, failure reports, Tripping reports etc. shall be provided by GETCO.

- However, the other relevant data/parameter over and above mentioned shall be finalized at the time of issue of order.

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