GUJARAT ENERGY TRANSMISSION CORPORATION LTD.
SARADAR PATEL VIDYUT BHAVAN,
RACE COURSE, BARODA – 390 007.

TECHNICAL SPECIFICATION

FOR

AUTOMATIC UNDER FREQUENCY LOAD SHEDDING PANEL

GETCO / E / TS – CRP 3603 / R3 Dt. 01.11.2025

GETCO Approved Make and Model Number are as per below

Company - GE
Model No - P142

Application-AUFLS

Company- ABB
Model No -REX615
Application-AUFLS

Bidder has to supply GETCO Approved make and model of UFR relay in the tender. Other make and

model shall not be allowed.

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SECTION –I I

Technical Specification of Automatic Under Frequency Load Shedding Panels

1.1. **SCOPE:**

This specification covers the manufacture, assembly, testing at manufacturer's works, supply and delivery of Automatic under Frequency Load Shedding panels complete with wiring, meters, relays, control switches and other miscellaneous equipments specified herein-after, in this Specification.

1.2. **STANDARDS:**

1.2.1 The AUFLS panel and materials covered by this specification shall comply with the requirements of the latest edition of the following standards including Annexure II as amended up to date except where specified otherwise in the specifications.

(a) A.C. Electricity meter: IS: 722 (Part –I & IV) (Latest edition)
(b) Indicating instruments: IS: 1248 (Latest edition)
(c)Recording instruments: IS: 6236 (Latest edition)
(d) Protective relays: IS: 3231 & IEC 60255 (Latest edition)

1.2.2 However, in the event of offered AUFLS panels, confirming to standard other than above standards, the salient points of differences between the standards adopted and the specified standards shall be stated in the offer.

1.3 **DRAWINGS** :

1.3.1. Bidder shall submit following drawings with the offer for preliminary scrutiny.
i) Principal dimensional details of automatic under frequency load shedding panel.
ii) Front and rear views of the panels with instrument, devices and relay positions marked. iii) Details of under frequency protection schemes and annunciation system offered with its leaflet.

1.3.2. The successful bidders shall furnish the following drawings for approval to the purchaser, within twenty days of receipt of order.

a) General arrangement drawings of Automatic Under Frequency Load Shedding panels, showing all parts / items mounted on them with height of each along with the complete panel wise list of equipment and list of name plates.
b) Schematic internal wiring diagram of the each panel, showing termination of external wiring.
c) Schematic drawing shall follow TB Nos. as under.
1 – PT Circuits,
2 – Aux. AC & DC supply
3 – Control Circuits,
4 – Annunciation Circuits,
5 – RTU / Spare, B – Bus wires

Details of all switches.

d) Outline drawings and internal wiring diagrams of all instruments, relays and other parts / items.
e) Outline drawings, mounting details, internal wiring diagram and item wise bill of material for all devices not located in bidders panels, but supplied by him with the panels.
f) Complete diagram (A.C. Schematic), covering all elements. They shall show all A.C. Power connections, and secondary connections for relays, meters etc. with vector representation.
g) Complete schematic control diagrams of all parts / items controlled from the panels, including synchronizing circuits, if required. These diagrams shall show complete internal circuits of the controlled parts / items and clearly indicate the terminal markings for extra connections.
h) Complete schematic drawing for annunciation system with various purposes for which it is suitable.
i) Foundation drawings including cable cutouts and floor plans of Automatic under Frequency Load Shedding panels.
j) Locations of cable slots for bus wires and weights shall also be given on these drawings.

1.3.3 The successful bidder may submit any other drawing found necessary in addition to the drawings stated above.

1.4 **DETAILED DESCRIPTION** :

1.4.1 **Construction of panel and detailed description :**

1.4.1.1 The Automatic Under Frequency Load Shedding panel shall be of simplex type and comprise of one vertical stationary front panel, provided with single doors (fitted and lockable with latches at three points) on the rear. However, for SAS (Substation Automation System) projects panels shall be with front opening only having swing frame and full duplex transparent front door with dimension of 900 mm (W) x 750 mm (D) x 2312 mm (H). The bidder has to get confirmation about panel construction in well advance from the purchaser.

1.4.1.2 The Automatic Under Frequency Load Shedding panels shall be fabricated out of structure leveled, finished sheet steel of minimum thickness 3mm for front side and 2.5mm for all other sides and necessary stiffening members. They shall form rigid, unyielding free standing, completely assembled enclosures, and neat in appearance. All structural members shall be bolted or welded together. All joints shall be made flush and all edges shall be bent at right angles and rounded. Necessary arrangements shall be made for bolting the adjacent panels together as well as for fastening them to the floor. Suitable vibration absorption devices and kick-plates along the base shall be bent at right angles and rounded. The opening required for mounting the parts / items shall be punched or cut and filed smooth.

Panel shall be painted first with anti rusting paint and then by two coats of synthetic enamel grey paint of shade 631 of IS: 5 for exterior and white for interior respectively.

1.4.1.3 **Dimensions** :

The dimension of the panels shall be as nearer as those stated below.

Height - 2312mm including M.S. frame of 50 x 50 x 4mm size for base

Depth - 610mm

Width - 610 mm

1.4.1.4 Under frequency relay and instruments shall be mounted on the front door of the panel and not on the moving part of the panel. The panels shall be completely metal enclosed and shall be dust moisture and vermin proof to meet the requirements to IP54: of IS 2147. They will be suitable for tropical climate. The panels shall be supplied complete with wiring, through wiring supports, interior lighting device, wiring, terminal blocks, space heaters, channels, base grounding M.S. bolts, nuts, washers etc.

1.4.1.5 All doors and removable covers shall be gasket all round with neoprene gaskets.

1.4.1.6 Design, material selection and workmanship shall be such as to result in neat appearance inside and outside with no weld, rivets or bolt heads apparent from outside and with all exterior surface true and smooth.

1.4.2 **Name plate and Marking**

Name plates shall be with black background with white engraved letters. Each part / item on the panels shall, also, have an appropriate nameplate. Nameplates for relays shall be marked with their function standard code number.

1.4.3 **Indicating Lamps :**

Indicating lamps shall be of “LED” type the supply for which shall be 110V/220V D.C unless stated otherwise. Lamp covers shall be preferably of screwed type, unbreakable and molded from heat resisting material. They shall be translucent to diffuse light. The overall diameter of lamp shall be 30 mm while that of cut out shall be 22.5 mm.

1.4.4 **Annunciation System :**

1.4.4.1 General :

Alarm annunciation system shall be provided for the control board in order to draw the attention of the operator to the abnormal operating conditions or the operation of AUFLS Scheme.

The annunciation equipment shall be suitable for operation on 220/110V DC in normal conditions and on 230V AC in case the DC supply to Annunciation is failed i.e. it shall work on both AC & DC supply with AC supply as standby.

Annunciation scheme shall have provision of AC fail and DC fail alarm internally without any external relays or wiring. Trip and Non-Trip alarms shall be distinguished by separate Hooter while DC fail alarm shall be through AC Buzzer.

1.4.4.2 **Annunciation :**

The audible annunciation shall be provided by means of a "Bell". The visual annunciation shall be by flickering of a facia window provided on the panel.

1.4.4.3 Warning / Non Trip Annunciation :

This is used during occurrence of an abnormal operating condition, other than the tripping of the circuit breaker / relay. The audible annunciation shall be provided by means of 'Hooter'. The visual annunciation shall be obtained by flickering of the respective facia window.

1.4.4.4 DC Fail Annunciation:

This shall be used for indicating DC fail condition. The audible annunciation shall be provided by means of 'Buzzer'. The visual annunciation shall be obtained by flickering of the respective facia window.

1.4.5 **Relays :**

It shall be as per part-III – Requirement of Automatic Under Frequency Relays.

1.4.6 **Auxiliary Relays :**

It shall be as per part-III – Requirement of Automatic under Frequency Relays

1.4.7 **Electrical Equipment and Wiring :**

1.4.7.1 Electrical equipment furnished by the contractor shall be designed for use under the climatic conditions, prevailing at site. Metal parts shall be protected against corrosion by plating and / or painting. Power & control wiring, shall have insulation of non-hygroscopic type unless specifically stated otherwise.

1.4.7.2 Control wiring shall be securely supported, neatly arranged, readily accessible and connected to equipment terminals and terminal blocks voltage grade 1.1 KV. Each wire shall be provided with identifying ferrule at each end or connecting point. Colour coding of control wiring shall be as per standard modern practice. All wires shall be flexible, multi strand copper wires with
P.V.C. insulation for 1100 volts grade and shall be suitable for specified under frequency panel and shall be of adequate cross section not less than 2.5 mm2 stranded copper wire. The wire shall be flame retardant and vermin proof, type, suitable for the tropical climate.

1.4.8 **Terminal Blocks :**

1.4.8.1 One piece moulded, barrier type, terminal block of non inflammable plastic, having voltage grade of 800 V shall be used complete with washers, and heads strips etc. and stud type terminals. Continuous current ratings for the terminal blocks shall not be less than 45

Amps. At least twenty percent spare terminal blocks shall be provided in each panel and evenly distributed in all TBs. The terminal blocks shall be located at the bottom, on one side of the panel.

1.4.8.2 Purchaser's control cable shall be of 2.5, 4.0 mm^2 size copper. The terminals shall be suitable for connection of copper conductors. In case of 2.5 sq mm size, the number of cables to be taken inside the terminal may be four. Accordingly, the terminal size suitable.

1.4.8.3 The control schemes shall incorporate necessary arrangements for isolation purpose, while testing and checking faults in control and signaling circuits.

1.4.9 **Space Heaters :**

Tubular space heaters of 60 watts with thermostat control of suitable rating for connection to single phase, 240 Volts, A.C. Supply complete with switches conveniently located, shall be provided at the bottom of the cubicle to prevent condensation of moisture. The loss of power shall be low enough to keep the temperature of surface well below permissible limits.

1.4.10 **Safety Earthing :**

Automatic under frequency panel shall be provided with earthing bus of copper having a minimum cross sectional area of 150 sq.mm. Earthing bus shall be securely mounted across the inside base of the panels. Earthing bus shall run throughout the width of panel. It shall be provided with M4 holes and nuts and bolts at a distance of 100 mm .Provisions shall be made for extending earthing bus bar to future adjoining panels. Earthing wires shall be connected by using suitable terminals and clamp connections. Solder connections shall not be employed.

1.4.11 **Switch board lighting:**

1.4.11.1 The switchboard shall be illuminated by 11 W, CFL with fixture including reactor, front cover, etc. The voltage rating shall be 230 Volts, 1Ø, 50 Hertz AC supply. This light shall be operated by door operated push button switches.

1.4.12 **Supporting Steel :**

1.4.13.1 All necessary embedded leveling steel, steel, anchor bolts, channels and other parts for supporting and fastening the panels shall be supplied by the successful bidder.

1.4.13 **Tropicalization :**

Wiring, terminal blocks, relays, instruments meters and control devices shall be suitable for installation in a tropical monsoon area, having a hot humid climate and dry and dusty season with ambient conditions specified Section- II. All equipment and accessories shall be painted by means of spray or dip coating and shall be

protected against fungus growth condensation, vermin and other harmful effects due to tropical environment.

1.4.14 **Painting :**

A suitable rust resisting primer paint shall be applied on the interior and exterior steel surfaces of panel after removing rust by sand blasting, foreign adhering matter of grease, scale etc. An under coat to serve a base and binder for the finishing coat shall be applied. The finishing coat on the exterior of the panels shall be of shade No. 631 (Light grey) of IS 5. Polished cellulose enamel of light grey evenly sprayed on the outside and egg shall white paint evenly sprayed on the inside shall be applied as finishing coat. Sufficient quantity of finishing paint shall be supplied for minor touching up required at site.

1.4.15 **Fire Protection :**

1.4.15.1 All equipment connections and cabling shall be designed and arranged to minimize the risk of fire and damage, which may be caused by fire.

1.4.16 **Test Blocks:**

1.4.16.1 Switch board type, back connected, semi-flush mounting type test blocks having Voltage rating 1100 V and Current rating 45A shall be provided with links.

1.4.16.2 Test Terminal Blocks shall be used to facilitate complete isolation of meters instruments and relays, so that power for testing can be supplied either from the instrument transformers or from an external source.

1.4.16.3 Loose Test Plugs / handles required for online testing of the relays through Test Blocks shall be in the scope of the tender and shall be supplied with the panels. However its quantity shall be 5% of the panel quantity

1.4.17 **Accessories:**

The successful bidder shall supply necessary accessories like test blocks, test links, special terminal boards etc. for testing, operation and maintenance of all relays and meters, as specified.

1.5 **TESTS** :

1.5.1 **Routine & Acceptance Tests:**

Before commencement of supply, one prototype shall be offered for inspection. Mass production shall only be allowed after clearing this inspection. This inspection shall be in addition to the regular lot wise inspection to be offered by the supplier.

The Automatic Under Frequency Load Shedding panels shall be subjected to routine tests according to the relevant standards and to such other tests as may be

required to ensure that each panel is satisfactory and in accordance with this specification. The Purchase reserves the right to witness all the tests and advance intimation shall be given regarding these tests. Test reports of all such tests shall be submitted to the purchaser for approval before inspection. Any modification required in the testing procedure shall be made as directed by the Purchaser at no additional cost to the Purchaser. No panel shall be despatched from the manufacturer's work before the relevant tests reports have been approved by the purchaser. The successful bidder shall send two copies of the certified final test reports to each consignee of all factory tests carried out on each panel, relay, meter, switch, instrument and other devices, which shall furnish complete information including the method of application and duration of test. List of routine tests to be performed on the panel shall, also, be furnished with the offer.

1.5.2 **Type Test :**

The bidder shall submit the reports of the type tests as stated hereunder for the offered item along with the offer, otherwise the offer shall be liable to be rejected. These tests must have been conducted in the NABL approved laboratory within ***last 7*** years prior to date of validation of the offer.

1. Degree of Protection – IP 54

It shall be certified by the successful bidder that the type tests in accordance with the relevant standards have been successfully carried out on all type of relays, meters, switches and other devices being supplied by him. Certified copies of all type tests shall be submitted to the purchaser (two sets). The type tests should not be ***older than 7 years.***

Important Note :

In case of non-submission / partial submission or type test reports of which validity is over, the bidder shall submit pending type test report/s from NABL accredited laboratory, in the event of an order, before commencement of supply without affecting delivery schedule, free of cost to GETCO. Confirmation for above shall be invariably submitted along with technical bid.

1.6 **PACKING AND TRANSPORTATION** :

1.6.1 After satisfactory final inspection and tests and after written approval has been given by the purchaser, the successful bidder shall suitably pack for transportation of panels by rail and road transport and deliver the same to the site. The marking shall include the contact number and the name and address of the consignee.

1.6.2 The supplier shall be responsible for arranging transport to site and shall satisfy himself that the transport arrangements are satisfactory.

1.6.3 The panels may be transported in suitable area with all instruments. Relays, switches and other devices mounted in position and wired. Instrument relays etc. shall be specially covered so as they shall not be damaged during the transportation & handling. Four copies of the packing list shall be sent well in advance before the goods are delivered.

1.6.4 The packing list for each panel shall indicate complete details of the panel being despatched to enable the consignee to identify the parts and to ensure that no part / item stated to have been supplied / transported has either been lost in transit or damaged to initiate procedure for replacement and also to enable loading of insurance claims. If the invoice does not contain full details and if any part has not been specifically mentioned in the packing list & is missing in transit, the supplier shall be responsible for the same and shall supply such parts to the purchaser without any extra cost.

1.7 **TESTING AND COMMISSIONING** :

The bidder has to supply, test and commission all the supplied panels at different GETCO sites without claiming any additional charges. However, the offer price shall be inclusive of the commission charges.

1.8 **GUARANTEED TECHNICAL PARTICULARS** :

The bidder shall furnish complete guaranteed technical particulars of **Annexure III of this specification.** Incomplete details against GTP shall be considered as incomplete offer.

1.9 **INSTRUCTION MANUAL & DRAWINGS** :

1.9.1 A copy of operating, maintenance and erection manuals in English language shall be supplied with each panel.

1.9.2 The manuals shall be bound volume and shall contain all the printed drawings, requisite information for erection, operation and maintenance of the panels and the following particulars.

a) Marked erection prints, identifying the components parts / items of the panels as dispatched with assembly drawings.
b) Performance curves, name plate details and other data of all devices.
c) Complete list of spare parts.
d) All the drawing of the panel

2.1 SYSTEM AND CLIMATIC CONDITIONS :

2.1.1. System details :

(i) System frequency (Hz) : 50
(ii) Earthing. : Solidly earthed.
(iii) AC Auxiliary supply : 1-phase, 2-Wire, 50C/s,230V AC.
: Voltage variation +10% & - 15%

: Frequency Variation ±3%

(iv) DC Auxiliary supply : 2 Wire, 110/220V DC : ± 10%, ungrounded.

2.1.2 Climatic Particulars :

a) Maximum ambient temperature of : 50 Air in shade (^{0}C)
b) Minimum ambient temperature of : 4 Air in shade (^{0}C)
c) Maximum yearly average ambient: 45 Temperature (^{0}C)
d) Minimum yearly average ambient : 30 Temperature (^{0}C)
e) Maximum relative humidity (%) : 95
f) Average number of thunder storm: 15 Days per annum
g) Average annual rain fall (CM). : 115
h) Maximum wind pressure (Kg/M^2) : 150
i) Earth quake acceleration : 0.08 x 2 g.
j) Height above mean sea level : Not exceeding 1000m.

2.1.3 The panels offered shall be suitable for continuous operation at the full rated capacity under the above conditions.

2.1.4 Since the Sub-Stations are near seashore or in an industrial area, the offered shall be suitable for heavily polluted atmosphere.

2.2 **SPECIFIC REQUIREMENTS** :

2.2.2.1 Annunciation :

a) 1 - 18 Way illuminated facia window type alarm annunciation for indication of individual types of faults stated below:-
(i) Stage 'A' Trip (ii) Stage 'B' Trip
(iii) Stage 'C' Trip (iv) Stage 'D' Trip
(v) PT Fail
(vi) Relay Faulty
(vii) DC Fail Annunciation
(viii) Stage 'A' Bypassed (ix) Stage 'B' Bypassed
(x) Stage 'C' Bypassed (xi) Stage 'D' Bypassed
(xii) Stage –A df/dt operated
(xiii) Stage-B df/Dt operated
(xiv) Stage C-df/dt operated

The unit shall be complete with necessary auxiliary relays, bell, hooter lamps, push key units for alarm reset, alarm acknowledgment and lamp test and shall be suitable for operation on 110 Volts / 220 V D.C. It shall be mounted on the front of the panel.

b) 1 - Set of alarm accept, reset and lamp test push buttons.

SEAL OF THE FIRM **SIGNATURE OF BIDDER.**

TECHNICAL SPECIFICATIONS OF AUTOMATIC UNDER FREQUENCY RELAY
PART - III

1.0 SCOPE

1.1 The overall scope of work proposed to be assigned to the successful bidder according to this specification covers the following aspects.

1.1.1 The design, manufacture, testing at manufacturer's works, supply and demonstration of the Automatic under frequency Relay as detailed in the schedule, F.O.R destination supply thereof, testing and commissioning at site.

1.1.2 Design and manufacture of automatic under frequency relays to meet the requirements of desired protection at 66 KV, 132 KV, 220 KV and 400 KV class system.

1.1.2.1 Design and fabrication of Protective Relays along with all necessary accessories like switches, indicating LED etc. to provide self contained and ready to use Protective Relays as per this specification.

1.1.3 Complete testing at manufacturer's works.

1.1.4 F.O.R. destination supply of completely assembled Automatic Under Frequency Relay.

1.1.5 Testing and commissioning of these Automatic under Frequency Relays at site.

1.1.6 It is not the intent to specify completely all the details of the design and construction of Automatic Under Frequency Relays. However, the Automatic Under Frequency Relays shall conform in all respects to high standards of engineering, design and workmanship as mentioned in clause 4.0 and shall be capable of performing continuous commercial operation up to the supplier's guarantee. In a manner acceptable to the purchaser, who will interpret the meaning of drawings and specifications, and shall have the power to reject any work of material which, in his judgment is not in accordance therewith. The offered Automatic Under Frequency Relays shall be complete with all components necessary for their effective trouble free operation. Such components shall be deemed to whether those are specifically brought out in this specification and/or the commercial order or not.

2.0 SCHEDULE OF REQUIREMENT

2.1 The consignee details/ Delivery instructions shall be issued by CE (Project) GETCO, Corporate office, Vadodara, to the successful bidder after successful inspection and testing of all relays & equipments at manufacturer's works.

2.2 Any special tools jigs and testing equipment if required for the maintenance/testing of the equipment offered shall be quoted as optional items. Unit prices of such equipment shall be quoted.

2.3 Recommended spares

The bidder shall furnish in his offer, a list of recommended spare with unit rates for Automatic Under Frequency relays that may be required for trouble free operation for a period of 10 years. The purchaser reserves the right of selection of items and quantities of these spares to be ordered.

3.0 STANDARDS:

Unless otherwise specified elsewhere, in this specification, the rating, performance and testing of Automatic Under Frequency Relays shall conform to the latest revisions, available at the time of placement of order of all relevant standards.

However the supplier shall submit the copies of English version of the relevant standards applicable to the Automatic Under Frequency Relays.

4.0 PRINCIPAL TECHNICAL PARAMETERS:

The Automatic Under Frequency Relays covered in these specifications shall have the technical requirements listed in **Annexure – III.**

5.0 GENERAL TECHNICAL REQUIREMENTS:

5.1 SCOPE OF WORK.

5.1.1 Supply of Automatic Under Frequency Relays as specified in accompanying **schedule `G'** and in this specification together with such auxiliary equipment and materials as required. The bidder shall indicate make, type and designation of each Automatic under Frequency Relays in the bid.

5.1.2 Preparation and furnishing of all the required drawings.

5.1.3 Testing of Automatic Under Frequency Relays and associated equipment and furnishing of test certificates

5.1.4 Preparation and furnishing of commissioning instructions, operation and maintenance manuals with all operational features/optional features.

5.1.5 The successful bidders have to submit **three sets of all types of drawings**, **operation and maintenance manuals.**

5.2 GENERAL REQUIREMENT FOR THE AUTOMATIC UNDER FREQUENCY RELAYS:

Design, material selection and workmanship shall be such as to result in neat appearance inside and outside with no weld, rivets or bolt heads apparent from outside and with all exterior surface true and smooth.

5.2.0 RELAYS:

5.2.1 All relays shall confirm to the requirements of IS: 3231/IEC-60255. Relays shall be suitable for flush or semi-flush mounting on the front with connections from the rear.

5.2.2 All AC operated relays shall be suitable for operation at 50 Hz. AC voltage operated relays shall be suitable for 110V VT secondary All DC operated relays and timers shall be designed for the DC voltage specified, and shall operate satisfactorily between 80% and 110% of rated voltage. Voltage operated relays shall have adequate thermal capacity for continuous operation.

5.2.3 The Automatic under Frequency relays shall be suitable for efficient and reliable operation of the protection scheme described in the specification. Necessary auxiliary relays and timers required for interlocking schemes for multiplying of contacts suiting contact duties of Automatic Under Frequency relays and monitoring of control supplies and circuits etc. also required for the complete protection schemes described in the specification shall be provided. All Automatic under Frequency relays shall be provided with at least two pairs of potential free isolated output contacts. Auxiliary relays and timers shall have pairs of contacts as required to complete the scheme contacts shall be silver faced with spring action. Relay case shall have adequate number of terminals for making potential free external connections to the relays coils and contacts, including spare contacts.

5.2.4 All Automatic Under Frequency relays, auxiliary relays and timers except the lockout relays and interlocking relays specified shall be provided with self-reset type contacts. All Automatic Under Frequency relay and timers shall be provided with externally hand reset positive action operation indicators with inscription. All Automatic Under Frequency relays which do not have built-in hand-reset operation indicators shall have additional auxiliary relays with operating indicators (flag relays) for this purpose.

5.2.5 No control relay which shall trip the power circuit breaker when the relay is deenergized shall be employed in the circuits.

5.2.6 Provision shall be made for easy isolation of trip / PT circuits of each relay for the purpose of on line testing and maintenance. Test Block and Test plugs/test handles, necessary for this, shall be included in contractor’s scope of supply free of cost.

5.2.7 Auxiliary seal-in-units if provided on the Automatic Under Frequency relays shall preferably be of shunt reinforcement type. If series, relays are used the following shall be strictly ensured.

a) The operating time of the series seal-in-unit shall be sufficiently shorter than that of the trip relay in series with which it operates to ensure definite operation of the flag indicator of the relay.

b) Seal – in – unit shall obtained adequate current for operation when one or more relays operate simultaneously.

c) Impedance of the seal – in- unit shall be small enough to permit satisfactory operation of the trip coil on trip relays when the D.C supply voltage is minimum.

5.2.8 All Automatic Under Frequency relays shall be provided with one extra isolated pair of contacts wired to terminals exclusively for future use.

5.2.9 The setting ranges of the relays offered, if different from the ones specified shall also be acceptable if they meet the functional requirements.

5.2.10 For numerical relays, the scope shall include the following.

a) Necessary **licensed software** and hardware to up/down load the data to/from the relay from/to the personal computer installed in the substation. However, **the supply of PC is not covered under this clause**.

b) The software shall be suitable for operations like switching, retrieval of information or changing of setting groups, retrieve oscillographic fault data from the relay memory and to store fault record data as oscillographic records in standard COMTRADE format. The software shall be suitable to provide oscillographic data into several different graphical representations that can be used to analyze the fault or event captured by the relay It shall also be possible to calculate additional values from the captured signals and displaying analog curve with time base phasor diagram locus diagrams, harmonic graphs etc. Automatic upload of DR files should be possible. The software shall be suitable for creating / modifying logics of the Automatic Under Frequency relay.

c) The relay shall have communication facility, if specified in the technical requirements listed in Annexure – III, with suitable port for local communication with PC and preferably also for future connectivity to SCADA. In such case the relay shall be capable of supporting IEC- 60870-5-103 / IEC 61850-8-1 protocols, as specified.

d) The relay shall be provided with all the software mentioned in the catalogue.

5.2.11 Any alternative/additional protections or relays considered necessary for providing complete effective and reliable protection shall also be offered separately. The acceptance of this alternative/additional equipment shall lie with the GETCO.

5.2.12 All the bidders have to demonstrate, mentioned fully programmable numerical relays, as may be demanded by the GETCO, free of cost within 15 days after issue of intimation for verifying its functions, features, accuracies etc. the testing shall be performed by fully 3 phase automatic testing set. The relays, which don't meet requirements, don't function as per GTP will not be accepted.

5.2.13 The bidder shall include in his bid a list of installations where the relays quoted have been in satisfactory operation.

5.2.14 All relays and their drawings shall have phase indications as R-Red, Y-Yellow, B-Blue.

6.0 TESTS:

The bidder shall submit the complete type test reports as stated hereunder for the offered relay along with the offer otherwise the offer shall be liable to be rejected. These tests must have been conducted in the NABL approved laboratory as per IEC 60255, IEC 60068, IEC 61000, IEC 60529, IEC 61010-1 within ***last 7 years*** prior to date of validation of the offer.

a. Performance tests:

i. Accuracy requirements ii. Limits of operating range of auxiliary energizing inputs and auxiliary Voltage dependence. iii. Limits of frequency range and frequency dependence iv. Rated burden
v. Mechanical Endurance test
vi. Characteristic and Functional test

b. Thermal requirements:

i. Maximum allowable temperature ii. Limits of short time thermal withstand value of input energizing quantities.
iii. Limiting dynamic value

c. Insulation Tests:

i. Dielectric Tests ii. Impulse Voltage withstand Test iii. Insulation resistance measurement

d. Influencing Quantities

i Permissible ripples
ii. Interruption of input voltage

e. Electromagnetic Compatibility Test:

i. 1 MHZ burst disturbance test ii. Electrostatic Discharge Test iii. Radiated Electromagnetic Field Disturbance Test iv. Electrical Fast transient Disturbance Test
v. Conducted Disturbances Tests induced by Radio Frequency Field
vi. Magnetic Field Test vii. Emission (Conducted and Radiated) Test.
viii. Surge Immunity Test
f. Contact performance Test

i. Contact making/Breaking capacity test ii. Continuous capacity test

g. Environmental tests:

i. Dry Cold Test ii. Dry Heat test iii. Storage temperature test
iv. Damp heat Cyclic test

h. Mechanical Tests:

i. Vibration response & Vibration endurance test

ii. Bump test iii. Shock response test
iv. Seismic test

j. Enclosure Test:

k Degree of Protection test – IP54

l Safety Test:

i. Single fault condition assessment ii. Earth bonding impedance test iii. Mechanical resistance to shock and impact iv. Protection against electrical shock
v. Protection against the spread of fire

The purchaser reserves the right to demand repetition of some or all the type test in the presence of the purchaser's representative. For this purpose the bidder may quote unit rates for carrying out each type test.

Important Note :

In case of non-submission / partial submission or type test reports of which validity is over, the bidder shall submit pending type test report/s from NABL accredited laboratory, in the event of an order, before commencement of supply without affecting delivery schedule, free of cost to GETCO. Confirmation for above shall be invariably submitted along with technical bid.

6.1 Acceptance and routine tests.

All acceptance and routine test as stipulated in the relevant standards shall be carried out by the supplier in presence of Purchaser's representative without any extra cost.

Immediately after finalization of the programme of type / acceptance/ routine / testing the supplier shall give two weeks advance intimation to the purchaser to enable him to depute his representative for witnessing the tests.

6.2 QUALITY ASSURANCE PLAN:

6.2.1 The bidder shall invariably furnish, along with his offer, the quality assurance plan adopted by him/his sub-suppliers in the process of manufacturing all major equipment/component.

6.2.2 Precaution taken for ensuring usage of quality raw materials and subcomponents shall be stated in the quality assurance plan.

6.2.3 The bidder should specifically express their consent to accept additions, revisions to their quality assurance plan to meet the purchaser's requirements if needed. The final quality assurance plan to be adopted, with mutual consent, shall be decided after discussion with successful bidder.

6.2.4 The offers are likely to be rejected if the quality assurance plan & details as per clause No. 6.2.1 **to 6.2.3** are not submitted along with the offer.

7.0 PERFORMANCE GUARANTEE

All Automatic Under Frequency Relays supplied against this specification shall be guaranteed for a period of **24 months from the date of commissioning**.

8.0 DOCUMENTATION:

The bidder shall furnish as a part of their offer, complete set of technical literature/manuals in original, in triplicate copy and typical schematic drawings in respect of each Automatic Under Frequency Relays offered by them.

8.1 Demonstration

During technical scrutiny of the bid, purchaser may ask to give demonstration of the offered Automatic Under Frequency Relays at purchaser's site. The bidder shall demonstrate the Automatic Under Frequency Relays within one week of intimation from purchaser.

9.0 PACKING AND TRANSPORT

9.1. All Automatic Under Frequency Relays/material shall be suitably packed for transport, carriage at site and outdoor storage during transit. The contractor shall be responsible for any damage to the Automatic Under Frequency Relays during transit due to improper and inadequate packing. The cases containing easily damageable material shall be very carefully packed and marked with appropriate caution symbols i.e. `FRAGILE' `HANDLE WITH CARE', `USE NO HOOK' etc. The contents of each package shall bear marking that can be readily identified from the package list and packing shall provide complete protection from moisture, termites and mechanical shocks etc.

9.2 Wherever necessary proper arrangement for attaching slings for lifting shall be provided and all packages clearly marked with gross weight, signs showing `UP' and 'DOWN' sides of boxes, contents of each package, order no. and date, name

of the plant/SS/ of which the material in the package forms part of and any handling and unpacking instructions considered necessary. Any material found short inside the intact packing cases shall be supplied by the manufacturer/supplier without any extra cost.

9.3 Bidder shall ascertain, prior to shipment, from concerned authorities, the transport limitations like weight and maximum allowable package size for transportation. Fragile material such as Instruments and other glass material shall be carefully covered with shock absorbing Automatic Under Frequency materials, such as thermocol, silica gel or equivalent moisture absorbent material in small cotton bags shall be placed inside the packing wherever necessary.

9.4 Each consignment shall be accompanied by a detailed packing list containing the following information.

a) Purchase order No.
b) Name of consignee
c) Details of consignment
d) Destination
e) Total weight of consignment
f) Handling and unpacking instructions.
g) Bill of materials indicating contents of each package
h) Sign showing upper/lower side of the crate.

10.0 SCHEDULES:

10.1. The bidder shall fill in the following schedules which form part of the tender specification and offer. If the schedules are not submitted duly filled in with the offer, the offer is likely to be rejected.

Schedule – B Guaranteed Technical particulars
Schedule – G List of the offered Automatic Under Frequency Relays.

10.2 Unless otherwise brought out separately by the bidder in the schedules of deviations the Automatic Under Frequency relay offered shall be deemed to conform to the specification, as listed in this tender, scrupulously.

10.3 For any deviation from the specification specifically brought out in the schedules shall be supported by authentic documents, standards and clarifications; otherwise the offer may be liable for rejection. Any deviation from the specification shall be highlighted giving reasons and unit prices.

10.4 If the Automatic Under Frequency Relay is being designed and manufactured in collaboration with other manufacturer, the following information shall be submitted by the bidder along with his offer.
a) Copy of collaboration between the bidder and manufacturer.
b) List of orders for offered Protective Relays, executed/ being executed by the supplier.

11 INFORMATION TO BE FILLED IN INVARIABLY BY THE BIDDER:

For ready reference of the purchaser, the items of information required to be invariably furnished by him in his offer, are listed below:

1. Four copies of the authentic English translation of each of the standards to which the offered Protective Relays conforms.
2. Schedule - `B' and `G '.
3. Documents and drawing listed in Clause no. 8.0

12 UNIT RATE FOR OTHER ACCESSORIES.

12.1 The bidder has to submit along with their offer unit rate of all the type of accessories required for trouble free operation of the protective relay for minimum 10 years. The offers without above unit rate are likely to be rejected.

12.2 The above unit rate shall be kept valid till the expiry of guarantee period.

13.0 GUARANTEE FOR MAINTENANCE SPARES AND SERVICES:

The bidder shall guarantee for supplying maintenance spares and services as well as repairing of protective relay for a period of the life **expectancy of** 10 **years**.

14.0 GENERAL:

a. The successful bidder has to provide reproducible tracings/ soft copy for all the drawings as a part of supply contract to the CE (Projects) GETCO, HO, VADODARA for documentation.

b. The successful Bidder has to provide instruction manual, O & M manual, Commissioning manual**,** all drawings, literature etc. for all relays and devices. Detailed circuit diagrams with trouble shooting protocols to all consignee destinations as well as to the ACE (Testing), GETCO, and the CE(Projects) GETCO, HO, VADODARA.

c. The successful bidder has to do **testing/commissioning** of protection relays to be supplied of each type, **by deputing his Service Engineer at free of cost.**

d. The successful bidder has to depute his service engineer along with necessary tools/kits/instruments/testing accessories required for testing, commissioning of relays and devices.

15.0 TRAINING

15.1 The successful bidder shall provide facility for training, at no extra cost to the purchaser's engineers at each circle (13 nos.) at GETCO site. The training shall cover familiarization with procedures of installation, testing, commissioning, operation, maintenance and trouble shooting on the control

and protection relays and equipment. Bidder has to furnish the training module at the time of detailed engineering.

15.2. The programme of the training shall be mutually discussed and finalized by the purchaser with suppliers.

ANNEXURE –I

SCHEDULE OF REQUIREMENT OF DESIRED DELIVERY

Sr.No	Name of Sub-Station	Particulars	Qty.	Delivery Destination
		Successful bidder has to collect the details of substations and locations from CE(Project) , GETCO, Corporate office , Vadodara		

SIGNATURE AND

SEAL OF THE BIDDER

ANNEXURE: II
LIST OF STANDARDS - GENERAL

Sr.No.	Standard no.	Title
1.	IS-3231	Electrical relays for power system protection.
2.	IEC-255 Part 1 to 3	Electrical relays for power system protection.
3.	BS – 142	Electrical relays for power system protection
4.	IS – 1248 IS – 2419	Indicating instruments.
5.	BS – 89	Indicating instruments
6.	IS – 6236	Recorders
7.	BS-90	Recorders
8.	BS – 152	Relay coding, auxiliary wiring and panel and wiring.
9.	IS – 8686	Static protective relays
10.	IS – 2147	Degree of protection for cubicles
11.	IS – 5	Colour for ready mixed paints and channels.
12.	IS – 3842 Part- II to IV	Application guide for protection
13.	IS – 6005	Code of practice for phosphating iron and steel
14.	IS-5578	Guide for making of insulated conductors.
15.	IS – 11353	Guide for uniform system of marking and identification of conductors and apparatus terminals.
16.	IS – 9482-1980	Characteristics values of input and outputs of single side band PLCC terminals.
17.	IS- 9528 Part-1 and 2	Planning of (single side band) power line carrier systems.
18.	IS – 10706 – 1983	Methods of tests for single side band PLC terminals.
19.	IS-8997-1978	Coupling device for PLC systems (note This is to be referred for the PLCC terminal connections.
20.	IEC-686-1	Transducers
21.	IS – 2206	Fuses
22.	IS – 9000	Dry heat test
23.	IEC – 801-4	Electrical heat transient bursts.
24.	IS 694	PVC Insulated cable for working voltage up to & including 1100 volt.

List of IEC Standards – Automatic Under Frequency Relays

Sr. No	Standard No.	Title
Characteristics, Performance, Accuracy, Burden, Mechanical endurance test		
1.0	IEC 60255-6	Thermal requirements , Mechanical Requirements Limiting dynamic value

		Accuracy requirements Rated Burden
2.	IEC-60255-11	Interruption to and alternating component in DC aux. Energizing quantity
3.	IEC-60255-3, IEC-60255-12, IEC-60255-13	Relay characteristic & Performance test
4.	IEC-60255-23	Contact Performance test
Electromagnetic Compatibility type test:		
1.	IEC-60255-22-1, Class-III,	1MHz burst immunity test
2.	IEC-60255-22-2, Class-III IEC-61000-4-2, Class-III	Electrostatic discharge test Direct application Indirect application
3.	IEC-60255-22-4, Class-A	Fast transient / burst immunity test
4.	IEC-, 60255-22-5	Surge immunity test
5.	IEC-60255-22-7, Class-A	Power frequency immunity test
6.	IEC-61000-4-8, Class-V	Power frequency magnetic field test
7.	IEC- 60255-22-3	Radiated electromagnetic field immunity
8.	IEEE/ANSI/C37.90.2	Radiated electromagnetic field disturbance
9.	IEC- 60255-22-3	Immunity to conducted disturbances induced by radio frequency fields test
10.	IEC- 60255-25	Electromagnetic emission tests - Conducted emission test - Radiated emission test
Insulation tests:		
1.	IEC- 60255-5	Dielectric test Impulse voltage test Insulation resistance
Environmental tests:		
1.	IEC-60068-2-1	Cold test Storage test
2.	IEC-60068-2-2	Dry heat test
3.	IEC-60068-2-3	Damp heat test, steady state
4.	IEC-60068-2-30	Damp heat test, cyclic
5.	IEC-60068-2-48	Storage temperature test
CE compliance		
1.	IEC- 60255-26	Electromagnetic compatibility requirements
Mechanical tests		
1.	IEC- 60255-21-1	Vibration
2.	IEC- 60255-21-2	Shock and bump
3.	IEC- 60255-21-3	Seismic
Degree of protection test		
1.	IEC 60529	Degree of Protection Provided by enclosure test

Safety test		
1.	IEC 61010-1	Single fault condition assessment Earth bonding impedance test Mechanical resistance to shock and impact - Rigidity test - Impact hammer test Protection against electrical shock Protection against the spread of fire

ANNEXURE: III

PRINCIPAL TECHNICAL PARAMETERS FOR AUFLS PANEL

Sr. No.	Item	Specification

1	Under Frequency Relay	(A) **Features:** i. It shall be a numerical relay. ii. The relay shall have minimum four plain under frequency stages. iii. The relay shall have minimum three df/dt stages. iv. Each frequency stage shall have timer for definite time delay setting. v. Each df/dt stage shall operate on frequency- rate-of-change (df/dt) function + Basic Frequency setting. vi. The relay shall have adjustable under voltage blocking setting. vii. The relay shall have setting facility through local HMI. viii. Each stage shall have external blocking input contact. ix. Each stage shall have two output contacts viz. one for trip and one for alarm. x. Output configuration for each stage shall be available for any combination viz. Plain u/f, Time Delay and df/dt. xi. The relay shall have adjustable pick up. xii. Relay self supervision output contact shall be available for annunciation. xiii. It shall have a flexible configuration of blocking inputs, protection stages and output relays. xiv. The relay shall have RS 232/ RS 485/RJ45 (Electrical Ethernet)/ OFC serial interface for downloading the parameters to a PC/ Laptop. xv. Interface and Analysis Software shall be provided to programming/ operate the relay from PC/ Laptop & analyze the results. xvi. It shall have continuous self supervision. xvii. The relay shall have high immunity to electrical and electromagnetical interferences. xviii. A communication facility with a choice of standard protocols is preferable. xix. It shall have an event and DR recording facility. The relay shall have 8 Nos. of DR recording facility with each DR of length 3 sec having site configurable pre fault and post fault time. xx. The relay shall have indication for operation of each stage and also relay healthiness supervision. xxi. Relay shall be compatible with IEC-61850 protocol. xxii. The relay shall be compatible with IRIG-B/SNTP

protocol for Time Synchroni

B) <u>Technical Parameters:</u>

(1) Inputs:

i. Rated Voltage: 110 V PT, ±10%

ii. Rated Burden: < 0.5 VA

iii. Rated Frequency: 50 Hz

iv. Continuous Thermal Overload Capacity: 200 V

v. Overload for ≤ 10 s: 230 V

(2) Auxiliary supply:

i. Operative Voltage: 80 – 265 V DC

ii. Burdens: ≤ 20 w

(3) No. of Stages:

i. Minimum 4 plain Under Frequency Stages.

ii. Minimum 3 df/dt stages

iii. Each stage shall have individual Plain U/f, Time Delay and df/dt setting.

iv. Final output shall be combination (and/ or) of any of the three i.e. Plain U/f, Time Delay and df/dt.

(4) Plain Under Frequency:

i. f < 40 – 60 Hz

ii. Resolution: 0.05 Hz

iii. Accuracy: ± 0.03 Hz

iv. Operating Time: 0.1 s

v. Minimum Measuring Volt: 0.25 x Rated V (5)Timer:

i. Definite Time Delay: 0.1 – 10.0 sec

ii. Time Accuracy: ± 1 %

(6) Rate of Change of Frequency:

i. df/dt (Negative): 0.1 – 5.0 Hz/s

ii. In step of: 0.1 Hz/s

iii. Accuracy: ± 0.05 Hz/s

iv. Sample time: 4 – 10 cycles

(7) Under Voltage Blocking:

i. V < 30 – 90 V

ii. Accuracy: ± 5 %

(8) Output Trip Contact:

i. Rated Voltage: 250 V AC/DC

ii. Continuous Current: 5 A

		iii. Current Cap. for 0.5 s: 30 A iv. Breaking Capacity: 220 V DC 1 A 110 V DC 3 A 48 V DC 5 A (9) External Inputs: i. Control Voltage: 20 – 250 V DC ii. Current consumption: < 10 mA (10) Data Communication: i. Serial Port RS 232/ RS 485/RJ45 ,Fiber-optic

		serial bus (Electrical/optical bus connection module powered from host relay in Fiber-optic of serial bus communication) (11) LED Indications: Minimum 7 LED i. P.T fail 1 ii. U/f operation (1 for each stage) 4 iii. Relay Faulty (self supervision) 1 iv. df/dt stage 1 (12) Other parameters: i. Ambient operating Temp. -5^0 – 55^0 C ii. Relay reset push button. iii. LCD/ LED(green) display iv. Flush panel mount case. (13) Binary Inputs: Minimum 8 nos. (Freely assignable to any function.) D.C Voltage : 110/125 V D.C ± 20 % : 220/250 V D.C ± 20 % (14) Binary outputs: Minimum 8 nos. suitable with station auxiliary D.C (as per Binary Input D.C) (Site Programmable)
2	Blocking Timer	**<u>Logic:</u>** On operation of any stage it is **intended** to block that particular stage for a set time and to enable the stage for operation on expiry of the timer count. i. Timer Supply Volt. 110/ 220V DC ii. Timer Range: 0 – 12 Hrs

		iii. In Steps of: 15 min.
3	Trip Relay	**Purpose:** Minimum 8 feeders will be connected to each plain under frequency stage and **24** feeders to df/dt stage for automatic under frequency load shedding. Accordingly trip relay shall be supplied for each stage. It shall be instantaneous with operating time less than 10 ms. It shall be 220/110V DC operated. Be provided with operation indicators
4	No volt relay	PT supply shall be supervised through an under voltage relay. An alarm will be generated on Annunciation for 'PT Fail' A lamp will glow on PT Fail condition. Accordingly the relay should have the output contacts.
5	DC Supervision relay	The relay shall be capable of monitoring the failure of D.C supply to which it is connected. It shall have adequate potential free contacts to meet the scheme requirement. The relay shall have a time `delay on drop-off' of not less than 100ms. And be provided with operation indicator/flag.
6	Annunciator	Microprocessor based and communicable Annunciation Scheme: i. Power supply: DC : 110/220 Volt AC : 240 V A.C (D.C Fail Condition) ii. Push Button: Accept/ Reset/ Test iii. Configuration: 4x3 window

ANNEXURE: IV

AUFLS SCHEME LOGIC

- Four stages will be set as discrete plain under frequency trip with a time delay.
- Three stage will be set as rate-of-change-of-frequency i.e. df/dt which will give final trip command below the set basic frequency only.
- Each plain under frequency stage will trip minimum of 8 feeders through a trip relay.
- df/dt stage will trip minimum of **24** feeders through a trip relay/ relays.
- All the contacts of trip relay provided for each plain u/f stage will have an isolation link.
- Each contact of trip relay provided for each plain u/f stage will be paralleled with one contact of trip relay provided for df/dt stage. But it shall be ensured that the df/dt trip command shall go directly without isolation link.
- Once any stage gets energized and trip executes, the stage will be blocked for the set time through a blocking timer, and after the expiry of blocking timer count the stage will be in service automatically.
- The relay should get blocked below the set input signal voltage i.e. PT.
- An annunciation will be generated on each stage energized for trip.
- An annunciation will be generated for each stage if it is bypassed i.e. the link to that stage is removed.
- The Relay shall have minimum 8 Nos. of Binary Input and 8 Nos. of Binary Outputs. However, bidder has to fulfill the requirement by providing the Auxiliary/Multiplier relay if input/output contacts are less.

SCHEDULE – B

GUARANTTEED TECHNICAL PARTICUALRS FOR AUTOMATIC UNDER FREQUENCY RELAY

(TO BE FILLED BY THE BIDDER AND FURNISH WITH TECHNICAL BID)

The GTP is to be filled up in this format and in the page of tender specifications only, to be submitted in duplicate along with the offer. This is intended for speedy comparison of various bidders GTP. The bidder shall fill in the particulars against appropriate items in respect of each rating and type of Automatic Under Frequency Load shedding panels with Relay offered in broad categories listed below.

Sr. No.	Parameter	Bidders comment
A	**Automatic Under Frequency Load Shedding panels:**	
1	Make	
2	(a) Type of panel (Simplex /Duplex) (b) Equipment mounted in which side of panel (front/rear) (c) No. of doors on which side of panel	

3	Overall Dimensions of Automatic Under Frequency Load shedding panels in mm (Width Depth x Height)	
4	Complete dimension of supporting channel in (mm)	
5	Thickness of sheet steel plates used for panels in mm (a) Front (b) Door frames (c) Base Frame (d) Side (e) Cubicle roof (f) Door	
6	Details of painting (a) IS code of practice for phospating iron and steel in which accordance the sheet steel work is done. (b) Shade no. and IS color (c)Paint thickness in mm	
7	Largest package by Transport (a) Gross weight (b) Overall Dimensions	
8	G.A Drawing attached	
9	Mounting details	

10	Others details if any	
B	**INDICATING LAMPS :**	
1	Make.	
2	Type.	
3	Operating voltage.	
4	Size of lamps	
5	Wattage of lamp. (Watts)	
6	Colour of lamps	
7	Life of LED in burning hours.	
C	**Panel Wiring**	
1	Insulation grade and type	

2	Size of wiring conductor for the following i) P.T. circuits. (mm^2) ii) D.C. supply circuit. (mm^2) iII)Other circuits. (mm^2)	
3	Size of earthling bar for safety earthing. (mm^2)	
4	Type of terminals provided on wiring.	
5	Conductor or material used for earthing	
6	Color and size of the wire used for earthing of different devices in the panel to the earthing bar	
7	Wiring conductor aluminum / copper.	
8	Types of lugs, sleeves and Ferrules to be used for panel internal wiring.	
9	Color code of wiring for following. i) P.T. circuits. ii) D.C. supply circuit. iii) Other circuits.	
D	**Annunciators**	
1	Make	
2	Type	
3	(a) Total no. of window (b) It shall be microprocessor based. (c) Window shall be replaceable. (D) NO/NC Selectable (E) Sequence /Grouping selectable (F) Choice of Colors (G) Choice of Window Sizes (H) Availibity of serial port for communication with type	
	of serial port (I) It shall have repeat relay card (J) A.C/D.C fail facility and LED facia (K) Windows based P.C. software (L) Cables, converters shall also be provided.	
4	Particulars of wiring	

5	Rated voltage. (Volts) (a) A.C (b) D.C	
6	Power consumption. (Watts.)	
7	Instantaneous making capacity of contacts	
8	Breaking capacity	
9	Overall dimensions of annunciator	
10	Availability of Accept/Reset/Test push button	
11	Provision for testing facility for flasher and audible alarm circuit.	
12	No. of points	
E	**Details of under frequency relay such as, type rating,V.A. Burden, Consumption, setting range, characteristics Descriptive leaflet etc to be attached.**	
F	**Un priced schedule of the offered item is attached (Yes/No).**	
G	**Terminal Blocks**	
1	Make	
2	Construction Details	
3	Voltage rating	
4	Current rating	
5	Type of TB for P.T/C.VT or other wiring	
6	No. of 2.5 Sq mm cables that can be connected	
7	No. of spare terminals	
H	**Circuit label**	
1	Material Size and Color	
I	**Auxiliary Relay**	
1	Make	
2	Type & designation	
3	Mounting(flush/semi flush on front/rear)	
4	Nominal voltage and % variation	

5	Contacts (Hand reset/Self reset)	

6	No. of Pairs of Contacts (a) Make Contacts (b) Break Contacts	
7	Speed operation of Relay	
8	Pick up/Drop off ratio	
9	Burden of Relay VA	
10	(a) Contact Rating (b) Voltage © Making Current and duration (D) Breaking Current and Duration	
11	Detail literature furnished	
12	Standard	
J	**Contact Multiplication Relay**	
1	Whenever auxiliary relay is used as contact Multiplication purpose, the relay should be latch type.	
2	Other specification as Auxiliary relay. i) Make ii) Type and designation iii) Nominal voltage and % variation. iv) Contacts, hand reset/self reset. v) No. of pairs of contacts. a) Make contacts b) Break contacts vi) Speed of operation of relay vii) Pick up/drop off ratio viii) Burden of relay – VA ix) (a) Contact Rating (b) Voltage © Making Current and duration (D) Breaking Current and Duration	
3	Detail Literature Furnished	
4	Standard	
K	**Tripping Relays**	
1	Make	
2	Type & Designation	
3	Rating	
4	(i) Operating Principle (ii) Literature write up enclosed	

5	Operating time and rated voltage	
6	Relay Suitable for being continuously monitored	

7	Hand reset/self reset contacts (i) NO. of No/NC contacts (II) Rating of contacts	
L	**Test Blocks**	
1	Make	
2	Type of Test Block (Switch board type & semi flush type)	
3	Voltage Rating of Test block	
4	Current Rating of Test Block	
5	Any other detail	
M	**Features of Under Frequency Relay**	
1	Timer for definite time delay setting with each frequency stage (Yes/NO) Specify the setting range	
2	Under voltage blocking feature with adjustable setting range (Yes/No) Specify the setting range	
3	Have HMI in relay (Yes/NO)	
4	External blocking input contact for each stage (Yes/NO)	
5	Separate output contacts for trip and alarm for each stage (Yes/NO)	
6	Availability of self supervision output contact for annunciation. (Yes/NO)	
7	Communication interface for downloading setting data and configuration. (RS232/RS485/RJ-45/OFC serial)	
8	Analysis software and configuration software shall be applied at free of cost (Yes/NO)	
9	Continuous self supervision (Yes /NO)	

10	In built event and DR recording facility (Yes/NO) (a) Please specify the no. of events can be stored (b) Total length of DR in Sec. (c) Whether DR length is adjustable and segregated in time chunks?	
11	Compatibility with IEC 61850 (Yes/NO)	
12	Total No. of LED Indications (Stage wise/user programmable)	

	Pl. specify in detail	
13	Compatible protocol for Time Synchronization with GPS.	
N	**Technical Parameters**	
(I)	**Inputs**	
1	Rated Voltage	
2	Rated Burden	
3	Rated Frequency	
4	Continuous Thermal Overload Capacity	
5	Overload for ≤ 10 s	
(II)	Auxiliary Supply	
1	Operative Voltage	
2	Burden	
(III)	No. of stages	
1	No. of plain frequency stage	
2	No. of df/dt stage	
(IV)	Plain frequency setting range	
	Frequency range	
	Resolution	
	Accuracy	
	Operating time	
	Minimum measuring volt	
(V)	Timer	
	Definite time delay	
	Time accuracy	

VI	Rate of change of frequency	
	df/dt (negative) setting range	
	Step range for setting	
	Accuracy	
	Sample time	
VII	Under voltage blocking setting range	
	Accuracy for under voltage setting range	
VII	Output trip contact	
	Rated voltage	
	Continuous current	
	Current capacity for 0.5 S	
	Breaking capacity at 110/220/48 V D.C	

IX	External inputs	
	Control voltage	
	Current consumption	
X	Enviromental parameters	
	Ambient oprating temperature range	
XI	Blocking timer logic	
	Timer supply voltage	
	Timer range	
	Step range	
O	**Trip Relay**	
1	Minimum 8 No. of feeders shall be connected with each plain frequency stage (Yes/NO)	
2	Minimum 24 No. of feeders shall be connected with each df/dt stage ?	
3	Agree to supply nos. of Trip /auxiliary relays for above mentioned conditions J1 and J2 and requirement of schemes.	
4	Operating time of trip relay	
5	Make and type of trip relay	

6	Trip relay shall be compatible to 110/220 V D.C (Yes/NO)	
P1	**Supervision of the D.C supply failure for relay (Yes/NO)**	
P2	**Time Delay on Drop off for the D.C supervision Relay in milli seconds.**	
Q	**Supervision for P.T supply for under voltage condition (Yes/NO)**	
R	**No. of Binary Inputs with Contact Rating.** **(a) No. of Binary Input** **(b) contact rating (D.C)** **(c) contact rating (A.C)**	
S	**No. of Binary outputs with Contact Rating.** **(a) No. of Binary Output** **(b) contact rating (D.C)** **(c) contact rating (A.C)**	

SCHEDULE:E
SCHEDULE OF DEVIATIONS FROM SPECIFIED STANDARDS

Sr. No.	Para meter	Stipulation of		Stipulation		Remarks
		Standard Ref.	Stipulation Ref.	Standard Ref.	Stipulation Ref.	

DATE
SEAL OF THE COMPANY
DESIGNATION

NAME OF THE FIRM
SIGNATURE OF THE BIDDER

SCHEDULE: F
SCHEDULE TO INDICATE BIDDERS CAPABILITY

Sr. No.	Order pending with Bidders for Automatic Under frequency panels	Commitment (Against pending orders) during the delivery period guaranteed in this bid.	Capability of supply in terms of rating and quantity per year.
	Order Client Qty.Ref.		

DATE NAME OF THE FIRM
SEAL OF THE COMPANY SIGNATURE OF THE BIDDER
DESIGNATION

SCHEDULE: G
LIST OF EQUIPMENT FOR AUFLS PANELS AND OTHER ACCESSORIES
(TO BE FILLED IN BY THE BIDDER)

Sr.no.	Description	Qty. reqd.	Make and type designation
	Shall be listed as per the requirements of the panel type mentioned.		

Schedule: H
REQUIREMENT FOR FIRST TESTING AND COMMISSIONING OF AUTOMATIC UNDER FREQUENCY LOAD SHEDDING PANEL TO BE CONFIRMED BY BIDDERS

1. The successful bidder has to provide reproducible tracings for all the drawings as a part of supply contract to the CE (Projects) GETCO, HO, VADODARA for documentation.

2. The successful bidder has to supply necessary tools/kits/instruments/testing accessories required for testing, commissioning of relays and devices as a part of supply contract to each consignee / destination

3. The successful Bidder has to provide instruction manual, all drawings, literature etc. for all relays and devices, write up for testing and commissioning procedures, relay setting calculations etc. detailed circuit diagrams with trouble shooting protocols to all consignee destinations as well as to the SE(Testing), GETCO, and the CE (Projects), GETCO, HO, VADODARA

4. The successful bidder has to do first testing/commissioning of AUFLS panel, by deputing his Service Engineer free of cost. The 10% value of order is to be retained over and above the money retained as per payment terms of the GETCO and the same is to be released after satisfactory first testing and commissioning of the panel.

5. The successful Bidder has to offer bare minimum rate per day for services of his Service Engineer for testing and commissioning of AUFLS panel at site on NO profit/No loss basis for the services other than mention in Cl. 4.0 above.