**Section 7. Technical Specifications**

**Procurement of 230 KV SF-6 Circuit Breaker for Sub-Station Division of APSCL**.

| **Item No.** | **Name of Goods** | | **Unit of Measurement** | **Quantity** |
| --- | --- | --- | --- | --- |
| **1** | **2** | **3** | **4** | **5** |
| **Description** | | **APSCL Requirement** |  |  |
| 1 | 1.1 Name of the Equipment | **230 KV SF-6 Circuit Breaker** | **Set** | **03** |
| 1.2 Standard | IEC-62271-100, 60273,60694,60815 |
| 1.3 Type | Live Tank Outdoor SF-6 circuit breaker |
| 1.4 Type of operation | Single Pole Operated |
| 1.5 Country of Origin | G-7 / EU |
| 1.6 Manufacturer | ABB/Siemens/Equivalent |
| 1.7 Ambient Temperature Range | -25/+50° C |
| 1.8 Auto reclose function for pole | 1p+3p |
| 1.9 Operating mechanism | Moto-wound spring |
| 2 | **Insulation Capacity** |  |
|  | 2.1 Maximum altitude above sea level | 1000 m |
| 2.2 Nominal System Voltage, kVrms | 230 kV |
| 2.3 Highest System Voltage, kVrms | 245 kV |
| 2.4.1 -to earth | 460 kV |
| 2.4.2 -across the open breaker | 460 kV |
| 2.4.3 -between phases | 460 kV |
| 2.5.1 -to earth | 1050 kV |
| 2.5.2 -across the open breaker | 1050 kV |
| 2.5.3-between phases | 1050 kV |
| 3 | **Switching Capacity** |  |
|  | 3.1 Time of arc extinction | 20±5 ms |
| 3.2 Rated normal current | 3150 A |
| 3.3 Rated short circuit breaking current | ≥ 50 kA |
| 3.4 Rated duration of short circuit | ≥ 3 s |
| 3.5 Rated frequency | 50 Hz |
| 3.6 Rated operating sequence | O-0.3s-CO-3min-CO |
| 3.7 Rated short circuit making current (peak)/ peak withstand current, Ip | ≥ 100 kA |
| 3.8 First-pole-to-clear factor |  |
| - Terminal Fault | 1.3 p.u. |
| - Short line fault | 1.0 p.u. |
| - Out of phase | 2.0 p.u. |
| 3.9 Rated line charging breaking current | 125 A |
| 3.10 Unloaded overhead lines-voltage factor | 1.20 p.u. |
| 3.11 Rated cable charging breaking current | 250 A |
| 3.12 Unloaded cable-voltage factor | 1.20 p.u. |
| 3.13 Number of operations without maintenance |  |
| 3.13.1 CO at no-load | ≥ 10000 |
| 3.13.2 CO at rated current | ≥ 2500 |
|  | 3.13.3 CO at rated breaking current, Isc | ≥ 5 |
| 4. | **Operating Times** |  |
|  | 4.1 Make time (min.) | To be filled |
| 4.2 Closing time CLOSE 1 (nominal) | To be filled |
| 4.3 Closing time CLOSE 1 (tolerance) | To be filled |
| 4.4 Rated break time | ≤ 50 ms |
| 4.5 Opening time OPEN 1 (nominal) | To be filled |
| 4.6 Opening time OPEN 1 (tolerance) | To be filled |
| 4.7 Minimum Dead time | 300 ms |
| 5. | **Design Data** |  |
|  | 5.1 Number of operating mechanisms per circuit breaker | 3 |
| 5.2 Number of poles | 3 |
| 5.3 Centre distance of steel supporting structure | To be filled |
| 5.4 Height of pillar | To be filled |
| 5.5 Cabinet material | Al or Stainless steel |
| 5.6 Minimum clearance in air, phase-to-earth | To be filled |
| 5.7 Minimum clearance in air, across switching device | To be filled |
| 5.8 Minimum clearance in air, between phases | To be filled |
| 5.9 Pole Centre spacing | To be filled |
| 5.10 Creepage distance, to earth | Min. 25 mm/kV |
| 5.11 Creepage distance, across open breaker | Min. 25 mm/kV |
| 5.12 Type of insulator | Porcelain |
| 5.13 Operating mechanism material | Al or stainless steel |
| 6 | **Rated mechanical terminal load** |  |
| 6.1 Static horizontal force, longitudinal FthA | ≥1750 N |
| 6.2 Static horizontal force, transversal FthB | ≥1250 N |
| 6.3 Static vertical force, Ftv | ≥1500 N |
| 6.4 Dynamic horizontal force, longitudinal Fwx  (N) | To be filled |
| 6.5 Dynamic horizontal force, transversal (N) | To be filled |
| 7. | **Arc quenching medium** |  |
|  | 7.1 Nominal pressure of SF-6 at 20° C | ≥ 6 bar |
| 7.2 Signal of SF-6 loss at 20° C | ≥ 5.2 bar |
| 7.3 General lockout at 20° C | ≥ 5 bar |
| 7.4 Mass of fluid of circuit breaker | To be filled |
| 8 | **Control Unit Data** |  |
| 8.1 Control Voltage | 220 V DC |
| 8.2 Control voltage tolerance | ±10% |
| 8.3 Motor-auxiliary supply voltage | 415 V AC, 50 Hz |
| 8.4 Voltage of Lighting | 230 V AC, 50 Hz |
| 8.4 Voltage of heating | 230 V AC, 50 Hz |
| 8.5 Voltage tolerance | ±10% |
| 8.6 Free auxiliary contacts, wired  (NO/NC/W) | 12 NO+12 NC+1V,  Standard Wiring |
| 8.7 Water-tight corrosion-resistant  Housing | IP 54 |
| 9 | **Design of monitoring** |  |
| 9.1 Number of tripping coils | 2 |
| 9.2 Number of closing coils | 1 |
| 9.3 Voltage of Tripping Coil | 220 V DC |
| 9.4 Voltage of Closing Coil | 220 V DC |
| 9.5 A crank for manual spring loading | Yes |
| 9.6 Accessories in central control panel |  |
| 9.7 Anti-pumping relay | Yes |
| 9.8 Local/remote control selector switch | Yes |
| 9.9 Local operation push buttons | Yes |
| 9.10 Minimum pressure lock out and alarm relays | Yes |
| 9.11 Service outlet (socket)- 230 V AC,  50 Hz | Yes |
| 9.12 Lighting switch | Yes |
| 9.13 Operation counter | Yes |
| 9.14 Motor MCB | Yes |
| 9.15 Time phase discrepancy relay |  |
| 9.16 Weatherproof corrosion resistance enclosure, Al or stainless steel | IP 54 |
| 9.17 Cu earthing rails inside central control cabinet | Yes |

**List of essential spare parts for each SF-6 gas circuit breaker & test report to be supplied by the bidder/tenderer:**

|  |  |  |  |
| --- | --- | --- | --- |
| Sl/  No. | Description of Item | Unit of Measurement | Quantity |
| 1 | 2 | 3 | 4 |
|  |  | APSCL Requirement |  |
| I | 40 Kg SF-6 Gas filled Bottle with Gas Cylinder | Nos. | 03 |
| II | SF-6 Gas refilling kit | Set | 01 |
| II | Trip Coil | Set | 03 |
| III | Closing Coil | Set | 03 |
| IV | Spring Charging Motor | Set | 03 |
| V | LOCAL-NEUTRAL-REMOTE Switch | Pcs. | 03 |
| VI | SF-6 Gas pressure Level Indication device with signaling system | Pcs | 06 |
| VII | 20-250V AC/DC Proximity Sensors for 230kV existing system | Pcs | 20 |
| **required drawings/documents for each SF-6 gas circuit breaker & test report to be supplied by the bidder/tenderer:** | | | |
| VIII | **List of Drawing and Documents:** |  |  |
| a | General outline drawings showing dimensions and shipping weights, quality of insulation media etc. | To be provided |  |
| b | Sectional views showing the general constructional features of the circuit breaker including operating mechanism, arcing chambers, contacts with lifting dimensions for maintenance. | To be provided |  |
| c | Drawing of control cabinet and circuit diagrams for operating mechanism. | To be provided |  |
| d | Schematic diagrams for all the control, supervision circuitries and auto reclosing | To be provided |  |
| e | Structural drawings and loading data for support structures. | To be provided |  |
| f | Foundation plan and loading data and foundation design. | To be provided |  |
| g | Drawings showing the complete operation cycle of the circuit breaker with description. | To be provided |  |
| h | Drawings showing the details of complete opening and closing operation. | To be provided |  |
| i | Operation and maintenance manual | To be provided |  |
| j | Type Test Report | Should be submitted along with tender document |  |
| k | Routine Test Report | To be provided |  |
| l | Lightning impulse withstand test | Test report to be provided |  |
| m | Power frequency voltage dry withstand test after the Lightning impulse test | Test report to be provided |  |

**List of essential test report to be supplied by the bidder/tenderer during delivery of SF-6 Circuit Breaker:**

Circuit Breakers offered shall be fully tested as per IEC in the internationally recognized test laboratory:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sl/  No. | Description of Item |  | Unit of Measurement | Quantity |
| 1 | 2 | 3 | 4 | 5 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Description of Required Test** | **APSCL Requirement** |  |  |
| i | Corona inception and extinction voltage test | Test report to be provided |  |  |
| ii | Temperature Rise and measurement of resistance test | Test report to be provided |  |  |
| iii | Short Time and peak current withstand test | Test report to be provided |  |  |
| iv | Short circuit test duties | Test report to be provided |  |  |
| v | Out of phase closing test | Test report to be provided |  |  |
| vi | Line charging and switching current test | Test report to be provided |  |  |
| vii | Mechanical Endurance Test | Test report to be provided |  |  |
| viii | Tightness Test | Test report to be provided |  |  |
| ix | Degree of protection for all cubicles | Test report to be provided |  |  |
| x | Seismic Test | Test report to be provided |  |  |
| xi | Tests on controlled switching scheme | Test report to be provided |  |  |
| xii | STC withstand test on terminal connector | Test report to be provided |  |  |
| xiii | Temperature Rise and tightness test on terminal connector | Test report to be provided |  |  |
| xiv | Tests on Auxiliary switches | Test report to be provided |  |  |
| xv | Short circuit current making and breaking tests | Test report to be provided |  |  |

NB:

Before Shipment All the Test Report specified in the Technical Specification must be submitted and taken approval from APSCL Authority by the Supplier