

		<p>hold good, and it shall not be necessary for Employer to seek a new license/renew license due to upgradation/change of hardware/machine in Bidder's System at site. All licenses shall be Valid for the continuous service life of the plant.</p> <p>26. The Servers/Workstations/PC Stations to be provided by the Contractor should be latest available in the market for the offered make and model at the time of supply to prevent early obsolescence and shall be subject to Employer's approval.</p> <p>27. The software packages including OS, Application software as per the functional requirement and Anti-Virus Software to be included with the Servers/Workstations/PC Stations (as applicable) shall also be the latest version available at the time of supply. As a customer support, the Contractor shall periodically inform and upgrade the Anti-Virus software of the workstations/servers/switches/firewall as applicable till completion of the warranty period and also till the completion of the AMS period.</p> <p><b>Note:</b> Statutory Approvals and Certificates e.g., PESO, AERB (wherever AERB approval is required, necessary documents for AERB approvals shall be provided by bidder), IBR (wherever applicable) etc.</p>
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Programmable Logic Controller (PLC)		
1.1	Power supply system	<ul style="list-style-type: none"> <li>One extra source of 230 V AC single phase, 50 Hz for auxiliary power supply shall be provided in the panel. e.g. fans, panel lamps, power sockets etc.</li> <li>For each I/O Panel Redundant 24 V DC regulated power supply unit (SMPS) shall be provided for interrogation voltage for digital input and loop power supply for transmitter. SMPS shall be selected with 25% separating The SMPS shall be separate for digital and analog inputs.</li> <li>A separate power supply bus shall be provided for interrogation voltage supply for all inputs and output respectively (even if the input interrogation voltage and output voltage is same).</li> <li>MCBs shall be provided for each rack of the PLC system.</li> <li>20 % spare MCB of each rating (at least one no. of each rating) shall be provided in each panel.</li> <li>In case of Foundation Field Bus, Separate redundant power supply modules shall be considered.</li> </ul>

1.2	Built-in power supply units	<p>The following minimum features shall be provided in the power supply unit mentioned above.</p> <ul style="list-style-type: none"> <li>• Protection against surge protection &amp; short circuit.</li> <li>• Electronic over current protection with feedback feature.</li> <li>• Over voltage protection.</li> <li>• Fuse protection in the input and output circuit.</li> <li>• Diode O’ring shall be envisaged for redundant SMPS.</li> </ul>
1.3	Central processor unit	<ul style="list-style-type: none"> <li>• Minimum 32bit microprocessor based with on board RAM of minimum 8 MB, Battery backup RAM &amp; NV RAM.</li> <li>• Execution time 0.3 millisecond per 1K instruction or better.</li> <li>• Provision to latch desired outputs.</li> <li>• Provided with hot redundant standby CPU (with appropriate communication module).</li> <li>• Fiber optic link shall be provided in between CPU’s for continued applying of data. In case of failure of working CPU, standby CPU shall takeover and maximum data loss shall be for 50ms The processor shall have in-built provision for software timers, counters, examining input conditions, compare, compute, logical, conversion from/ to BCD (Binary coded decimal), bit manipulation, block memory manipulation, diagnostic, shift, sequencing, conditional jumping, subroutine instructions, high speed counting function, PID functions, mathematical functions.</li> <li>• Maximum CPU loading shall be limited to 50% after commissioning.</li> <li>• CPU shall be capable of handling at least more than 10% of the I/O (any mix) required in this project plus an additional 400 I/O of any mix.</li> </ul>
1.4	Input Units	<ul style="list-style-type: none"> <li>• Modular, hot swappable and from the same family as the CPU.</li> <li>• Insulation level of 500V DC.</li> <li>• Input interrogation voltage 24 V DC.</li> </ul>

1.4a	Digital Input Modules	<p>Digital input units shall have the following features:</p> <ul style="list-style-type: none"> <li>• 16 / 32 inputs per module.</li> <li>• Optocoupler / galvanic isolation</li> <li>• LED status indication for each channel.</li> <li>• BCD input units suitable for four-digit input</li> <li>• Pulse inputs (Incremental encoder / digital tacho)</li> <li>• Absolute / incremental encoder inputs.</li> <li>• High speed counter type inputs.</li> <li>• All the cards shall be compatible of receiving digital signals from field sensors and switches directly.</li> <li>• All the control modules / cards shall be lacquered.</li> <li>• Digital inputs with fused terminal with LED indication for fuse blown.</li> <li>• LED status indication in the front of I/O cards.</li> <li>• SSI i/p shall be provided if required</li> </ul>
1.4b	Analog input Modules	<ul style="list-style-type: none"> <li>• Analog input units shall have the following features:</li> <li>• Shall be 4 / 8 / 16 channels,</li> <li>• Suitable for 4-20 mA/4-20 mA HART / 0-10V DC / RTD/ thermocouple / weighing signal inputs / 0-20 mA / 1 - 5 volt.</li> <li>• Differential input shall be provided when specified.</li> <li>• Provided with internal temperature compensation for TC Input with necessary A/D converter having at least 12 / 14bit resolution based on application.</li> <li>• Suitable for J/K/S/E/N/B/R/T type thermocouples &amp; for PT1000/PT100, 2- wire / 3 wire /4 wire</li> <li>• Galvanically isolated with insulation level of 500V DC.</li> <li>• For 4 – 20 mA analog inputs, fused TB with LED for fuse blown.</li> <li>• The healthiness of every input shall be monitored &amp; diagnostic LED indication provided.</li> <li>• Analog module shall have the facility to be configured in voltage or current mode and differential input mode.</li> </ul>
1.5	Output units	<ul style="list-style-type: none"> <li>• Modular.</li> <li>• Insulation level of 500V DC.</li> </ul>
1.5a	Digital Output modules	<p>Digital output units shall have the following features:</p> <ul style="list-style-type: none"> <li>• 16 / 32 digital outputs per module.</li> <li>• Rated for 24 V DC/ 110 V AC</li> <li>• With insulation level of 500V DC</li> <li>• The output module shall be able to drive interposing relays BCD output units shall be as follows: -</li> <li>• Suitable for four-digit output.</li> <li>• Rated to drive seven segment LED displays</li> </ul>

1.5b	Analog output modules	<p>Analog outputs shall have the following features:</p> <ul style="list-style-type: none"> <li>• Shall be of 4 / 8 analog output channels.</li> <li>• Suitable for 4-20 mA / 0-20 mA / +/- 20 mA / 0-10V DC / +/-10V DC, 1-5 V dc outputs as per requirement with necessary D/A converters having 12bit resolution with insulation level of 500V dc.</li> <li>• Each output shall be galvanically isolated &amp; differential type. With short circuit protection.</li> </ul>
1.6	Additional features	<ul style="list-style-type: none"> <li>• Network shall be 100 MBPS/ 1GBPS. However, switch to switch connectivity shall be 1GBPS. Network switch shall be at least layer 2 managed switches.</li> <li>• Communication with computers in distributed hierarchical control system and operator consoles / display units.</li> <li>• High speed communication among Programmable Controller and operator consoles/ display units shall be provided through dual redundant TCP/IP Ethernet using Ethernet cards on HMI station.</li> <li>• The Controller system shall be immune to the following: <ul style="list-style-type: none"> <li>– Radio frequency interference</li> <li>– Electromagnetic interference (EMC compatible)</li> </ul> </li> <li>• The methods and standards followed for these features shall be furnished by the supplier.</li> </ul>
1.7	Mounted spares	<ul style="list-style-type: none"> <li>• Min of 10 % of spare I/Os prewired and at least one spare module of each type.</li> <li>• Provision shall be provided with empty slots/ space for future expansion for 10% I/O modules.</li> </ul>
1.8	Self-Diagnostic features	<ul style="list-style-type: none"> <li>• Parity errors, cycle errors and under voltage</li> <li>• Failure in central processor unit, memory and power supply.</li> <li>• Indication of type of failure.</li> <li>• Automatic turning OFF of all outputs or optionally holding of all outputs in their last state on failure detection.</li> <li>• Fault detection up to card level.</li> <li>• Communication failures – all types of Fuse failure indication for outputs</li> </ul>
1.9	Monitoring functions	<ul style="list-style-type: none"> <li>• Monitoring of internal voltages</li> <li>• CPU Status monitoring</li> <li>• Memory status monitoring</li> <li>• I/O Status monitoring</li> <li>• Address monitoring</li> <li>• Bus &amp; communication signal monitoring</li> <li>• Broken sensor detection</li> </ul>

		<ul style="list-style-type: none"> <li>• A milli ammeter with selector switch shall be provided on panel facia.</li> <li>• monitor the earth leakage current.</li> </ul>
1.10	Termination s	<ul style="list-style-type: none"> <li>• All inputs and output wired up to easily accessible terminal blocks rated for 660V.</li> <li>• Suitable for terminating up to 2.5 sq. mm. copper conductor industrial control cables.</li> <li>• Fuse terminals for all input &amp; output signals (with LED indication).</li> <li>• For different type of terminal input different suitable terminal blocks to be used.</li> <li>• Color coding shall be used for different type of voltage levels.</li> </ul>
1.11	Earthing	<ul style="list-style-type: none"> <li>• Separate earthing bus for power / panel earthing and electronic earthing shall be provided.</li> <li>• Electronic earthing bus shall be suitably insulated.</li> <li>• The panel shall be provided with a continuous bare copper ground bus of suitable size. The ground bus shall be bolted to the panel structure on bottom on both sides. The bolts shall face inside of panels.</li> <li>• The system ground shall be isolated from the panel ground with suitable isolators. All internal component grounds or common shall be connected to the system ground, which shall be fabricated of copper flat (size 25mm x 6mm min., length as applicable).</li> <li>• Shield on instrumentation cables shall be grounded on panel side. System and shield ground shall be connected to separate earthing pit using separate strip and suitable size of cable which shall be in the scope of bidder only.</li> <li>• The panel shall be grounded at two points with a separate electronic earth pit, which shall be connected to the nearest NTPC's electronic earth pit (if any). Separate electronic earthing of PLC and instrumentation if any, shall be in the bidder's scope at mutually agreed location during detailed engineering. Earthing design shall be carried out in accordance with the requirements of CEA regulation 2010 and code of practice for earthing IS: 3043.</li> </ul>
1.12	Enclosure	<ul style="list-style-type: none"> <li>• Conforming to IP-42 class in Programmable Controller room/control room.</li> <li>• Conforming to IP-54 class for remote I/O cubicles located in Plant/field.</li> <li>• In the case of the panel located outside the control room, built-in panel AC shall be provided.</li> </ul>