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| | | instruction of Owner or Engineer-in-Charge within the time limit specified by the Owner or Engineer-in charge. |

## G. Control & Instrumentation Requirements:

| CONTROL & INSTRUMENTATION SPECIFICATIONS | | |
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| **1** | **General** | 1. C&I System shall be envisaged separately for 'CO2 Capture, Compression, and Storage Block' and the 'C-Brick Manufacturing Block'.<br>2. The C&I system shall meet operational requirements and correctly interface with the main process. The scope of work shall also include all material and services to constitute an integrated C&I system together with all accessories, auxiliaries and associated equipment ensuring operability, maintainability, and reliability of plant.<br>3. The operation of plant shall be done through PLC based dedicated control systems - to be provided with local start / stop & indication on control room operator workstation.<br>4. Common / Master PLC shall be Dual processor based i.e PLC system shall be provided with two processors (including main processing unit and memories) one for normal operation and one as hot standby – and should be suitably interfaced with HMI system.<br>5. The CPU system shall have facility of bump less transfer in case of failure of one. In case of failure of working CPU, standby CPU shall takeover and maximum data loss shall be for 50ms.<br>6. The Bidder shall provide software licenses (latest versions) for all software being used in Bidder's System. The software licenses shall be provided for the project and shall not be hardware/machine specific.All licenses shall be valid for the continuous service life of the plant.<br>7. Minimum two (2) number of PC One (1) : OWS and One (1) EOWS, and one printer shall be provided for each control room i.e for 'CO2 Capture, Compression, and Storage Block' control room and the 'C-Brick Manufacturing Block' control room along with suitable console and furnitures .The profile and dimension shall be decided during detailed engineering and shall be subject to Employer's approval without any additional cost. PCs shall have Dual Ethernet interface with LAN accessories for all PC based OWS and EWS shall be provided.<br>8. Above PLC based systems shall be supplied with UPS of minimum 5KVA capacity for each control room. (Actual capacity of UPS may vary based on the number of connected devices/equipment with the |

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| | | system, which will be finalized during detail engineering without any additional cost to NTPC).<br>9. All PLC along with OWS (Operator Workstation) & EWS (Engineers Workstation) shall be powered by 230V UPS power supply along with battery backup of minimum 1 hours shall be in the scope of bidder. The Bidder shall also furnish all required hardware/ equipment/ cubicles / JBs for conversion, distribution and/or stabilization of UPS power source.<br>10. PLC memory shall be field expandable. The memory used for the system shall not exceed its capacity by more than 60% and have extra capability for at least 20% expansion in future.<br>11. A minimum of 10 % of spare I/O-s prewired and at least one spare module of each type. Provision shall be provided with empty slots/ space for future expansion for 10% I/O modules.<br>12. A minimum of 20% spare relays of each type and rating mounted and wired in cabinets TB with termination in terminal blocks should be provided.<br>13. Spare field instruments with sensors: 2.5% of population of each type and size with minimum one (1) number of each type.<br>14. Other supplementary items to be provided: (i) Power Supply Modules & Power Packs, Cooling Fans: 1 No of each type and size, (ii) MCB, Contactors, Connectors: 1 No of each type and size, (iii) Fuses & Relays: 100% of each type & each rating.<br>15. Two-way communication must be established between Individual control room PLCs i.e. 'CO2 Capture, Compression, and Storage Block' control PLC and the 'C-Brick Manufacturing Block' control PLC.<br>16. Remote connectivity for the systems, as mentioned at SN. 15, limited to process viewing only. The bidder must supply the necessary hardware and software to enable remote connectivity, ensuring all required cyber security compliance is met.<br>17. All instruments and equipment shall be suitable for use for specified site climatic conditions, and industrial environment in which corrosive gases and/or chemicals may be present. All electronic instruments and enclosures in field shall be dust proof and weatherproof to IP-65 as per IEC-60529 or equivalent NEMA enclosure rating or better and secure against the ingress of fumes, dampness, insects, and vermin. All external surfaces shall be suitably treated to provide protection against corrosive plant atmosphere.<br>18. The minimum degree of protection Class IP: 55 min. for indoor & IP-65 min for outdoor applications containing electronic components IEC 60529 or equivalent. All field instruments containing electronic |

components shall be protected from direct sun radiation unless they are in shaded area.

19. The redundancy in control system components (Network Switches, controller, etc) Power supply system components shall be designed by the contractor to ensure that malfunction of any single Control system component/ power supply system component etc. shall not lead to loss of any major auxiliary or loss of control function or loss of protection function.
20. All the electronic modules PCB should have conformal coatings that can provide protection against extreme moisture, corrosive gases and aggressive dust, or combinations thereof.
21. The equipment/system shall ensure provision of latest proven state-of-the-art technology to guard against obsolescence.
22. **Compatibility:**
    - All sub packages with its utilities shall be connected to respective control room PLC through a two-way communication link.
    - Bidders shall determine the optimal hardwired and soft signals required to achieve data transfer between all the access points.
    - The contractor shall use approved and standard equipment like convertors and/or adaptor devices etc. required to achieve the above and shall provide an agreement of technical support and support availability. The contractor shall obtain the necessary approval for Licenses authorizing the use of communication equipment at specified frequencies, if required.
23. **Integration signals:**

    For Integration purposes the contractor shall determine all the optimal hardwired and soft signals required to achieve data transfer for integration purposes and hence collect this data.

    The contractor shall obtain the necessary approval for Licenses authorizing the use of communication equipment at specified frequencies, if required.

    Central PLCs must be abled to get interface with other PLC/DCS as per the future requirements via Ethernet or Modbus RS 485 protocol.
24. 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).
25. Bidder shall provide software licenses for all software being used in Bidder's System. The software licenses shall be provided for the project and shall not be hardware/machine specific. That is, if any hardware/machine is upgraded or changed, the same license shall