

**TERMS OF REFERENCE
FOR THE SUPPLY, DELIVERY, INSTALLATION, TESTING, TRAINING, AND
COMMISSIONING OF MACTAN DISASTER RECOVERY FACILITY (DRF)**

I. OVERVIEW

Acknowledging the importance of Numerical Weather Prediction (NWP) as a major tool for forecasting weather in a span of few hours to several days, PAGASA, in 2010, invested in a high performance computing facility. Since then, this facility sufficiently provides the necessary computing capability needed to forecast critical mesoscale structures associated with convective scale systems. Lately, however, there is an increase of sectors who are clamoring for a more tailored-fit and complex forecasts that entails higher computing requirements which led to the procurement of a new supercomputing system that aspires to fulfill the needs of the public in terms of weather and climate forecasts.

As the demand on weather and climate products of PAGASA increases, the inevitability of service outages is of utmost concern. In the event of any unexpected incident that may result to the inoperability of the computing facility in the Central Office, the proposed facility in Mactan, Cebu is critical to keep systems online. This facility will host PAGASA operational model, forecast, and archive systems.

II. APPROVED BUDGET FOR THE CONTRACT

The Approved Budget for the Contract is **THREE HUNDRED MILLION PESOS (Php300,000,000.00)** inclusive of Value Added Tax (VAT), custom duties, and other government taxes. (See Annex A, B, C, and D for Cost Breakdown)

III. BID VALIDITY

The bid proposals shall remain valid for a period of one hundred and twenty (120) calendar days from the date of submission of bids.

IV. QUALIFICATIONS OF THE BIDDERS

(Please refer to Section II. Instructions to Bidders, the Bid Data Sheet and Checklist of Eligibility and Technical Requirements of the Bidding Documents)

In addition, thereto, all bidders:

1. Must have at least five (5) years of experience in the installation of HPC and of providing computing resources intended for scientific and technical problems on the premise of computer simulation. Bidders should submit proof of completed/awarded contracts of similar scope
2. Must be in the business of renovation, maintenance or build of data center; renovation, maintenance or build of offices, buildings; renovation, maintenance or build of local or wide area wired or wireless data, voice and video network

communication; software and hardware programming and distribution; System integration. Must submit proof (SEC Articles of Inc. – Primary purpose or equivalent, Mayor's permit, Company profile).

3. Must be an ICT company with Contractors license issued by Philippine Contractors Accreditation Board (PCAB) with the following required Category and classification:

a. PRINCIPAL CLASSIFICATION:

General Building with minimum category of "A"

b. SPECIALTY CLASSIFICATION:

- Communication Facilities
- Electrical Works
- Mechanical works
- Fire Protection works
- Air-conditioning and Refrigeration works
- Painting works

PCAB must be valid at the time of the proposal submission until the awarding. Should the said license expire prior or while construction is ongoing, the winning bidder must renew it accordingly and furnish documentary proof of its renewal and/or extension. Submit proof (Valid PCAB License/Renewal extension and/or proof of payment for renewal, Mayor's permit)

c. Must have Sustaining Technical Employee (STE) on its roster of employees registered with DTI-PCAB under the name of the bidder.

- Architect
- Civil Engineer
- Electrical Engineer
- Mechanical Engineer
- Electronics and Communications Engineer

Must submit proof (valid PRC license, STE Affidavits, training certificates)

d. Must have the following personnel:

- One (1) Project Manager or equivalent

Should be a regular employee with at least ten (10) years of experience in project management, design and implementation; Trained in Total Building Integration Cabling and Project Management; Trained in Premises Cabling Design and Installation; Trained in Wireless LAN; Trained in Precision Air-conditioning System; Trained in Fire Systems Design, Configurations and Installation; Trained in Uninterruptible Power Supply. Submit proof (CV, Certificate of Employment, training certificates, company ID)

- One (1) Facilities Engineer or Safety Engineer

a licensed engineer with at least five (5) years of experience in related field; completed the prescribed course in Occupational Safety and Health by DOLE. Submit proof (CV, PRC License, BOSH & COSH training certificates)

e. Must be an ISO 9001 certified for the provision of providing IT related products and services for:

- Renovation/maintenance, or build of data center
- Build/renovation of data, voice and video communications
- Software and hardware programming and distribution
- Trade of hardware equipment including computing equipment
- System Integration

f. Must be a bonafide institutional member of a Safety Organization of the Philippines (SOPI) within the last five (5) years.

- g. Must have completed, within the last ten years (10), a single contract to be bid, and whose value, must be at least twenty-five percent (25%) of the ABC. For this purpose, the similar contract shall include the following:
- Precision Air-Conditioning Unit (PACU)
 - Uninterruptible Powers Supply (UPS)
 - Fire Suppression System
 - Structured Cabling system – Fiber Optic & UTP Cabling
 - Electrical works
 - Security Door Access System
 - Surveillance System
 - Racks/Server Racks
 - Data Center Enclosure
 - Civil and Architectural works
 - Internet of Things on temperature, humidity and water leak detection
- h. Must be an OEM and/or authorized Business Partner/Reseller of all required major Data Center components. Submit proof (reseller /Partnership /OEM Certification)
- i. Must have at least two (2) regular employees trained in the following fields:
- Uninterruptible Power Supply
 - Precision Air-conditioning
 - Fire Suppression System
 - Surveillance System
 - Structured Cabling System
- j. Must have employees certified in each of the following:
- Certified Information Security Manager (CISM)
 - Certified Information System Security Professional (CISSP).

V. DELIVERY PERIOD AND PLACE OF DELIVERY

The winning bidder shall supply, deliver, install, test, and commission the Disaster Recovery Facility at PAGASA Mactan Complex, Cebu City and conduct the requisite training thereto, within the period of eight (8) months, commencing from the date of issuance of the Notice to Proceed.

VI. BID PROPOSAL CONTENTS

All bidders shall include in its submissions an **Engineering Block Diagram** of the whole computing system, its power supply requirement, including but not limited to the cooling system, the grounding system and other accessories in standard engineering format with complete sets of brochures.

To aid the Procuring Entity in its procurement planning and to ensure a sustainable and continuous operation and maintenance of the computing system, the winning bidder shall be required to include in its bid proposal a list of recommended spare parts, both serviceable and disposable, with their corresponding prices and guarantee their availability in the market within the next eight years.

The winning bidder shall clearly indicate in its bid offer the model number and specifications of the supercomputer system and all other equipment and accessories referred in items, VII. TECHNICAL SPECIFICATIONS AND REQUIREMENTS FOR SOFTWARE, HARDWARE, FACILITY PERIPHERALS, AND NETWORK SYSTEMS and VIII. DRF to be supplied.

These details will allow the **PAGASA-Bids and Awards Committee** to fully evaluate and determine compliance and responsiveness by the prospective bidders to each specific bidding requirement.

VII. TECHNICAL SPECIFICATIONS AND REQUIREMENTS FOR SOFTWARE, HARDWARE, FACILITY PERIPHERALS, AND NETWORK SYSTEMS

1. Software

1.1. WRF Modeling System

The winning bidder:

- a. Shall install the latest official release of WRF-ARW with the following configuration:
 - Outer WRF domain at 12km horizontal resolution and inner nest at 3 km horizontal resolution, both with 30 levels in the vertical; The outer 12 km domain must be run to 144 hrs. The inner 3 km domain must be run to 48 hrs. Both domains must be rerun every 3 hrs.; It should include the use of Sun Grid Engine (SGE) or equivalent or better job management system and the Ganglia Cluster Monitor or equivalent or better cluster monitor; and
 - Web-based Graphical User Interface to allow setting domain configurations and scheduling and monitor runs; and
- b. Must ensure seamless integration with the current system.

1.2. WRF Output Product Generation and Display

The winning bidder must provide a Web-based high-resolution display system that has the following requirements:

- a. Web-based interactive Graphical User Interface (GUI);
- b. Ability to overlay raster, contours, and wind barbs for various WRF output fields from both the outer and inner domains as selected by users;
- c. Ability to display the last five days of WRF output as selected by user;
- d. Ability to allow for high-resolution street-level, topography, and basic country/province mapping backgrounds and provide user selectable data overlay transparency;
- e. Ability to pan, zoom, and animate displayed fields;
- f. Provide cursor readout of data fields; and
- g. Ability to create MP4s of user selected animation.

1.3. Architectural Requirements

The selected architecture for the system must fulfill the following requirements:

- a. Must be based on the Linux operating systems;
- b. Shall utilize clustered servers including head and compute nodes to provide maximum scalability and reliability;
- c. Single point of failure shall be minimized;
- d. Must be able to compile and run all components of WRF including necessary libraries;
- e. Must support parallel applications based on the Message Passing Interface (MPI) standard and should utilize a dedicated, low-latency, high-speed network for the MPI traffic.

2. Hardware

2.1. 1x Master Node Server

- a. Must be branded

- b. Processor: Dual 64-bit 12-core Intel Xeon Gold 5118 at 2.3GHz
- c. Cache Memory:
 - Level 3: 16.5 MB shared inclusive L3 cache per processor
- d. Memory:
 - Configured with at least 64GB DDR4-2666 registered ECC DIMM
 - Expandable to 3TB DDR4 -2666 with 24 DIMM sockets
- e. Internal Disk:
 - Configured with 2x 200GB SATA SSD 2.5inch drives
 - Expandable up to eight (8) SAS/SATA HDD/SSD
- f. RAID Support: Must support RAID levels 0, 1, 5, 6, 10, 50, 60
- g. Video controller: Integrated VGA video port
- h. Network interface:
 - Integrated four (4) 10/100/1000 Base-T Ethernet ports
- i. I/O Interface:
 - Two (2) management ports: One 10/100/1000 Base-T Ethernet port and one RJ-45 serial port
 - 3 USB ports
 - Support up to 3 PCIe 3.0 slots
 - two (2) port QSFP+ InfinibandPCIe adapter
- j. Power Supply: Dual redundant, hot swappable power supply 750 watts
- k. Warranty: 3 years 24x7, 4-hour response

2.2. 26x Compute Node Server

- a. Must be branded
- b. Processor: Dual 64-bit 12-core Intel Xeon Gold 5118 at 2.3GHz
- c. Cache Memory:
 - Level 3: 16.5 MB shared inclusive L3 cache per processor
- d. Memory:
 - Configured with at least 32GB DDR4-2666 registered ECC DIMM
 - Expandable to 3TB DDR4 -2666 with 24 DIMM sockets
- e. Internal Disk:
 - Configured with 1x 120GB SATA SSD 2.5inch drive
 - Expandable up to eight (8) SAS/SATA HDD/SSD
- f. RAID Support: Must support RAID levels 0, 1, 5, 6, 10, 50, 60
- g. Video controller: Integrated VGA video port
- h. Network interface:
 - Integrated four (4) 10/100/1000 Base-T Ethernet ports
- i. I/O Interface:
 - Two (2) management ports: One 10/100/1000 Base-T Ethernet port and one RJ-45 serial port
 - Three (3) USB ports
 - Support up to 3 PCIe 3.0 slots
 - Two (2) port QSFP+ InfinibandPCIe adapter
- j. Power Supply: Dual redundant, hot swappable power supply 750watts
- k. Warranty: 3 years 24x7, 4 hour response

2.3. 1x Infiniband Switch

- a. Must be branded
- b. 36x Infiniband QSFP ports
- c. Non-blocking switching capacity: 2.9Tbps
- d. Port-to-port latency: 200ns
- e. Remote management protocol: SNMP, CLI

f. Features:

- Port mirroring
- Virtual Protocol Interconnect (VPI)
- Quality of Service (QoS)
- Front to back airflow
- Infiniband FDR Link support
- Static routing
- Adaptive routing
- Congestion control
- Forward Error Correction
- Non-blocking ports
- Hot-swappable fan

g. Interfaces:

- 36x QSFP
- 2x 1000Base-T RJ-45 for management
- 1x USB
- 1x serial (RS-232) DB-9

h. Cables:

- 36x Infiniband QSFP passive copper cable 3 meters

i. Warranty: 3 years 24x7, 4 hour response

2.4. 1x Gigabit Ethernet Switch

a. Must be branded

b. 48x RJ-45 auto-sensing (10/100/1000Base-T) fixed ports

c. 32x 10GbE SFP+ ports

d. 1x hot swap expansion module bay

e. Switch Fabric Capacity (full duplex): 260Gbps

f. Forwarding Rate: 193Mpps

g. CPU memory: 1GB

h. Flash memory: 256MB

i. Packet Buffer Memory: 4MB

j. Switch attributes:

- Line-rate Layer 2 switching
- Line-rate Layer 3 routing
- Dual firmware images on-board
- Temperature sensors for environmental monitoring
- Cable diagnostics
- Optical receiver diagnostics
- Switch auditing support

k. Management ports:

- 1x RJ-45 console/management port with RS232 signaling
- 1x Out-of-Band Management Port (10/100/1000Base-T)
- 1x USB Type A port

l. Standard Traffic-Port Features:

- Auto-negotiation for speed and flow control
- Auto MDI/MDIX
- Port mirroring
- Flow-based port mirroring
- Broadcast storm control
- Energy efficient ethernet per port settings

- Port profile support

m. Cables:

- 36x CAT6 RJ-45 cables 5meters

n. Warranty: 3 years 24x7, 4 hour response

2.5. 1x Network Attached Storage

a. Must be branded

b. Processor: 64-bit quad-core Intel Xeon E3-1220v6 at 3.0GHz

c. Cache Memory:

- Level 3: 8 MB shared inclusive L3 cache per processor

d. Memory:

- Configured with at least 16GB DDR4-2400 UDIMM

e. Internal Disk:

- Configured with 4x 2TB 7.2K NLSAS3.5inch drives RAID5

f. Network interface:

g. Integrated two (2) 10/100/1000 Base-T Ethernet ports

- Power Supply: Dual redundant, hot swappable power supply 750watts.

h. Operating System: Windows Storage Server 2016 Standard

i. Warranty: 3 years 24x7, 4 hour response

2.6. 2x Graphics Server

a. Must be branded

b. Processor: Dual 64-bit 12-core Intel Xeon Gold 6126 at 2.6GHz

c. Cache Memory:

- Level 3: 19.25 MB shared inclusive L3 cache per processor

d. Memory:

- Configured with at least 64GB DDR4-2666 registered ECC DIMM
- Expandable to 3TB DDR4 -2666 with 24 DIMM socket

e. Internal Disk:

- Configured with 14x 900GB 15K SAS 12Gbps 2.5inch drives as follows:
 - 2x 900GB 15K SAS drives in RAID 1
 - 12x 900GB 15K SAS drives in RAID 10
 - Expandable up to sixteen (16) SAS/SATA HDD/SSD
 - RAID Support: Must support RAID levels 0, 1, 5, 6, 10, 50, 60

f. Video controller: Integrated VGA video port

g. Network interface:

- Integrated four (4) 10/100/1000 Base-T Ethernet ports

h. I/O Interface:

- Two (2) management ports: One 10/100/1000 Base-T Ethernet port and one RJ-45 serial port
- 4 USB 3.0 ports
- Support up to 4PCIe 3.0 slots

i. Power Supply: Dual redundant, hot swappable power supply 750watts

j. Warranty: 3 years 24x7, 4 hour response

2.7. Tower Desktop Workstation (2 sets)

- Must be branded.

- Processor: 2x Intel Xeon Gold 6130 2.1GHz, 3.7GHz Turbo, 16C, 10.4GT/s 3UPI, 22M Cache, HT (125W) DDR4-2666 1st

- Memory: 32GB (4x8GB) 2666MHz DDR4

- Hard Drive: 2x 3.5" 2TB 7200rpm SATA Hard Drive

- Optical Drive: 8X DVD+/-RW Slimline
- Graphics Card: Dual NVIDIA Quadro 5GB
- Keyboard and Mouse
- Operating System: Redhat Enterprise Linux WS v7.3 with 3 YR subscription
- Others: Integrated Intel AHCI SATA chipset controller (8x 6.0Gb/s), DisplayPort to DVI (Dual Link) Adapter, 1Gbit NIC add-in card (PCIe- Intel)
- RAID: 0 & 1
- Ports:
 - Front: 2 USB 3.1 Type A, 2 USB 3.1 Type C, 1 Universal Audio Jack
 - Rear: 6 USB 3.1 Type A, 1 Serial, 2 RJ45 Network, 2 PS2, 1 Audio Line out, 1 Audio Line in/Microphone
- Slots: 2 PCIe x16, 2 Additional x16 slots with 2nd CPU, 1 PCIe x8 open ended, 1 x16 wired as x 4, 1 x16 wired as x1
- Monitor: 23 - 24" Monitor
- Warranty: 3 years

2.8. Laptop (5 sets)

- Must be branded.
- Display: 15.6" FHD High Refresh Rate 144Hz 3ms IPS-Level Anti-glare Display
- Processor: Intel Core i7-8750H 2.2GHz (Turbo up to 3.9GHz)
- Chipset: Mobile Intel HM370 Express Chipsets
- Standard Hard Drive & Standard Optical Drive: 256GB PCIeNVMe solid state drive + 1TB FireCuda SSHD(Upgradeable) • Graphics Controller: NVIDIA GTX 1070 8GB GDDR5
- Standard Memory: Number of SODIMMS: 16GB DDR4 2666Mhz (Upgradeable - 32GB Max) Two SODIMM Sockets
- Network / Communication: 10/100/1000 Mbps
- 802.11ac 2*2 +Bluetooth 5.0
- Operating System Standard OS: Windows 10 (64-bit)
- Warranty: 3 years

3. Facility Peripherals and Network Systems

3.1. Fire Protection System

- a. The winning bidder shall supply FM 200 fire suppression system and Very Early Smoke Detection Apparatus.

FM 200 suppression System must be provided for the following rooms:

- Server Room
 - Network Rooms (Core Switch and MMR)
 - Battery Rooms
 - UPS Rooms
 - Electro-Mech Room
- b. The system shall be installed by an experienced firm regularly engaged in the installation of automatic FM-200 fire extinguishing systems in strict accordance with NFPA standards.
 - c. All bidder's firm must have a minimum ten (10) years of experience in design, installation, and testing FM-200 or similar fire suppression systems. A list of systems of similar nature and scope shall be provided at the time of proposal.

d. System Description and Operation

- The system shall be total flooding FM-200 extinguishing system designed to provide a uniform concentration of 7%, at normal average ambient temperature, minimum of FM-200.
- The amount of FM-200 to be provided shall be the amount required to obtain and hold the minimum uniform concentration for ten (10) minutes. The winning bidder shall take into consideration such factors as unclosable openings (if any), run-down time of fans, time required for dampers to close (and requirements for any additional dampers), and any other feature of the facility that could affect concentration
- The system shall be actuated by a combination of ionization and photoelectric smoke detectors. Automatic operation in each separate protected area shall be as follows:
- Actuation of one (1) detector in either loop shall:
 - Illuminate the respective zone (circuit) lamp on the control unit.
 - Energize a pre-alarm audible or audible/visual signal associated with that area in which the detector was operated.
 - Actuate door closer/holders on access doors to the protected area.
 - Transmit a signal to the building's fire alarm system
- Actuation of a second detector in the same area, but on the second detection loop, shall:
 - Illuminate the respective zone (circuit) lamp on the control unit.
 - Energize an evacuation audible and visual signal associated with the area in which the detector was operated.
 - Start time-delay sequence.
 - Shut down ventilation system and/or close dampers.
- Discharge of the FM-200 shall occur at the end of time-delay period.
- The system shall be capable of being actuated by manual discharge stations located at each fire exit. Operation of manual discharge station shall duplicate the cross-zones sequence description above, except that time-delay shall be bypassed. The manual discharge station shall be of the electrical actuation type and be supervised at the control panel. Local, manual, mechanical release shall be installed on each pilot cylinder. Systems that do not allow for this type of releasing shall not be permitted.

e. Materials and Equipment

- Materials and equipment shall be standard products of the manufacturer's latest design and suitable to perform the functions intended. When one or more pieces of equipment must perform the same functions, they shall be duplicates produced by one manufacturer. The name of the manufacturer and the serial numbers shall appear on all major components.
- All devices and equipment shall be UL listed and/or FM approved.
- All devices, equipment and components shall be products of the same manufacturer.
- The FM-200 control panel shall perform the functions necessary to operate the detection, control and release of the FM-200 Suppression System. The panel shall accept input from the following types of equipment used to make up the system: smoke detectors, thermal detectors, and manual pull stations. The control unit shall be approved by Underwriters' Laboratories, Inc., and/or Factory Mutual as an FM-200 system control unit. This control unit shall be located as shown on plans.

- The control unit shall be housed in a wall mounted, sheet metal enclosure suitable for protecting electrical circuits. It shall be a NEMA Type 1 metal cabinet with hinged, locked doors.
- The control unit shall operate on 220 volts AC, 50/60 Hz.
- In the event of a loss of rectified power, visual and audible trouble signs shall be activated.
- The control unit shall contain a self-contained, 24 volts DC emergency power supply. The units shall have built-in, rechargeable standby batteries to provide a minimum 24-hour emergency power. A trouble signal will be initiated if battery leads are disconnected or the battery is in an abnormally low state of charge.
- Manual discharge stations shall be of the dual-action type, which will require That an outer door be lifted to expose the actuation door. The concealed Releaseswitch shall be double action SPST. The front shall be suitably labeled. Push button type manual discharge stations shall not be permitted.
- Manual actuation shall bypass the delay and abort functions and shall cause all alarm and shutdown devices to operate the same as if the system had operated automatically.
- The detectors shall be spaced, located, etc., in accordance with the manufacturer's specifications and within the guidelines of NFPA standard 72E.
- Each detector shall have a LED to indicate the status of the detector.
- All wiring shall be furnished and installed by the winning bidder.
- Unless a written variance is obtained, all wiring shall be installed in electrical metallic tubing (EMT) or conduit.
- All system components shall be securely fastened to their support independent of the wiring. Runs of conduit and wiring shall be straight, neatly arranged, properly supported, and parallel and perpendicular to walls and partitions.
- The sizes of the conductors shall be those specified by the manufacturer. Color code shall be used where specified. All wires shall be tagged at all junction points and shall be free from grounds or crosses between conductors. Final connections between equipment and the system wiring shall be made under direct supervision of a factory trained representative.
- All wiring shall be installed to conform to the requirements of the National Electrical Code
- The complete electrical installation of the system and all components shall be grounded in accordance with the National Electrical Code. Abort Stations shall be of the "Dead Man" type and located next to each manual station. The abort stations shall be supervised and shall indicate a trouble condition at the FM-200 control unit if depressed. "Locking" or "keyed" abort stations shall not be permitted.
- Each protected area shall have its own separate supply of FM-200. The system shall be of central storage design.
- The FM-200 shall be stored in floor mounted cylindrical containers. Containers should be super-pressurized with dry nitrogen to 360 PSIG. Containers shall be of high-strength alloy steel construction that complies with the Department of Transportation regulation for refillable pressure vessels and conforms to NFPA 2001. Containers valves shall be actuated by solenoid operation only. Parallel or Series wired initiators shall not be permitted.
- Each agent storage container shall be securely mounted to a rigid

surface. The bracket anchors and mounting surface shall withstand a thrust at 1000 lbs for 5 seconds.

- Discharge nozzles shall distribute the FM-200 throughout the protected area.
- All distribution piping shall be in accordance with the latest requirements listed in NFPA Standard 2001.

3.2. Aspirating Smoke Detections System (VESDA/HSSD)

The system should protect server room false ceiling, return air vent, rack area and below the raised floor areas using highly sensitive LASER-based Smoke Detectors with aspirators connected to properly designed network of sampling pipes and Display control panel. The Bidder shall also make provision in the Aspirating Smoke Detectors to trip AHU and to shut fire dampers if required in the event of fire through the relay contacts. The system will provide an early warning of fire in its incipient stage, analyze the risk and provide alarm and actions appropriate to the risk. The system should be integrated with the proposed BMS and should be with the following functional process:

- a. Continually drawing air into a pipe network attached to a detector unit.
- b. Passing the air through a dual stage filter to remove dirt
- c. Sending the clean air to a laser detection chamber for smoke detection.
- d. Measuring the light scatter caused by any smoke
- e. Processing the detector signal and presenting the smoke level graphically
- f. Communicating the information to a fire alarm control panel thru relay/ input module, a software management system or a building management system.
- g. Design Requirements
 - The System shall consist of a highly sensitive LASER-based smoke detector, aspirator, and filter.
 - It shall have a display featuring LEDs and Reset / Isolate button. The system shall be configured by a programmer that is either integral to the system, portable as well as PC based.
 - The system shall allow programming of Multiple Smoke Threshold Alarm Levels, Time Delays and Faults including airflow, detector, power, filter block and network as well as an indication of the urgency of the fault.
 - It should provide configurable relay outputs for remote indication of alarm and fault Conditions.
 - It shall consist of an air sampling pipe network covering the server room false ceiling, return air vent, rack area and below the raised floor areas to transport air to the detection system, supported by calculations from a computer based design modeling tool.
 - The system should be interfaced with the building fire alarm system / BMS with a dedicated System Management graphics package.
- h. Performance Requirements
 - Shall provide very early smoke detection and provide multiple output levels corresponding to Alert, Action, and Fire 1 & 2. These levels shall be programmable and shall be able to set sensitivities ranging from 0.005 – 20% obscuration / meter.
 - Shall report any fault on the unit by using configurable fault output relays or via the graphics Software.
 - Shall monitor for filter contamination.
 - Shall incorporate a flow sensor in each pipe and provide staged airflow faults.

- Shall have a clean air supply to maintain Laser chamber clean all the time.
- i. Displays on the Detector Assembly

The detector shall have a LED / LCD / Bar graph display for the multiple alarm threshold levels indicated and faults such as detector fault, airflow fault and indication for Isolate and Reset.
 - j. Installations

The winning bidder shall install the system in accordance with the manufacturer's recommendation.

3.3. Rodent Repellent System

- Two numbers of compact, safe, environmentally friendly and non-irritating pest repellent Very High Frequency Oscillator (VHFO) units (each unit with one master control and 6 satellites) are to be installed in DRF and UPS room.
- The entry of Rodents and other unwanted pests should be controlled using non-chemical, non-toxic devices. Ultrasonic Frequency sound wave based repellent system shall be proposed.
- The rodent repellents will be provided in the raised flooring and ceiling to repel the pests without killing them.
- The installed units must withstand high temperatures in false ceilings and low temperatures in cold storages and air locks

3.4. Water Leak Detection System

Water leak detection sensing tape shall be installed in the water prone areas of the DRF and to be integrated with BMS. Water leak detection System shall be integrated with Building Management System (BMS) and designed to protect the Air-conditioned premises and to alert the personnel about the leak in the AC systems. The system shall also be designed to trip the AC when the sensor is activated. Events are clearly reported on LCD/LED display with full English language description of the nature of the fault in the panel. The panels for water leak are located at the BMS room.

a. Components of water leak detection system

- Tape Sensors
- Water Leak detection modules,
- Condensation detectors
- I/O modules
- Sounders

All connected to a control panel

b. Control Panel

- The control panel shall be computerized 6 zone multiplex controller
- The system shall be programmed, armed or disarmed through a control key pad.
- The code to arm or disarm the system shall be changed only by entering a master code.
- The entire system shall be backed up by a maintenance free rechargeable battery to take care of system's power requirements whenever power fails.
- The system shall be totally tamper proof and shall activate an alarm if the control panel is opened, the sensors tampered with or if the system cables are cut even in the disarmed state.

- The system shall log 500 events and optionally printer shall be connected for generating reports.
- The system shall be totally tamperproof and shall activate an alarm if the control panel is opened, the sensors tampered with or if the system cables are cut even in the disarmed state.

3.5. Integrated Building Management System (IBMS)

- This shall provide one central point through which various alerts can be monitored by the graphical user interface of the entire system and should be able to generate reports. Dynamic colour graphics facility should be provided for monitoring and operation of the system without specialist computer skills.
- The systems should consist of “Command and Control” server and other allied accessories to integrate a wide range of critical infrastructure systems to protect from fire, unauthorized entry and surveillance in all areas.
- The IBMS system should be supplied and installed with complete Sensors I/O modules, Direct Digital Controllers, Communication Controllers and Supervisory Software for interfacing with various safety and security systems proposed for the Data Recovery Facility as per this tender. This shall include laying of cabling in duct, conduits and power supply etc., necessary for installation of the system with supply of appropriate type products.
- The necessary terminal blocks that are required for connection of field equipment cables to DDC cables are also in the scope of the winning bidder. The Building Manager deals with a single viewing window which is a screen of PC monitor, known as operator workstation through which the health, status and data of various services are available continuously in the form of ‘Live graphic’. Automatic reporting takes place through an online printer in various forms like Alarm summary, history trend or in any other form of reporting decided by the user.
- The IBMS shall also perform the following general functions.
 - Building Management & Control
 - Serve as operator Man – Machine interface
 - Data Collection & Historisation
 - Alarm Event & Management
 - Trending, Reports & MIS Generation
 - Maintenance & Complaint Management
 - Network Integration
 - It should have the facility to send SMS & Email alert system for critical equipment’s events like failures in UPS Power, Cooling, Fire emergency, etc.
 - It should ensure that the power & cooling units are switched off when the fire breaks off & open the Access doors with siren & alert mechanism as mentioned above.
 - It should integrate UPS systems, PAC systems, addressable Fire detection system, Fire suppression Gas release panel, VESDA, Access control system, CCTV surveillance system and Water Leakage Detector system, as specified in this tender.
 - Also should have facility to add additional temperature monitoring devices and options to integrate other devices like DG, etc. All the above listed Systems communicate with the IBMS on MODBUS RTU Protocol or by other protocol provided by each of the system or by hard wired points to establish the communication for the desired functions of IBMS.

- It should be based on advanced state of art of technology wherein the various sub-systems are seamlessly integrated on a single platform and the IBMS software remains the head end for all the proposed safety and security system.
 - The Screen would incorporate real time values of critical information that may be released by the respective systems. All critical alarms that may be available on the respective system shall pop-up on the Building Automation System Software Screen as and when they appear. The user can acknowledge the alarms and the information is stored in the Audit trail file of the Building Automation System.
- f. System Configuration
- The proposed BMS shall have 2 or 3 levels of intelligence namely:
- DDC Controller
 - Communication Controller or Gateway or Router or I/O Module
 - BMS PC Control Station
- g. Safety
- Intelligent Microprocessor based Fire Alarm & Detection System
 - Gas based Fire Suppression System- NOVEC1230- Hardware interface
 - Water Leakage Detector system
 - VESDA smoke detector system
- h. Security
- Biometric Smart card based Door Access Control
 - CCTV surveillance system
- i. Utilities
- PACU and Comfort Aircons
 - Lighting System
 - Power Meters
- j. Centralized Operation
- PC based Operator console.
 - Integration of all utilities, safety and security systems mentioned in this tender.
 - Main Server based station with BMS application Software.
 - Integrated user friendly Graphic Central Software
 - Report generation, Logging, trending and Print out.
- k. System Architecture
- The proposed system shall:
- Be based on Distributed Network-able intelligent system.
 - Be microprocessor based. Direct Digital Controllers (DDC) shall interface with relays, sensors, actuators and safety & utility systems.
 - Be modular, utilizing industry standard protocols.
 - Allow distribution of system functions such as monitoring and control and graphical user interface etc. through LAN, to allow maximum flexibility and performance.
 - Be capable of remote monitoring through dial up modem or internet or through WEB Browser.
 - Support various third party systems using standard hardware and software to link various functional nodes into a single integrated system.
 - Support communications with a wide variety of control devices and software systems.

- Be capable of generating alarms, operator transactions and system reports. The system shall have provision for connecting to dedicated USB/Serial printer interface or through BMS control station.
- I. Monitoring and Control
- Easily configurable to suit the user specific requirements. There shall be no restrictions on usage of the controllers to specific requirement. All controllers shall thus be seamlessly integrated to the network and systems that require software drivers to be developed for shall not be accepted.
 - All configurations shall be permissible while the system is on-line without interruption to monitoring and control on other controllers. Systems that require going off line for programming/ configuration shall not be acceptable. Specifically, IBMS nodes must not require "re-starting" to implement database changes.
 - The communications driver for a controller type shall be configurable on-line by users with the appropriate security access. The parameters that can be modified based on Device /Controller Type, Communications Port, Baud rate, Device Name, User ID
- m. Communications
- The IBMS system shall provide communications over a variety of physical media topologies like RS-232, RS-485, Bacnet
 - The system shall be capable of supporting many communication links to networks of control devices. Each connection shall operate independently of the others and facilities shall be provided by system displays to individually place the channels in service or out of service.
 - The system shall be capable of supporting many network connected Operator Stations simultaneously.
 - It shall also be possible to configure hardware and software points from the IBMS stations for each of these controller panels using a consistent configuration data format across all panel/controller types.
 - It shall be possible to interface to different types of controllers/devices using an industry standard interface protocols such as MODBUS, BACNET etc. This shall allow simple interfaces to proprietary devices to be interfaced using a standard protocol.
- n. Fail Safe
- The processor outstations should have battery backed RAM for greater than one year and all outstation parameters should be protection in the event of failures. In the event of power failure, all outputs should go to safe or default parameters. The battery life should be a minimum of ten years.
- o. Power Supply & Environment
- Power supply shall operate at 240 V AC using power supply for field devices. A suitable Single Phase 5 KVA UPS with 30 minutes backup support shall be provided by the winning bidder and installed in Ground floor UPS Room.
- p. IBMS Management Station Software
- All bidders shall quote a Master Server & one client software. The management station software must run on a networked environment such as Windows 10 Professional providing kernel level security for access to the network as well as the IBMS database. As a minimum, the Management station software shall have the following packages. Plant Viewer / graphics viewer, Builder package to edit / alter graphics and schematics Log Viewer, Alarm Viewer, Trend Viewer, Object Viewer.

q. Smart Card based Access Control

- Microprocessor, TCP/IP based Main Controller directly on LAN in master slave configuration having 12 door Reader Capacity and controlling I/O or reader board modules as per system requirement. The system should also log the entry and exit records for later auditing and also to be interfaced with proposed IBMS. This system should assist in controlling any unauthorized movement within the restricted server and UPS room area. Four units of IP based electronic access control system at server room entry door, emergency door, ante room and UPS room entry door should be installed for restricted access based on preset access policy.
- Main entry door to UPS and Ante room should be Card based access control and the server room doors will have to be with biometric based Smart Card reader units.
- Exit from doors will be with push button also with Emergency exit switch / Break glass switch
- Electromagnetic Lock (600 lbs) suitable for Single / Double Door with door position sensor & necessary accessories.
- All access records to be captured in software log.
- Enterprise Access Control System Software for 18 readers with 1 client user license with browser based GUI, support integration with Fire security and IBMS system.
- Time & Attendance Module with capability to integrate with Main IBMS Software on the same Platform
- Concealed Cabling with suitable fire retardant power and data cables as per manufacturer recommendation should be carried out in 25 mm dia PVC Conduit.
- The proposed system shall be based on Distributed Network-able intelligent system. The system shall be microprocessor based. Direct Digital Controllers (DDC) shall interface with relays, sensors, actuators and safety & utility systems.
- All configurations shall be permissible while the system is on-line without interruption to monitoring and control on other controllers. Systems that require going off line for programming/ configuration shall not be acceptable. Specifically, IBMS nodes must not require "re-starting" to implement database changes.

r. IBMS PC Control Stations

- The Control stations shall comprise of Personal Computers providing high level operator interface with the system. The terminals shall be capable of providing the operator with the facility for remote system interrogation, control, retrieval/storage of logged data, annunciation of alarms and reports, analysis of recorded data and the formatting of management reports.
- The bidders shall quote in their offer the configuration of PC that is required by them for operation of their Master server & Client Softwares.
- The minimum suggested configuration of the control station shall be suitable for the power supply voltage of 230 V AC +/- 10% 50 HZ + 3%.
- Workstation / Server hardware details (2 Sets):
 - Processor : Intel® Xeon® Scalable processors
 - Processor family : Intel® Xeon® Scalable 5100 series Intel® Xeon® Scalable 4100 series Intel® Xeon® Scalable 3100 series
 - Processor core available : 6
 - Processor cache : 8.25 MB L3

- Processor : Intel® Xeon® Scalable 3104 (6 core, 1.7 GHz, 85W)
- Processor number : 1
- Processor speed : 1.7 GHz
- Maximum memory : 192 GB
- Memory slots : 6 DIMM slots
- Memory type : HPE DDR4 SmartMemory
- Memory, standard : 8 GB (1x 8 GB) RDIMM
- Drive type : 8 LFF SAS/SATA/SSD or 16 SFF SAS/SATA/SSD depending on model
- Included hard drives : None ship standard, 8 large form factor drives supported
- Infrastructure management : Included: HPE iLO Standard with Intelligent Provisioning (embedded), HPE OneView Standard (requires download)
- Optional: HPE iLO Advanced, HPE iLO Advanced Premium Security Edition
- Power supply type : 1 HPE ML110 Gen10 350W ATX FIO Power Supply Kit
- Expansion slots : 5 PCIe 3.0, for detailed descriptions reference the QuickSpecs
- Network controller : HPE Ethernet 1Gb 2-port 332i Adapter
- Storage controller : HPE Smart Array S100i SR Gen10 SW RAID
- Form factor: 4.5U Tower Warranty: 3/3/3 - Server Warranty includes three years of parts, three year of labor, three year of onsite support coverage.

s. IBMS Software

- Based around client-server architecture with a high- performance database for real-time information to local or network-based clients such as operator stations, or to enterprise applications, such as spreadsheets or relational databases.
- Networking solutions to support both local and remote operator stations and field controllers.
- The system also communicates with the PC network to provide a true window into total enterprise through the standard TCP/IP network topologies, ranging from local high-speed Ethernet LAN5 to Wide Area Networks.
- Standard toolbars for all key functions
- Pull-down menus
- Standard building reports
- Pre-engineered point structures
- A building-specific shape library
- Advanced point processing routines
- Most recent / highest priority alarm field on all displays
- Standard status bar on all displays

3.6. CCTV

The CCTV System shall be IP based system with monitoring camera units coupled to a low voltage weather-proof external Passive Infrared Red (PIR) motion detector designed to simultaneously or individually control CCTV switchers and video recorders. The PIR motion detector senses the movement and triggers the recording of the event.

- a. Camera Specifications:
 - IP based camera with motion detector sensor
 - Imager: 1/3" Super HAD color CCD (PAL: 752H x 582V)
 - Horizontal Resolution: 470 TVL
 - Lens: Wide angle (3.6 mm to 126 mm) with optical zoom and auto focus
 - Digital Zoom: 12x
 - Video output: 1.0Vp-p ± 0.1Vp-p, 75 ohms.
 - Sensitivity: 1.0lx (30IRE), 0.1lx (IR Filter OFF), 0.001lx (IR Filter ON, 256 Fields), 0.0001lx (IR Filter OFF, 256 Fields)
 - Signal to Noise Ratio: Greater than 50 dB.
- b. Color Monitor Features:
 - Picture Tube: 21 inch (53 cm) flat square tube)
 - Resolution: Horizontal: 450 TV lines
 - Phosphor: P22
 - Dot Pitch: In-line 0.71 mm stripe
 - Defection: 90° angle
 - NTSC/PAL (auto-sensing)
 - Video loop-through with automatic termination
 - Supports two composite and one S-VHS video input (looping)
 - Audio Input/Output- 2 channels
- c. Digital Video Recorder
 - Stand Alone Digital Video Recorder
 - Built-in splitter for split screen monitoring (1/4/ 9/13/16 split mode)
 - Max. 4TB storage capacity (Through IEEE 1394 port for external HDD)
 - Intelligent file system for managing event recording data
 - Captured video data to be available on demand for a period of six months
 - DVR supports 8 IP camera video channels. Video, Audio, and Text Event-Logs are digitized and stored on two internal hard-drives. Using a 'Proprietary Wavelet Algorithm, average file size is 1 to 5KB while still maintaining clarity high enough for facial recognition easily. Windows' FAT32 formatted HDD is compatible with DVR. The data can be simply
 - 16 sensor inputs and 4 alarm outputs
 - Built-in hardware motion detection (64- division comparison)

3.7. Structured Cabling Components (for 10Gbps Network)

- Central Patch Rack to Communications Room connection
 - Inter rack structured cabling
 - Shall provide cat6 UTP cables, ANSI/TIA/EIA-568B.2 certified
 - Shall provide Fiber Optic Cable, multimode, 50 microns OM3, indoor fiber optic cable connection
 - Shall use 24 ports loaded patch panel on both Data Center rack and Core Switch rack (24 runs of cat6), ANSI/TIA/EIA-568B.2 certified
 - Must use 24 ports fiber patch panel on both Data Center and Core Switch rack
 - Shall include cable manager / organizer
 - Shall provide 3.0 meter Cat6 factory terminated patch cord
 - Shall provide 1.0 meter Multi mode FOC patch cords
 - Shall include appropriate installation and termination
 - Shall include harnessing using Velcro and appropriate tagging
 - Shall include fluke network testing with hard copy result

- Data Center Rack to Server Racks
 - Shall supply and install multimode, 50 microns, indoor fiber optic cable on each racks inside the Server Room
 - Shall supply of 12 ports fiber patch panel on each Server Rack
 - Shall provide cat6 UTP cables, ANSI/TIA/EIA-568B.2 certified
 - Shall provide 24 ports loaded patch panel on each Server Rack ANSI/TIA/EIA-568B.2 certified
 - Shall provide 24 ports loaded patch panel on Central patch rack, ANSI/TIA/EIA-568B.2 certified
 - Shall include factory terminated 3.0 meter MM fiber patch cord (patch panel to switch)
 - Shall include factory terminated 3.0 meter Cat6 patch cord (patch panel to switch)
 - Shall include appropriate installation and termination
 - Shall include harnessing and appropriate tagging
 - Shall include fluke network testing with hard copy result
 - Outdoor fiber optic cable shall be in aerial installation
 - Shall include conduit, hanger, bracket and support peripherals

3.8. Network and User Activity Monitoring (Single Software with the following modules)

- a. Network Performance Monitoring
 - Network scanning, detection of devices and TCP/IP services, web access with browser
 - Interactive network maps, user maps, branches, intelligent maps, pop-up menu with definable own tools
 - simultaneous work of multiple administrators, management of administrator authorizations, administrator access log
 - Response time and correctness, packets received/lost statistics (PING, SMB, HTTP, POP3, SNMP, IMAP, SQL, etc.)
 - WMI counters: CPU load, memory usage, disk usage, network traffic, etc.
 - Windows actions: service status change (start, stop, restart), event log entries
 - SNMP v1/2/3 counters: network traffic, temperature, humidity, power supply voltage, toner level, etc.
 - Routers and switches: port mapping
 - Notifications (on desktop, by e-mail, by SMS) and repair actions (program launch, computer restart, etc.)
- b. Device and Equipment Inventory
 - List of applications and Windows updates on single workstation (registry)
 - List of applications and Windows updates on single workstation (disks scan)
 - Overview of workstation hardware
 - Details of workstation hardware (model, motherboard, CPU, memory, disk drives, adapters, etc.)
 - Hardware and software inventory audit
 - Hardware and software change history
 - Fixed Assets: IT assets register database (defining own fixed asset types, their attributes and values, attachments, data import from CSV file)
 - List of Inventory on Android devices
- c. User Activity Monitoring
 - Detailed work time (activity/break start and end time)

- Blocking of launched applications
 - Visited web pages (number of page visits, with headers, number and duration of visits)
 - Blocking web pages
 - Printouts: audit (per printer, user, computer), printing costs
 - Static remote view of user desktop (without access)
 - Screenshots (user work history “screen by screen”)
 - User activity overview
 - General information on user activity
 - Detailed work time monitoring
 - Application usage monitoring
 - Visited web sites (duration and number of visits)
 - Printing costs and auditing
 - Network traffic generated by the user
- d. Help Desk
- Trouble ticket database
 - Creating and managing trouble tickets (assigning to administrators with e-mail notification)
 - Remote access to machines (an employee and administrator can see the same screen) with possible request for consent from the user
 - Agent and offline scanner for Linux Ubuntu, offline scanner for Mac OSX
- e. Data Guard
- List of devices currently connected to the network
 - Identification of devices on the basis of their serial numbers
 - Defining access rights to selected data media
 - History of operations performed on the devices
 - Access rights created on the device and Active Directory level
- f. Management of Admin Authorization
- Access to application server from a console in a local network
 - Simultaneous work of multiple administrators
 - Varied access rights for different system users
 - View of information from a web browser
- g. Management Server
- (1) set of server hardware with the following specifications:
- At least 3.70Ghz
 - Rackmounted type
 - At least 16 GB of Memory
 - Supports up to 4 fixed hard disk
 - 1 TB of hard disk capacity
 - With Windows Server 2016 Operating System

3.9. Data Center Infrastructure Monitoring (Server Farm)

- a. Supply of Data Center Infrastructure Management (DCIM) software with service agreement for one 1 year with the following features and specifications:
- Data Center Management
 - Application Dependency Mapping / Impact Chart
 - Password Management
 - IP Address Management (IPAM)
 - ITAM (IT Inventory and Asset Management)
 - Agentless Discovery (Auto discovery)

- b. Supply, Install and configure one (1) set of server hardware with the following specifications:
 - At least 3.70Ghz
 - Rackmounted type
 - At least 16 GB of Memory
 - Supports up to 4 fixed hard disk
 - 1 TB of hard disk capacity
 - With Windows Server 2016 Operating System

3.10. PaBX with VOIP Phones

- a. Single system can be expandable up to 384 TDM users or 500 IP users with NO additional hardware.
- b. VoIP Gateway is already integrated on the Main board.
- c. Support up to 2000 users in one network , 1 master and 31 slaves with single administration
- d. Redundant Power Supply
- e. Solid State Storage (MMC min. of 8GB)
- f. The system shall also include a power box and battery back-up for 1 to 2 hours back up time.
- g. Protocol Interoperability. The system must be able to interoperate with other telephone systems and endpoints using E&M, CAS, QSIG ECMA, CORNET, DPNSS, DSS1, H323, & HFA IP, IP/SIP standards.
- h. Connectivity Interface support for Public Switched Telephone Networks (PSTN): Digital and, ISDN Basic and Primary rate access T1/T2, PCM R2 access, SIP Trunks
- i. The IP PABX operating system(LINUX Based) must be proprietary OS based such that it provides reliability and robustness regardless of quantity of subscribers and applications interfaced to it.
- j. System must support global standards.
- k. The system shall be capable of being centrally managed via a web based telephony management application.
- l. System features
 - Auto relocate of phones
 - Direct/Group Pick up
 - Hunt group
 - Call Forwarding Local to Local & FWD to Network
 - Call Back
 - Call Transfer
 - Call waiting
 - Conferencing - minimum 8 party conference
 - Automated Attendant
 - Intelligent System feature prompting
 - Speed dialing
 - TDM Subscriber Auto Relocate
 - DID/DOD
 - Class of service Extension Trunk barring
 - Least call cost routing (LCR)
 - Alternative routing
 - Night service
 - Virtual extensions
 - Integrated wireless telephony (Wi Fi ,DECT)
 - Support SIP (Session Initiated Protocol) extensions

- Hotline (Auto dial)
- Music on Hold
- Class of Service Change over (COS per Extension)
- Voice Calling
- Group Calling For TDM Subscriber & IP subscriber
- Time Reminder For Digital Subscriber
- Telephone Lock
- Associated Dial

m. VoiP Phone

- Cordless, >50 m indoor range and 300 m outdoor range
- 290 hr Standby time and 23 hrs talk time
- Phonebook and 150 address book
- Phonebook transfer via DECT and LAN
- 10 Last dialed
- Automatic dialing of operator prefix
- Direct dial
- Automatic redial function in handset
- Date reminder function and alarm call
- With functional illuminated and graphical display

3.11. OUTDOOR LED Billboard (5m x 4m)

- Outdoor LED
 - Pixel Pitch 6.4 mm
 - Module size (WxH)& Module Resolution 256mm x 256mm&40 x 40
 - Pixel Type 1R1G1B
 - LED Type SMD3535
 - Cabinet Material Aluminum
 - Pixel density (pixels /Cabinet) 25,600
 - Brightness (nits) ≤ 5300
 - Grey Level (bit) 12
 - Color (trillion) 0.068
 - Contrast 1500:1
 - Refresh Rate(Hz) ≥ 1920
 - Driving Mode 1/5 scan
 - Viewing Angle 120°/90°
 - Ingress protection IP64
 - Input Voltage AC 100~240v
 - Max. Input Power (W/m²) 450
 - Ave. Input Power (W/m²) 180
 - Signal Interface AV , S Video, VGA, DVI, HDMI, SDI, DP
 - Comm. Connection Cat 5e, single mode fiber
- LED Video Processor
 - Video Input HDMI, DVI
 - Audio Input HDMI, external audio
 - HD Video source 12 bit, 10 bit, 8 bit
 - Resolution Supported 2048 x 1152, 1920 x 1200, 2560 x 960
1440 x 900 (12 bit/10bit)
 - Supports cascading
 - Additional interface 1 light sensor
 - Gray scale processor/presenter 18 bit
 - Video Format RGB, YCrCb4:2:2, YCrCb:4:4
 - Housing 1U rack
 - Rated Voltage 100 ~ 240vAC

- Rated power 3.2 ~ 2.5 W
- 3.12. Video Controller (2 sets)
 - Seamless (1x3; 2x3) HDMI Matrix Switch HDMI Matrix Selector Switcher with Picture Multiviewer Video Wall Controller
 - Supports video resolutions of 1080p/1080i/720p/576p/576i/480p/480i at 50/60
 - In-built automatic equalisation and amplification to ensure optimum signal transmission without loss in video/audio quality
- 3.13. Video Wall
 - Screen size (inches) 55"
 - Connectivity HDMI, DP, DVI-D, RGB, Audio, IR Receiver
 - Brightness 450
 - Resolution 1,920 x 1,080 (FHD)
 - Supersign Compatibility
- 3.14. Data Cabinet and mounting components (20 sets, high-end)
 - 4 Vertical mount angle type A with RU marking
 - 1 Front door fully perforated with swing handle
 - Snap on site panel plain metal with lock keys
 - Roof fan tray 2 fans
 - 2 Power distribution unit (PDU) vertical, 24 outlets left to right (3 prong Phil. Standard) with plug, power cord #14, monitor display with off/on switch
 - 1 Cable tray (100mmW)
 - 1 pack (30pcs) cagenut with screws
 - 4 caster wheel with levelling feet
 - SES rack 19"W x 42RU outside dimension 600mmW x 1200mmD x 2080mmH
 - Space inside 19"W x 900mmD x 42RU

VIII. DRF

1. Concept

The Facility shall be implemented as per drawings, scope, specifications and general contract conditions following the design and build guidelines as per annex G of IRR RA 9184.

All bidders shall provide detailed cost breakdown for all labor, material tools, equipment, supervision and other related items required to complete the project as per scope of work, specifications and approved working drawings.

All bidders are required to visit the site, verify the existing site conditions to develop their proposal.

The requirements for DRF are the following:

- 10 Car parking slots minimum (including PWD Parking);
- 5 Motorcycle parking area minimum
- DRC composed of:
 - Network Operation Center (NOC)
 - NOC View Deck
 - Server Room
 - Stock Room
 - Staging and Laboratory Room
 - Executive Lounge
 - Main Lobby
 - Production Room

- Telco Room
- Electrical Room
- Mechanical Room
- Male and Female Toilet including PWD Toilet
- Porch
- Fire Exits
- Landscape
- PWD Ramps
- The use of structural steel, steel decking & concrete is considered to speed up the construction.
- Provision of Fire Protection System, PACU, CCTV, PABx System
- Provision of Electrical, Supply and Water supply
- Parking requirements such as signage's, markings etc.

The detailed project cost estimate shall follow DPWH guidelines for preparation of the approved budget for contract (ABC).

The Facility	<ul style="list-style-type: none"> ● Single-Storey Concrete Building with Roof Deck Covered with Structural Steel Long span Roofing.
Project Site	<ul style="list-style-type: none"> ● PAGASA Mactan, Cebu Complex
Project Image	<ul style="list-style-type: none"> ● Quality of materials and workmanship with advance technology in construction meeting target deadlines.
Design Guidelines	<p>The Detailed Architectural and Engineering Design (DAED) shall be governed by the following Design Codes:</p> <ol style="list-style-type: none"> 1. Presidential Decree (PD) No. 1096 National Building Code of the Philippines (NBCP); Annex G <ol style="list-style-type: none"> i. <i>Batas Pambansa (BP) Blg. 344</i>, An Act to Enhance the Mobility of Disabled Persons by Requiring Certain Public Buildings, Institutions, Establishments and Public utilities to Install Facilities and Other Devices. ii. National Structural Code of the Philippines (NSCP), Volume I 2015 iii. Philippine Electrical Code (PEC), 2009 iv. Republic Act (RA) No, 9514, Revised Fire Code of the Philippines v. Revised National Plumbing Code of the Philippines vi. Philippine Society of Mechanical Engineers (PSME) Code vii. Philippine Electronics and Communication Code

2. Space Requirements

Description and Breakdown of Areas	Area per Number of Units
Network Operation Room (NOC)	30.00 sq.m.
View Deck	11.50 sq.m.
Stock Room	21.00 sq.m.
Staging and Laboratory Room	13.50 sq.m.
Server Room	83.00 sq.m.
Executive Lounge	16.00 sq.m.
Main Lobby	16.00 sq.m.
Production Room	30.00 sq.m.
Electrical Room	52.00 sq.m.
Mechanical Room	40.00 sq.m.
Telco Room	21.00 sq.m.
Male Toilet w/PWD Toilet	10.00 sq.m.
Female Toilet w/PWD Toilet	11.00 sq.m.
Fire Exit Doors Left Wing	5.00 sq.m.
Fire Exit Doors Right Wing	2.52 sq.m.
Porch	40.00 sq.m.
PWD Ramps	
Hall way	
Roof Deck	550.00 sq.m.
Structural Steel Long span Roofing	550.00 sq.m.
Parking Lot	Good for 10 Automobiles, 5 motorcycles

3. General Scope

- a. The DRF includes the following scope of works:
 - Preparation of the Detailed Architectural and Engineering Design to be approved by PAGASA TWG.
 - Complete Construction Methodology and Work Program of the DRF are based on final Detailed Architectural and Engineering Design Plans to be approved by PAGASA TWG.
- b. The design and specifications of the DRF shall conform to, but not limited to the minimum standards set by the following:

- National Building Code of the Philippines (NBCP)
 - Fire Code of the Philippines
 - Accessibility Law (BP 344)
 - Electrical Code of the Philippines
 - Mechanical Code of the Philippines
 - Sanitary/Plumbing Code of the Philippines
 - Applicable local regulations and ordinances
- c. A complete set of preliminary architectural and engineering drawings on a 20" x 30" blue print paper minimum size shall be submitted by the all bidders as part of its technical proposal.
 - d. All bidders shall include in their proposal the cost of the Detailed Planning and Design Services and the Complete Construction of the Proposed Mactan, Cebu Disaster Recovery Facility as defined in this bid document.
 - e. Upon approval of the Final Detailed Architectural and Engineering Design Plans and Specifications, the winning bidder shall then proceed with the construction works under the terms and conditions set forth herein.
 - f. Upon Project Completion in accordance with the terms and conditions set forth herein, the winning bidder shall turnover the completed project.

4. Detailed Scope

4.1. Pre-Planning

All bidders must:

- a. Have scrutinized the TOR and complied their proposal with its contents and requirements without exception.
- b. Have visited and inspected the site.
- c. Have determined and satisfied all matters pertaining to the project, including the location and the nature of the work; climatic conditions; the nature and condition of the terrain: geological conditions at the site; transportation and communication facilities; the requirement and the availability of materials, labor, water, electric power, the locations and extent of aggregate sources, and other factors that may affect the cost, duration and execution of the work, and has determined the general characteristics of the project and the conditions indicated above.
- d. Have acquainted and familiarized all conditions, local or otherwise, affecting the carrying out of the contract work and have arrived at an estimate of the facilities available and the facilities needed for the project.
- e. Be aware that the owner shall not assume any responsibility regarding erroneous interpretations out of any data furnished by the latter.
- f. Have familiarized with all laws, decrees, regulations of the Philippines, local regulations and ordinances which may affect or apply to the operations and activities.
- g. Be aware that the DRF shall cover the period of eight (8) months to complete.

4.2. Survey and Studies

- a. Survey of Existing Utilities
 - 1) The prospective bidder is expected to conduct an actual site survey of the project area to identify/verify preliminarily, the parameters and boundaries of the proposed project including easements and property lines. In the process, the prospective bidder shall familiarize with the site condition and nearby occupancy.

- 2) It is also expected that the prospective bidder shall familiarize with existing relevant materials and literature of the project, to be able to come up with an intelligent proposal.
- 3) Determine existing and proposed infrastructure, facilities, utilities, etc., which may have a bearing on the planning and design exercise. The winning bidder shall identify/locate the existing utilities at the site, namely:
 - Electrical Power Supply System (underground and/or overhead)
 - Water Supply System
 - Sewer and Storm Drainage System
 - Telephone Lines (underground and/or overhead)

4.3. Planning and Design Phase

4.3.1. Architectural and Engineering Design Requirements/Considerations:

4.3.1.1. General

- a. The detailed design shall conform to the general standards adopted by the National Building Code of the Philippines, Electrical Code of the Philippines, Mechanical Code of the Philippines, Plumbing/Sanitary Code of the Philippines, Fire Code of the Philippines, Accessibility Law (BP 344), local regulations and ordinances as a minimum.
- b. All design considerations/assumptions shall be based on the actual site condition, soil boring data, and topographic survey.
- c. The technical drawings and specifications shall clearly indicate all the details required to ascertain the care and thoroughness devoted in the preparation, accuracy and technical soundness, and their usefulness as a guide to project implementation.

4.3.1.2. Site Grading and Clearing

- a. Site clearing and relocation of existing structures (if any) shall be taken into consideration. Water supply shall be sourced from the existing local water utilities provider at the area.
- b. All existing and design elevation shall be indicated in the plans complete with established horizontal and vertical survey references.

4.3.1.3. Drainage and Sewerage System

- a. The winning bidder shall carry out a detailed design for the water supply of the project. The design should be on the basis of the source and volume of water supply, water consumption (domestic and fire protection system), piping network, and conveyance in accordance with the applicable laws, rules and regulations governing health, safety and sanitation.
- b. Water supply shall be sourced from the existing local water utilities provider at the area.

4.3.1.4. Power and Lighting Supply and Distribution

The winning bidder shall coordinate with PAGASA for the application to the local electric company.

4.3.1.5. Mechanical Works

All Mechanical Equipment/s as may be required for the project shall take into consideration the objective and requirements of the project in accordance with Mechanical Code of the Philippines, Fire Code of the Philippines, National Building Code and other applicable laws and ordinances.

4.3.1.6. Parking Design

- a. The Parking layout should provide continuous flow of traffic.
- b. The design should allow safe movement of pedestrian from parking at the Disaster Recovery Facility.
- c. The design should allow for appropriate landscaping of the parking.
- d. All parking spaces, exclusive of access drives or aisles, shall consist of a rectangular area not less than 2.5 meters wide by 5 meters in length except that parallel parking stalls shall be 2.5 meters by 6.5 meters.
- e. Provide one slot of parking for PWD. Spaces intended for PWD parking should be marked accordingly. Refer to BP 334 for detailed requirements for marking and signs.
- f. Must have proper drainage.
- g. Must have proper lighting
- h. Parking bays, access lanes Average lux = 75, Mi. = 50
- i. Must have Approved Wheel Stops Prefabricated concrete parking barriers, where used, shall be a minimum of 15 x 15 centimeters or 6" wide, 6" high, and 2 meters or 6 feet long Prefab barriers must be firmly and permanently anchored below the pavement with galvanized anchor pins.
- j. Manually operated car barrier for DRF entrance shall be durable and waterproof. The boom shall be made of aluminum and has maximum arm length of 4.5 meters.

4.3.1.7. Trench Works

Bidder has to carry out the trench work from Diesel Generator (DG) location up to the Electrical room and substation to Electrical room and other existing structures that will be connected to the DRF.

- a. Trench shall be of minimum 900mm depth and 300 to 450mm wide.
- b. Cables shall be laid with proper required protections using Bricks, Sand etc.
- c. Hume pipes of suitable sizes to be provided at Road crossings and other required locations
- d. Concrete chamber should be provided at required places with checkered plate for maintenance (Both the sides of road crossings etc.,)
- e. Enough care should be taken not to damage any existing pipes, wires, cables that comes in the way of trench. Any damage done to existing structure must be repaired and brought back to its original condition (prior to damaging it) by the winning bidder and all costs relating to it shall be through their account.

4.3.2. Material Specification

4.3.2.1. Floor Finishes

- a. 800mm. x 800mm. Granite Tiles (Hallway, Entrance lobby, Stockroom, staging and laboratory room)
- b. 800mm. x 800mm. Granite Tiles – non-skid (Porch)
- c. 600mm. x 600mm. Granite Tiles – non-skid (for C.R.)
- d. Carpet finish (View deck, executive lounge, production room and telco room)
- e. Mechanical and Electrical Room (Floor epoxy paint 3 coats)

- f. For Parking: Paver Blocks finish incl. landscaping works
- g. For Ramps and Perimeter Walk way: Plain Cement Finish but 20mm. groove for ramps.
- h. Server Room and NOC Raised Flooring
 - Shall be elevated/raised to 600mm, but can be reduced or raised further depending on the outcome of the CFD simulation
 - With 1" rubber insulation under the raised flooring system
 - Raised floor pedestals must be connected to a grounding system
 - Anti-static floor tiles.
 - Ramp must be modified to adapt to the new height of the RF system
 - Access Floor panel of size 600 x 600 mm shall be all steel welded construction with an enclosed bottom pan of 64 hemispherical cones and top plain sheet shall be fuse welded at required locations to form a panel.
 - Flooring panels of 18-gauge steel 600 x 600 coated with 50-micron epoxy conductive paint
 - Concentrated point load of 450 Kg and Uniformly Distributed Load of 1350 Kg/ Sq.m
- i. Antistatic vinyl flooring shall be provided at the Electrical and Mechanical rooms as per minimum specifications below:
 - 2 mm thick anti-static vinyl flooring over the prepared surface.
 - It shall be fixed by applying the appropriate cement paste to fix it over the base floor slab.

Note: Use heavy duty tile adhesive for all grouting and adhesive materials, branded, high-end quality.

4.3.2.2. Wall Finishes

- a. 600mm. x 600mm. Granite Tiles (Walls of Toilets) from floor to ceiling height
- b. 6" thick Load Bearing CHB, Plain Cement Plaster finish, painted for all concrete walls (*refer to proposed floor plan*)
- c. 12mm. thick fire rated tempered glass partition (*refer to proposed floor plan*)
- d. 12mm. thick tempered curtain glass wall (*refer to proposed floor plan*)

4.3.2.3. Ceiling Finishes

- a. Required False ceiling works shall be carried out at different rooms as below:
 - Standard Fire Resistant Gypsum Board for NOC, Server Room, Telco Room, Mechanical Room, Electrical Room, Stock Room and Staging and Laboratory Room on Aluminum T-runner grid ceiling system.
 - A modular and grid system, accessible false ceiling at appropriate height should be installed which also supports the concealing all optical fiber cables, electrical power and lighting wiring with suitable cable tray in all areas. It also serves as a plenum for lighting fixtures and PAC units. All the ceiling lights will be mounted on the false ceiling and suitably supported from the true ceiling.
- b. ¼" thick Fiber Cement Board on Furring Channel Framing for, Hallway, Executive Lounge, Production Room, and Toilet.
- c. Perforated Aluminum Ceiling Panel 2' x 4' on aluminum t-runner ceiling framing for Main Lobby.

4.3.2.4. Thermal Insulation Finished

Bidder has to carry out the Thermal insulation work on the ceiling and flooring of the Server room.

- Ceiling slabs should be heat-insulated, or coated with a heat insulating material to avoid condensation and to reduce the heat transfer in the server room area
- Insulation shall be done with 25 mm thick self-adhesive aluminum foil face nitrile rubber Trench for cables and pipes

4.3.2.5. Painting and Varnishing Works

- a. Semi-gloss latex, branded, High-end quality: for interior walls
- b. Semi-gloss liquid tile branded, high-end quality: for exterior walls.
- c. White flat latex finish branded, high-end quality: for interior ceilings
- d. Epoxy paint with primer branded, high-end quality: for structural steel.
- e. Wood Stain finish branded, high-end quality.

4.3.2.6. Doors, Partitions, and Windows

- a. Solid Wood Tanguile Panel Door (50mm.) and jambs, well-seasoned, good quality, treated, kiln-dried.: for toilet Main Door.
- b. Steel Fire Exit Door, UL-listed 3 hours' fire rating complete panic device and vertical steel rod: for Fire Exit Door (left and right wing)
- c. 12mm. thick frameless fire rated glass door w/heavy duty hinges: for NOC, View Deck, Stock Room, Staging and Laboratory Room, Main Lobby, Server Room, Production Room, Executive Lounge, Mechanical Room, Electrical Room and Main Entrance.
- d. 20mm. thick hollow core stainless steel (304) Doors for Male and Female including PWD Toilets, hinges must be heavy duty and Stainless steel as well.
- e. 20mm. thick hollow core stainless steel frosted (304) toilet and urinal partitions.
- f. 12mm. thick frameless fire rated glass window: for Electrical Room.
- g. Operable Wall partition
 - 92mm. thick
 - Hinges – SOSS or Stainless Steel butterfly for Door Panel
 - Min width = 900mm.
 - Track shall be aluminum
 - Jamb frame shall be aluminum
 - Carrier System – 2 glider rollers for alum. Track
 - Panel Insulation = 60kg./cu.cm.
 - Mechanical Cranking Seal – Manually Operated Retractable
 - End Panel Closure – Rotable type or telescopic element to seal the gapbet wall attachment
 - Sound Transmission Class-48-55DB
 - Overhead support
 - Laminated Finish

4.3.2.7. Handrails, Grab Bars, Balusters

All handrails, grab bars and balusters shall be Stainless Steel (frosted) and shall conform with the *Batas PambansaBlg. 344 and National Building Code of the Philippines*.

4.3.2.8. Finishing Hardware

Stainless steel lever-type, heavy duty, branded, high-end quality.: for locksets, hinges, door stoppers, barrel bolts, etc.

4.3.2.9. Waterproofing

- a. Fluid –applied elastomeric, at least 5-year warranty: for rest room, canopy, plat boxes etc.
- b. Waterproofing Bituminous Torch-membrane w/ 2” thick concrete topping (smooth finish) reinforced with gauge #8 Steel matting.

4.3.2.10. Plumbing Works

- a. Piping Materials shall be uPVC pipe series 1000: for soil, waste, & vent piping system.
- b. Piping Materials for water supply shall be PPRC high quality fusion type: for cold water line.
- c. Fixtures, Flush tank water closet (white) vitreous china, under counter oval (white) vitreous china, Wash Basin (white) vitreous china, urinal (white) vitreous china, complete with fittings and other accessories.

4.3.2.11. Furniture

Location	Furniture Composition
DRF	<ul style="list-style-type: none"> • 8 number of workstation tables <ul style="list-style-type: none"> ○ Each shall be with Drawers, cupboards, Key board tray, CPU rack ○ Provision for raceways to be provided • 8 numbers of high back revolving chairs to be provided • 6 numbers of 55” LED TVs shall be provided in NOC room <ul style="list-style-type: none"> ○ It should be mounted on walls with required supports and UPS power sockets • 1 Workstation shall be dedicated for Monitoring systems in the BMS room to monitor CCTV, DCIM etc.,
View Deck	<ul style="list-style-type: none"> • 4 numbers of high back revolving chairs
Executive Lounge	<ul style="list-style-type: none"> • One Complete set of Sofa
Main Lobby	<ul style="list-style-type: none"> • One Complete set of Sofa
Production Room	<ul style="list-style-type: none"> • One Complete set 10 seating capacity conference table

4.3.2.12. Soil Treatment

Organic Phosphate termicyde minimum of five (5) tear effective termite barrier

4.3.2.13. Structural System

- a. Concrete 3500psi (28 days)

- Ready Mixed for columns, beams, roof deck slab
- b. Concrete 3000 psi (28 days)
 - Ready Mixed for slab on grade, tie-beam and footing
- c. Structural Steel
 - Approved ASTM
- d. Reinforcing Bars
 - Approved ASTM

4.3.2.14. Walling System

Refer to proposed Disaster Recovery Facility Floor Plan

4.3.3. Electrical System

4.3.3.1. General

- a. All electrical works shall be done in accordance with the provisions of the latest edition of the Philippine Electrical Code (PEC), existing applicable laws, ordinances, requirements, rules and regulation of the local government and local power company.
- b. The winning bidder shall secure and pay all wiring permit for all fees required for the works and furnish the owner the certificate of final electrical inspection,
- c. The winning bidder shall conduct earth ground test, wire insulation and load test upon completion of works,
- d. In case of discrepancy between plans and site condition, specifications and revisions changes, the winning bidder should immediately verify and consult with the PAGASA electrical engineer,
- e. All location and mounting height are subject to approval of PAGASA Electrical Engineer,
- f. The winning bidder shall be responsible in the preparation of as-built plans duly signed and sealed by professional electrical engineer,
- g. Final lighting fixture and wiring devices shall be approved by PAGASA electrical engineer,
- h. The winning bidder shall be responsible for the preparation of shop or construction drawing required by the owner, this includes devices and fixtures elevation,
- i. The winning bidder shall visit site condition and include all cost necessary to complete the system at no cost to owner, including cost of coring service and expenses for the restoration of any damage affected, civil, architectural finishes or relocation of existing facilities on building,
- j. The winning bidder shall locate all splicing boxes to accessible place or with access panels,
- k. Any materials and fittings not shown on this plans but needed to complete the system and operation shall be included with the winning bidder's scope of works,
- l. All works shall be done under the direct supervision of license duly registered electrical engineer or registered master electrician.
- m. Additional notes:
 - use of mica shall be limited to 150mm
 - use of flexible metallic conduit shall be limited to 1m
 - provide proper conduit support, g.i. wires as support shall not be allowed

4.3.3.2. Specifications

- a. Power supply to the building shall be 400V/230V, three phase, 3 wires + N + G, 60hz.

- b. All materials to be used shall be new and approved type for purpose and location.
 - c. Normal and emergency circuit shall not be combined in one conduit.
 - d. Receptacles for general use shall be duplex 20a, 230vac, ground type.
 - e. All wires should have a maximum load of 80% of wire ampacity.
 - f. Light switches minimum rating shall be 16a, 230vac.
 - g. All materials to be used shall be brand new.
 - h. Mounting heights shall be as follows:
 - Light switches - 1.30m above finished floor
 - Convenience outlet - 0.30m above finished floor
 - Telephone outlet - 0.30m above finished floor
 - Panel board - 1.8m above finished floor
 - ACU outlet - near the equipment
 - i. Conduit embedded within concrete wall shall have a minimum cement plastered of 20mm thick.
 - j. All conduit pipe above ceiling should have independent hanger supports.
 - k. All lighting fixtures should have independent hanger supports.
 - l. All boxes shall be occupied only of 50% of wire volume. Voltage drop shall be limited to 2.5v from source to panel board as P.E.C. requirement of acceptable to the laboratory equipment.
 - m. Circuit breakers serving motors and lighting shall be industrial and commercial bolt-on type respectively with minimum of 10kaic.
 - n. All wires and cables shall be brand new and approved type.
 - o. Color coding
 - Line1 – Red
 - Line 2 – Yellow
 - Line 3 - Blue
 - Neutral - White
 - Grounding - Green
 - p. Preferred distribution boards must be industrial type, bolt-on with 18kaic minimum unless otherwise specified.
 - q. Use solderless connector, mechanical 1 pressure type copper lugs for connection of wire larger 8.0mm².
 - r. Use filler compound, scotch fill or approved equal at sharp edges to provide smooth surface before taping with electrical tape.
- 4.3.3.3. Load computation is for 40 server racks, 4.5kW, 230V each.
- a. The electrical works consist of provision of a reliable and efficient power supply system to all servers and all associated utility facilities. All servers, networking components, monitoring systems and other critical loads shall be provided with uninterrupted power supply (UPS) system.
 - b. Complete structured electrical power distribution works such as cabling from NEMA 4x near the compartmentalized pad mounted transformer to Feeder Panel to UPS and UPS Room up to the Disaster Recovery Center includes supply-installation-testing-commissioning (SITC) of Panels, UPS Distribution Panels, PACU, Data Center Room, Utility / NOC Room area and lighting.
 - c. Modular UPS system and all cabling, distribution boxes, feeders, etc. within the room with battery backup of 30 minutes at full load. The system is to be designed in such a way that it has a provision of providing full system load in continuous running condition along with at least 50% redundant capacity. Grounding system should be provided. Each rack's PDU's (Power Distribution Unit) power should be provided with individual distribution path.
 - d. Detailed diagrams such as general arrangement drawing, single line diagrams, control wiring diagrams for electrical panels, grounding layout

schemes, UPS and battery rack layout drawings shall be prepared and provided by the prospective bidder as per available rooms nearby the Disaster Recovery Center area with future upgrade positions.

- e. The bidders shall design, engineer, supply/manufacture, test, install, connect, commission and site test the Electrical Distribution System for any and all power requirements within the Disaster Recovery Facility. This shall include, but not be limited to, UPS, lighting system, input power to various sub systems of the Data Center.

4.3.3.4. Panel Boards

Low Voltage Switchgear (LVSG), Main Distribution Panel (MDP), Lighting Panel (LP), PDU DP, UPS DP, MECH DP, Transient Voltage Surge Suppressor (TVSS) shall be gray coated, bolt-on, gauge 16 NEMA enclosure with Neutral and Grounding bus bar and Digital Energy Meter.

Additional requirements of the winning bidder:

- Must provide certificate of Authorization from Manufacturer/Principal authorized to re-sell and provide technical support and consultation for product offered.
- Must be Authorized Service Partner or certified service sales partner of the product offered to ensure technical expertise on the offered solution.
- Must provide at least two (2) locally based Engineers certified on Brand offered. Resume must be submitted with a photocopy of certification issued by Manufacturer.
- Must provide certification from the manufacturer that equipment to be supplied is brand new and intended for Philippine market.
- Should submit a detailed project implementation plan which shows that the offered solution shall be integrated in the existing system.

4.3.3.5. Transient Voltage Surge Suppressor (Tvss)

The incoming switchgear and electrical distribution panels shall be equipped with TVSS as defined in the IEEE standard 1100 (1999).

- The TVSS shall be constructed of Metal Oxide Varistor (MOV) technology and internal surge capacitors.
- The surge protective devices shall be sized per IEEE Std C62.41 – 1991 and IEEE Std C62.45 – 1992
- The TVSS shall have a UL listing and labeled 1449 – 3 suppressed voltage rating of 1000V peak
- The unit shall have a maximum continuous operating voltage (MCOV) rating of minimum 320VRMS.
- The Response time of TVSS shall be ≤ 0.5 nanoseconds.
- The TVSS shall provide up to 40dB for RFI & EMI noise attenuation.
- TVSS monitoring shall consist of indicator lamps and form C dry contacts. Monitoring of all modes, including N-E is required.
- The TVSS warranty shall be 3 years minimum and cover all parts of the TVSS.

4.3.3.6. Grounding

Grounding, Lightning and Surge Protection systems to be installed must conform with the latest Data Center standards and best practices. Separate grounding system shall be installed to all IT equipment, server racks, UPS, etc.

DRC grounding should be separated from the building grounding system mainly used for other non-IT equipment, lighting, etc. The understructure system in the raised floor of the data center, metallic pipes, cable ladders and steel cabinets also shall be properly connected to the building grounding system. Both grounding shall be bonded/welded underground, providing a resistance of <1 ohm.

All earth pits shall be as per IS 3043 with latest amendments. (Grounding / earth pipe). The minimum distance between the two grounding station shall be 3 meters. A ground ring with relevant earth test terminal boxes shall to be provided at regular intervals. Adequate number of earth strips with proper sized holes shall be provided for extending grounding / looping earth connections at various floors shall be provided and executed as per the requirement.

Prior to the installation, the winning bidder should submit their proposed design for approval of PAGASA.

4.3.3.7. Existing and proposed future buildings in Mactan complex should be included in the design and computation of the whole electrical system, which are listed below:

- Proposed PRSD building – 175AT, 1Ø, 230V
- Wind tunnel building – 50AT, 1Ø, 230V
- Proposed Multi-purpose building – 60AT, 3Ø, 230V
- Proposed Planetarium – 60AT, 3Ø, 230V
- Existing synoptic building – 15kVA, 3Ø, 230V

4.3.3.8. LIGHTING AND CONVENIENCE OUTLET

a. Lighting fixtures (material) of the desired specifications shall be in accordance with the external lighting standard. All bulb/lamps to be used should be LED (no ballast).

Lighting level:

- Production room–500 lux (use 2xT8 LED tube w/o ballast in a lighting fixture with prismatic diffuser)
- Executive lounge–500 lux(use 2-T8 LED tube w/o ballast in a lighting fixture with prismatic diffuser)
- EE room – 500 lux (use 2S-T8 LED tube in a industrial lighting fixture without ballast)
- Telco room – 500 lux(use 2-T8 LED tube w/o ballast in a lighting fixture with prismatic diffuser)
- Mechanical room – 500 lux(use 2-T8 LED tube in a industrial lighting fixture without ballast)
- NOC – 500 lux(use 2-T8 LED tube w/o ballast in a lighting fixture with prismatic diffuser)
- Storage room – 200 lux(use 2-T8 LED tube w/o ballast in a lighting fixture with prismatic diffuser)
- Main entrance and perimeter – 200 lux (use 5w pin light)
- Hallway – 200 lux(use 5w pin light)
- Lobby - 200 lux(use 2-T8 LED tube w/o ballast in a lighting fixture with prismatic diffuser)
- Server room - 500 lux(use 2-T8 LED tube w/o ballast in a lighting fixture with prismatic diffuser)

- Staging room - 500 lux(use 2-T8 LED tube w/o ballast in a lighting fixture with prismatic diffuser)
 - Comfort room - 200 lux(use 5w pin light)
- b. Point wiring shall be supplied, connected and tested as required in the entire Data Recovery Facility.

Convenience outlet shall be duplex with grounding.

- Production room - 13 C.O.
- Executive lounge – 3 C.O.
- EE room – 3 C.O
- Telco room – 1 C.O
- Mechanical room – 2 C.O
- NOC – 12 C.O
- Viewing deck – 1 C.O
- Storage room – 1 C.O
- Lobby - 3 C.O
- Hallway – 2 C.O
- Staging room - 2 C.O
- Server room - 4 C.O, 20 – twist lock outlet
- Comfort room - 2 C.O

4.3.3.9. EMERGENCY LIGHTS

Emergency lights are required in the DRF and associated areas. These lights will be illuminated automatically in case of power failure. The emergency lights should conform to the following specifications:

- Should have built-in battery
- Should have built-in battery charging system
- Should have enough LUX level to illuminate the designated areas
- LED type

4.3.3.10. EXIT INDICATION LIGHTS

The DRF and associated areas Exit location are required to be equipped with Illuminated Exit Sign. This Exit Sign should be mounted in such a manner that it should be visible from a distance. These Exit Signs should have self-contained battery operated non-maintained emergency light

4.3.3.11. CABLE LADDER FOR POWER AND DATA SYSTEM

- Shall supply and install Cable Ladder for power and data system
- Shall be placed/installed under ceiling for Server room
- Shall have a dedicated electrical wire gutter to cover the rack distribution design
- Shall have a separate cable ladder: one (1) for data; one (1) for power distribution
- Dimensions shall be enough to accommodate wires and cables
- Shall have an appropriate vertical clearance between the acoustic boards and the racks.
- Shall be capable to handle all cables for data and power distribution
- Shall include all appropriate hanger and bracket support peripherals
- Minimum distance between 2 supports shall be within 900mm (3ft.)

- All installed cables shall be neatly tied to the accompanying racks and ladders.
- In the false ceiling area, a proper structured cable ducting should be provided for the electrical and networking cables which are separately placed with a minimum distance of 400 to 500 mm. Below the raised floor area, from UPS distribution panel electrical power cables to all racks and Network cables between servers, network racks and service provider interface box location should be laid through the suitable cable tray arrangement. Three number of 1.5 inch PVC pipes from raised floor to ceiling should be provided at the optical fiber interface units for routing all incoming fiber cables from service provider and outgoing fiber / Ethernet network cables to other buildings. As well as in the outside wall of the building for routing these external network cables, three numbers of 3" dia PVC pipes from the first floor ceiling level to building ground level should be fixed.

All materials to be used shall be brand new, approved type, and ISO 9001 certified.

4.3.3.12. Uninterruptible Power Supply

Minimum of 2 units to provide backup power from main distribution panel. This includes connection requirements.

Main Specifications

- Rating: 200kVA Capacity (Scalable up to 300kVA)
- Input Voltage: 400V, 3 Phase, 3 wires with neutral and ground
- Output Voltage: 400V, 3 Phase, 3 wires with neutral and ground
- Power Module rated at 1pf (output)
- Efficiency must be not lower than 95.5% (rated linear loads)
- LCD Display must be touch screen and must be hot-swappable for field replacement (no shutdown required)
- Power Modules must be in modular type and also hot-swappable for field replacement (no shut down required)
- Input THDi (current harmonic distortion) must be ,3% at 100% load, maximum
- AC/DC Capacitors must last 10 years from the time it will be operational, before the standard replacement
- Must have a monitoring software that can monitor multiple UPS systems in one single view
- Status must be able to be viewed in the Building Management System (BMS).

4.3.3.13. STATIC TRANSFER SWITCH (STS)

- Static Transfer Switches are intelligent units that transfer the load to an alternative source when the primary source is out of tolerance. This ensures "high availability" of the power supply for sensitive or critical installations. The purpose of STS devices is to ensure the redundancy of the power supply to critical installations by means of two independent power sources, increase power supply reliability for sensitive installations, and facilitate the design and expansion of installations that guarantee a high availability power supply
- Minimum 1 unit 600AT to provide redundancy taking power from two separate UPS Sources.

4.3.4. Precision Air Conditioning Units (PACU)

a. General

- Minimum of 2 units for alternate operation.
- 25TR Precision Air-conditioning Unit (PACU) for the server room
- DX Air Cooled, Down flow Type
- PACU must be equipped with EC Fans
- Standard R407C Refrigerant
- PACU must be dual circuit (dual compressor and dual outdoor condenser)
- Inverter Type or equipped with unique energy saving technology
- Control accuracy for temperature is $\pm 1^{\circ}\text{C}$ and for Relative humidity is $\pm 5\%$.
- Equipped with scroll compressor for less vibration, low noise and higher efficiency
- Equipped with washable air filter and alarm to notify for dirty filter
- Capable of Self-Diagnosis with Isolated Control Panel
- Capable of connecting to a network of cooling system for remote power on/off, monitoring duty cycle
- Status must be able to be viewed in the Building Management System (BMS).
- The PAC units' control strategies shall be PID Logic Control with dew point compensation for accurate temperature and humidity control.
- A selection of return or supply air control shall be provided to suit the application.
- Access to the controller setting shall be protected with passwords to prevent against unauthorized access.
- In normal operating mode the main screen shall display unit number, temperature and relative humidity set points and actual, graphs, time, date and operating status.
- Dynamic icons shall identify the system operating mode.
- 48-hour real time log of temperature and humidity data shall be retained by the control system.
- All parameters and data shall be protected in memory by an onboard battery.
- Each unit shall be capable of providing sensible cooling capacities at rated ambient temperatures with adequate airflow and should be meant for 24 hours/365 days' operation.
- Unit should be able to send an SMS to an authorized personnel in case of the failure of the unit.

b. Supply & Installation of Mechanical/Precision Cooling Works

- Air Cooled DX Type Precision Air-Conditioning units (PACU's) shall be provided for the server room, with appropriate redundancies. These units will be programmed to allow rotation of duty units, and automatic start-up of redundant unit once the duty PACU fails.
- Variable Refrigerant Flow DX units shall be supplied for the battery rooms, Command Center/NOC, Utility room and all other areas (common and office areas) in compliance with PAGASA's requirements.
 - The winning bidder shall ensure that all utilities to be tapped to existing tapping points on the actual site condition are the correct utilities for the data center requirements and shall be thoroughly checked prior to connections and installations.
 - The winning bidder must include the installation of effective exhaust system at the UPS Battery Rooms to purge out Hydrogen Gas typically emitted by the batteries during charging period.

- Installation of Precision Air Conditioning Units (PACU's) complete with controllers, safety devices, operational accessories, including refrigerant and refrigerant piping, insulation, filter dryers, hangers & supports, concrete plinth, insulation, aluminum cladding and accessories to complete the system. The required ducting of the condenser units shall also be included.
- Supply and installation of the Variable Refrigerant Flow units, complete with controllers, accessories, hangers and support, refrigerant and refrigerant piping, and insulation. The required ducting of the condenser units shall also be included.
- Purging fans for the purpose of discharging fire suppression gas to outside of the gas suppression protected area, and battery room exhaust - complete with controllers, safeties, operational accessories, dampers, grilles, volume dampers, duct fittings, hangers & supports, and other accessories to complete the system. Specifications of the exhaust motor to be proposed by the bidder and must be right-sized to deliver an effective purging system.
- Condensate Drain piping for all cooling equipment and shower area, up to the nearest condensate drain riser.
- Ducting and its accessories (combination type fire dampers, volume dampers, filters as indicated in the drawings and as required by code).
- Seismic support as required by Philippine Building Code.
- Air distribution system connecting from the existing building AHU including ducting, dampers, diffusers, grilles, supports, and all required accessories.
- The contractor shall be responsible for checking, tracing and verifying the location of cutting/sealing point of piping ductwork systems including equipment to avoid reworks.
- All equipment that will be supplied should be able to interface with the BMS (Building Management System).
- Testing and Commissioning of all mechanical systems installed on site.
- The contractor is responsible for site coordination during fabrication and installation to avoid interference, conflict or clash with other services such as lighting fixtures, wire ways, sprinkler systems, and other ductworks.
 - All required painting and labeling.
 - Disposal of waste and debris.

4.3.4.1. Comfort Air Conditioning Units

General

- Minimum of two units running in alternate mode:
 - Network Operation Center (NOC) : 2 - 3TR Inverter 230V/1Ph/60Hz, floor mounted
 - EE room: 2-3TR Inverter 230V/1Ph/60Hz, wall mounted
- Production Room: 1-3.0TR Inverter 230V/1Ph/60hz, cassette type
- Executive Lounge: 1-3.0TR Inverter 230V/ 1Ph/60hz, cassette type
- Laboratory Room: 1-3.0TR Inverter 230V/1Ph/60hz, cassette type
- It shall include all (but without limiting) equipment, accessories, pipes, refrigerant, input power cables from the ground floor distribution panel, communication cables, supports, Power distribution panel along with switchgear and accessories, suitable power outlet boxes with breakers

for individual connections to the AHUs and integration to the proposed BMS.

- The air-conditioning equipment shall be a standard product of the manufacturer and of a design of proven reliability & satisfaction in the service intended.
- The system shall be rated for continuous operation of 24 hours a day.
- The condensing unit shall be air cooled type and shall be provided with hermetically sealed compressor meant to give a durable, trouble free and low noise performance. The compressor shall be capable of operating continuously at the maximum ambient temperature of 50C. The condensing unit shall be suitable for outdoor installation in a weather exposed to sun and rain.
- Cooling units of higher cubic meter per hour (CMH) and higher static pressure are to be provided to cover the depth of the room.
- The refrigerant shall be non-inflammable, non-toxic and non-explosive and have the pressure and temperature characteristics suitable for this operation. It is proposed to provide FREON 22 being the safest.
- All refrigerant pipe shall be of copper possessing sufficient strength and size suitable for service and shall be provided with thermal insulation of suitable material.
- Air-conditioning system of each room shall be complete with condensing units, interconnecting refrigerant copper piping, PVC piping for condensed water drain, wiring between the outdoor condensing unit and indoor room unit, wiring between AC Distribution Board and outdoor condensing unit, protection devices, temperature control units and other accessories. All wiring shall be fire retardant. The inclination of the PVC piping for draining away of water shall be properly adjusted so that water leaked from the air-conditioning units is drained away from the room.
- The equipment shall be suitable for operation on 400V +/- 10% V, three phase AC, 50 Hz supply / 230 V +/- 10% V, Single Phase AC, 50 Hz depending on the size of the machine. Necessary earthing arrangement shall be made.
- If any equipment fails to meet the specified and guaranteed performance as found from test at site, then the equipment is liable to be rejected and to be replaced by the contractor with those fully compliant with the stated requirements specified herein.
- The air-conditioning machines shall be Programmable Logic Controlled (PLC) type so that the rotational running of the machines is maintained automatically. This should include supply and installation of required panel board, distribution board and timer unit for programmable automatic running of individual air-conditioning machines for maximum period of 16 hours continuously at one stretch. Running combination of individual units shall have to be indicated.
- Following drawings & manuals / information shall be submitted in at least THREE copies at appropriate stages & for handing over the system.
Manufacturer's data for product, features, components & performance along with the offer.
Operation & maintenance manual with;
 - List of recommended spares & replacement components.

- Detail operating instructions covering operations in normal & abnormal conditions.
- Shop drawings showing detail fabrication, assembly of components, internal & interconnecting wiring, dimensions, plans & views, installation details access & clearance etc for approval.
- Hot aisle and cold aisle configuration of the PACU system
- Product certificates for Brought out items.
- Factory test certificates & Inspection report.
- Field test reports.

4.3.5. DIESEL ENGINE GENERATOR

a. Standard features

- Radiator 40°C Max, fans driven by belt, safety guard
- 24V charge alternator
- Standard Control panel
- Isolation Class H/H and IP23 protection
- Dry type air filter, fuel filter, oil filter and coolant filter
- Permanent magnet generator
- 12V batteries, rack and cable
- Ripple flexible exhaust pipe, exhaust siphon, flange, muffler

b. Generator rating

- 1000kW/1250kVA
- 400V/230V
- 60hz.
- 3 phase
- 0.8 P.F

c. Application data

- Installation place: Indoor (well ventilated)
- Ambient temp: -25°C to 45°C (heater is needed below 5°C)
- Ambient Humidity: less than 80%
- Altitude: Maximum 1,000m above sea level

d. Engine data

- Air intake system: turbo, air/water cooling
- Fuel system: PT type fuel pump, EFC
- Cylinder arrangement: 12 in "V"
- Displacement: 37.8L
- Bore and stroke: 159mm
- Compression ratio: 14:5:1
- Rated RPM: 1800 RPM
- Max standby power at rated RPM:
- Governor type: electronic

e. Exhaust system

- Exhaust gas flow: 2643 L/s
- Exhaust temp.: 552°C
- Max back pressure: 10kpa

f. Air intake system

- Max intake restriction: 6.23kpa

- Consumption: 920 L/s
 - Intake Flow: 30425 L/s
- g. Fuel system
- 100% (Prime power) load: 266 g/kw.h
 - 75% (Prime power) load: 273 g/kw.h
 - 50% (Prime power) load: 288 g/kw.h
- h. Oil system
- Total oil capacity: 170L
 - Oil consumption: ≤ 4 g/kw.h
 - Engine oil tank capacity: 143L
 - Oil pressure at rated RPM: 310—448K/Pa
- i. Cooling system
- Total coolant capacity: 252L
 - Thermostat: 82 - 93°C
 - Max water temperature: 104°C
- j. Alternator data
- Number of Phase: 3
 - Connection Type: 3 phase 5 wire “Y” type connecting
 - Number of pole: 4
 - Power factor: 0.8
 - Protection Grade: IP23
 - Altitude: ≤ 1000 m
 - Cooling System: IC01
 - Exciter Type: Brushless, self-exciting
 - Insulation Class: H
 - Winding Pitch: 2/3
 - Winding Material: 100 % copper
 - Rotor support type: Single type
 - Voltage regulation: +/- 1%
 - Total harmonic: at no load <1.5%
 - TGH/THC: on load <2%
 - Wave form NEMA(TIF): <50
 - Wave form IEC(THF): <2%
 - Power at 1800rpm: 1250kva / 1000kw
- k. Generating Set Data
- Voltage Regulation: $\geq \pm 5\%$
 - Voltage Regulation, stead state: $\leq \pm 1\%$
 - Sudden voltage warp (100% sudden reduce): $\leq \pm 25\%$
 - Sudden voltage warp (sudden increase) : $\leq \pm 20\%$
 - Voltage stable time (100% sudden reduce) : ≤ 6 s
 - Voltage stable time (sudden increase) : < 6s
 - Frequency Regulation, stead state: $\leq 5\%$
 - Frequency Waving: $\leq 0.5\%$
 - Sudden Frequency Warp (100% sudden reduce) : <+12%
 - Sudden Frequency Warp (sudden increase) : <-10%
 - Frequency recovery time (100% sudden reduce) : <5s

- Frequency recovery time (sudden increase) :<5s

I. Control System Minimum Specification

- Standard Features:
 - Manual and Auto Start Control Module
 - Back-Lit ICON LCD Display
 - Fully Configurable Via PC Software4
 - 6 Digital Input and 2 outputs
- Control Button:

Stop/Reset, Auto Start, page
- Warning and Shutdown:

Fail to start/stop, low oil pressure, under/over speed charge failure, Low fuel level, battery over/under voltage, over/under frequency, CAN ECU warning emergency stop, magnetic pick-up failure
- Alternator data
 - Line to neutral and line to line AC volts
 - 3-phase AC current
 - Frequency
 - kW, kvar, power factor kva (three phase and total)
- Engine data
 - DC voltage
 - Engine speed
 - Lube oil pressure and temperature
 - Coolant temperature
- Other data
 - Genset model
 - Start attempts start, running hours' kW hours
 - Load profile (operating hours at % load in 5% increments)
 - Fault history
 - Data logging and fault simulation

m. Standard control function

- Digital voltage regulation
 - Integrated digital electronic isochronous governor
 - 3 phase, 4 wire line to line sensing
 - Configurable torque matching
- Amp Sentry AC protection
 - Amp sentry protective relay
 - Over current and short circuit shutdown
 - Over current warning
 - Single and three phase fault regulation
 - Over and under voltage shutdown
 - Over and under frequency shutdown
 - Overload warning with alarm contact
 - Reverse power and reverse var shutdown
 - Field overload
- Engine protection
 - Battery voltage monitoring, protection and testing
 - Over speed shutdown
 - Low oil pressure warning and shutdown
 - High coolant temperature warning and shutdown

- Low coolant level warning and shutdown
- Low coolant temperature warning
- Fail to start (over crank) shutdown
- Fail to crank shutdown
- Cranking lockout
- Sensor failure indication
- Low fuel level warning or shutdown
- Fuel in rupture basin warning or shutdown
- Full authority electronic engine protection
- Control function
 - Time delay start and cool down
 - Real time clock for fault and event time stamping
 - Exerciser clock and time of day start/stop
 - Data logging
 - Cycle cranking
 - Load shed
 - Configurable inputs and outputs
 - Remote emergency stop

The winning bidder shall provide a permit to operate from the Department of Environment and Natural Resources (DENR).

4.3.5.1. FUEL TANK

- Size should be able to provide an 8hr operation for the generator.

4.3.6. AUTOMATIC TRANSFER SWITCH(Utility to Genset application)

- 1600AT, 400V, 3W+N+G
- Voltage rating: 400VAC, 60Hz.
- Arc interruption: multiple leaf arc chutes provide dependable arc interruption
- Neutral bar: a full current-rated neutral bar with lug is standard on enclosed 3-pole transfer switches.
- Auxiliary contacts: two isolated contacts (one for each source) indicating switch position are provided for customer use. Contacts are normally open, and close to indicate connection to the source. Wired to terminal block for easy access. Rated at 10amps continuous and 250VAC maximum. UL recognized, and CSA certified
- Operating temp.: -40 °F (-40 °C) to 140 °F (60 °C)
- Storage temp.: -40 °F (-40 °C) to 140 °F (60 °C)
- Humidity: up to 95% relative, non-condensing
- Altitude: up to 10,000ft. (3000m) without derating.
- Surge withstand ratings: Voltage surge performance and testing in compliance with the requirements of IEEE c62.41 (category B3) and IEEE C62.45
- Total transfer time (source to source): will not exceed 6 cycles at 60Hz. with normal voltage applied to the actuator and without programmed transition enabled.
- Manual operation handles: Transfer switches rated through 1000 amps are equipped with permanently attached operating handles and quick-break, quick-make contact mechanism suitable for manual operation. Transfer switches over 1000 amps are equipped with manual operators. All switches must be de-energized for manual operation is attempted.
- Adjustable time delay
 - Engine start:0 to 120sec

- Transfer normal to emergency:0 to 120 sec
- Re-transfer emergency to normal:0 to 30min
- Engine stop:0 to 30min
- Programmed transition:0 to 60sec
- Under voltage sensing:3 phase normal, 3 phase emergency
 - Accuracy: +/- 2%
 - Pickup:85% to 100% of nominal voltage
 - Dropout:75% to 98% of pickup setting
 - Dropout time delay:0 to 120 sec
- Over voltage sensing: 3 phase normal, 3 phase emergency
 - Accuracy: +/- 2%
 - Pickup:95% to 99% of dropout setting
 - Dropout:105% to 135% of nominal voltage
 - Dropout time delay:0 to 120 sec
- Over/under frequency sensing:
 - Accuracy: =/- 0.05Hz.
 - Pickup: ±5% to ±20% of nominal frequency
 - Dropout:1-5% beyond pickup
 - Dropout time delay:0.1 to 15.0 sec
- Voltage Imbalance sensing:
 - Dropout:2% to 10%
 - Pickup:90% of dropout
 - Time delay:2.0 to 20.0 sec
- Phase rotation sensing:
 - Time delay:100msec
- Basic indicator panel:
 - Source available/connected LED indicators
 - Test/exercise/override buttons
- Digital display – standard

4.3.7. GENSET

The winning bidder shall furnish high quality work, materials and equipment meeting the requirements of this specification and applicable international codes and standards.

The scope of work shall cover the following:

- a. Supply, deliver, test, install, and commission of the following:
 - one unit of 1250 KVA Standby capacity, Three Phase, Brand New Open Type Generator Set Mactan PAGASA Station complete with Power Cables, Controls & Instrumentations, Overload Protective Devices and other Accessories
- b. Supply of labor and materials for the following:
 - Installation testing and commissioning of the new EGS, to be supervised by licensed professional mechanical and licensed professional electrical engineer.
 - Mounting and alignment of the new EGS to the existing foundation of the new EGS provided with skid and vibration isolators.
 - Cable trench and other trench components

- Load bank testing at 0%, 30%, 50% and 100% load to be witnessed by PAGASA technical staff at the winning bidder's warehouse prior to delivery to Mactan PAGASA Station.
- c. On site Trainings
- Training of at least three (3) operators in the operation, maintenance and troubleshooting of the generator set.
 - Supply of Three (3) sets of Operation Manual and Digital Control Software
- d. The winning bidder
- shall submit a valid Distributorship Agreement or Manufacturer's authorization of the Generator set.
 - The winning bidder has completed within the last five (5) years a single contract in the supply, delivery, installation, testing and commissioning of generator sets equivalent to at least 50 % of the value of the Approved Budget Contract (ABC).
 - Provide upon completion of installation and commissioning a Warranty Certificate that the EGS is guaranteed free from factory defects on mechanical & electrical parts and workmanship for 2 years or 1,000 running hours whichever comes first

4.3.8. Compartmentalized Pad Mounted Transformer

- a. 1500kVA Compartmentalized pad mounted transformer
- Phase: 3 Phase
 - Frequency: 60Hz
 - Vector Group: delta-wye
 - Primary Voltage /BIL: 34.5Kv
 - Secondary Voltage: 400Vac
 - Conductor: Copper
 - Regulation Range on HV: 34.5kV +2 / -2 @2.5%
 - Vector Group: Dyn11
 - Impedance Voltage: 5.75%
 - Sound Level: 60Db
 - Max Ambient Temperature: 40 deg C
 - Temperature rise of top oil: 60 deg C
 - Temperature rise of windings: 65 deg C
- b. First Private Pole (FPP) including the following:
- Concrete Pole, 50ft, Class 3A
 - Load Break Switch o Outdoor Distribution, 600A, 36kV, Rated 630A
 - Power Fuse Assembly 36kV
 - Distribution Lighting Arrester, 27kV w/ mounting bracket
 - Consumables
- c. Primary Hardware from FPP to Transformer
- #1/0 XLPE cable (Metering pole to FPP)
 - #1/0 Tree wire cable (Metering pole to FPP)
 - #1/0 ACSR cable (neutral wire)
 - Consumables

- d. This specification covers the supply, delivery, installation, testing and commissioning of:
- 1500kVA Compartmentalized pad mounted transformer,
 - First Private Pole (FPP),
 - Concrete Pole, 50ft,
 - Class 3A Load Break Switch o Outdoor Distribution, 600A, 36kV, Rated 630A
 - Power Fuse Assembly 36kV Distribution Lighting Arrester, 27kV w/ mounting bracket
 - Primary Hardware from FPP to Transformer
 - #1/0 XLPE cable (Metering pole to FPP)
 - #1/0 Tree wire cable (Metering pole to FPP)
 - #1/0 ACSR cable (neutral wire)
 - Construction of concrete pedestal, 4runs, height 6m, including the excavation, gravel bedding, rebar's and mandrel works, Supply and installation of UPVC Duct, UPVC elbow, End bell Form works, Concrete backfill/Compaction.
 - Construction of concrete encasement, 4 runs, 100mm diameter, including the excavation, gravel bedding, rebar's and mandrel works, Supply and installation of UPVC elbow, Concrete Spacer, End bell, UPVC Form works, Concrete backfill/Compaction, Assist in Energization.
 - Construction of cyclone fence with transformer pad.
- e. Additional requirements of the prospective bidder:
- must provide certificate of Authorization from Manufacturer/Principal authorized to re-sell and provide technical support and consultation for product offered.
 - must be Authorized Service Partner or certified service sales partner of the product offered to ensure technical expertise on the offered solution.
 - must employ at least two (2) locally based Certified Engineers of Brand offered. Resume must be attached and photocopy of certification issued by Manufacturer.
 - must provide certification from the manufacturer that equipment to be supplied is brand new and intended for Philippine market.
 - should submit a detailed project implementation plan which shows that the offered solution shall be integrated in the existing system.
 - should provide certificate that has 24x7 technical support capabilities and identify the person responsible for restoring service due to outages and provide his contact details i.e. contact person, position, contact numbers and email address.
 - Provide certificate from manufacturer that they ate capable of rendering after sales support in the next five (5) years.
 - Must employ and assign an authorized safety officer to oversee the implementation of the project. The assigned safety officer must be a member of safety organization of the Philippines.

4.3.9. Electric service application

The winning bidder shall be responsible for processing of service application to the Mactan Electric Company (MECO) including the payment of all the required fees.

4.3.10. Plumbing System

- a. uPVC Series 1000 Pipes
 - Drainage Lines
- b. uPVC Series 1000 Pipes
 - Sewer Lines
- c. IPS Fusion Polypropylene, Random Copolymer (PPRC) pipes & fittings
 - Water Lines
- d. High end Porcelain Water Closet
 - Toilet Fixtures

4.3.11. Thermal and Moisture Protection

Bidder has to carry out the Thermal insulation work on the ceiling and flooring of the Server room.

- a. Ceiling slabs should be heat-insulated, or coated with a heat insulating material to avoid condensation and to reduce the heat transfer in the server room area
- b. Insulation shall be done with 25 mm thick self-adhesive aluminum foil face nitrile rubber Trench for cables and pipes.

4.3.12. Final Design and Construction Plan

4.3.12.1. Architectural Design

- a. The building should be designed with structural, electrical, mechanical, fire protection, natural or combine ventilation following parking design standards.
- b. The prospective bidder shall prepare the Preliminary Architectural Plans in accordance with the requirements of the National Building Code of the Philippines, Accessibility Law (BP 344) including all other applicable laws and local ordinances.

SUBMITTALS (at suitable scale on 20" x 30" blue print paper minimum size):

1. Site Development Plan for DRF and Mactan Complex
 - Embankment of sites for DRF and PRSD Building
 - Stone Masonry wall for embankment protection
 - Concrete Perimeter Fence for D.R.F. only (Including perimeter lighting)
 - Concrete Retaining Wall for Embankment Protection
 - Paver Blocks Laying for D.R.F. location only
 - Landscaping Works for D.R.F. only
 - Concreting of road for the whole Mactan Cebu Complex
 - DRF Concrete Guard House with Automatic Boom Barrier
2. Vicinity Map
3. Perspective
4. Floor Plans
5. Elevation Plans
 - a. The Front Elevation
 - b. Rear Elevation
 - c. Right Elevation

d. Left Elevation

6. Elevation Plans
 - a. Longitudinal Section
 - b. Cross Section
7. Doors and Windows Schedule
8. Plans and Details of Stairs and Ramps
9. Reflected Ceiling Plan
10. Schedule of Finishes for Floors, walls and ceiling
11. AUTOCAD file of Architectural Drawings

4.3.12.2. Structural Design

- a. The proponent shall prepare the necessary structural analysis/calculation and design of the structural members of the building component in accordance with the National Building Code of the Philippines with its referral codes such as the latest National Structural Code of the Philippines. The design for the structure shall take into account, among other things, the seismic requirements of the area to determine the optimum safety of the whole structure and to minimize possible earthquake damage.
- b. On the basis of the data obtained from the detailed site investigations, topographical/soil and survey, geotechnical engineering, foundation investigation, material testing, survey of existing site conditions, the seismic requirements of the area, the load requirements of the building and other investigation required to obtain the data necessary to ensure the safety of the structure, the proponent shall prepare the preliminary structural design plans of the structure.

SUBMITTALS (at suitable scale on 20" x 30" blue print paper minimum size):
Structural Design Calculations (Using Latest Structural Design Software)

1. AUTOCAD file of Structural Drawings
2. Criteria and Design Notes
3. Foundation Plans
4. Floor framing plans
5. Schedule of slab, beams and girders
6. Schedule of columns
7. Schedule of footings
8. Structural details of stairs/ramp, if applicable
9. Structural details of retaining wall, if applicable
10. Structural details of stone masonry wall, if applicable
11. Roof framing plan
12. Schedule and details of trusses

4.3.12.3. Sanitary/Plumbing Design

a. General

- The detailed design shall conform to the general standards adopted by the Sanitary & Plumbing Code of the Philippines and other pertinent laws and ordinances.
- All design considerations/assumptions shall be based on the results of the technical studies, detailed analyses, and design computations.

The technical drawings and specifications shall clearly indicate all the details required to ascertain the care and thoroughness devoted in the preparation of the drawings.

b. Drainage and Sewerage

- Drainage and sewerage shall be underground.
- The drainage layout shall show all the required information such as direction of flow, manhole-to-manhole distances, and sizes of lines, manholes/canals, location of outfalls, etc.

SUBMITTALS (at suitable scale on 20" x 30" blue print paper minimum size):

1. General Notes
2. Legend and Symbols
3. Sewer, vent and storm drainage layout
4. Enlarge toilet plan for common and PWD toilets
5. Isometric Diagram
6. Miscellaneous details
7. Drainage System
8. Septic Tank plans and detail

c. Water Supply and Distribution System

- The winning bidder shall carry out a preliminary detailed design for the water supply of the project. The design should be on the basis of the source and volume of water supply, water consumption (domestic & fire protection system), piping network, and conveyance in accordance with the applicable laws, rules and regulations governing health, safety and sanitation.
- Water supply will be sourced from the existing water concessionaire at the area.

SUBMITTALS (at suitable scale on 20" x 30" blue print paper minimum size):

1. General Notes
2. Legend and Symbols
3. Water Line layout
4. Water Line Isometric Diagram
5. Water Tank plans and details
6. Cistern tank plans and details
7. Miscellaneous details

4.3.12.4. Electrical Design

- a. The prospective bidder shall prepare a preliminary design plans for the electrical and power supply system of the building in accordance with the Electrical Code of the Philippines, Fire Code of the Philippines, National Building Code of the Philippines and other relevant laws and ordinances
- b. The prospective bidder shall prepare a design for the electrical and power supply system and telephone system considering ease of maintenance and prevention of illegal connections.
- c. Electrical supply shall be sourced from the local electrical utility

SUBMITTALS (at suitable scale on 20" x 30" blue print paper minimum size):

1. Power Riser Diagram
2. Power Layout System
3. Lighting Layout System

4. Fire Alarm System
5. Local Area Network System
6. CCTV System
7. Grounding System
8. Load Schedule
9. Others as applicable

4.3.12.5. Mechanical Design

The prospective bidder shall prepare a preliminary design plans for the mechanical equipment's, fire protection system and Air-conditioning System based on requirements of the projects in conformity with Mechanical Code of the Philippines, Fire Code of the Philippines, National Building Code of the Philippines and other relevant Laws and Ordinances.

SUBMITTALS (at suitable scale on 20" x 30" blue print paper minimum size):

1. General Notes
2. Legend and Symbols
3. Fire Protection System plans and layout
4. Air-conditioning System schedule and ventilation layout
5. Other mechanical equipment's layout and details to conform with the requirement of the project

Other Requirements

- Technical Specifications
- Structural Design Analysis and Computation

5. Quantity Calculations

The prospective bidder shall submit the quantities of the different types of works to be carried out. In particular, the quantities of each work item shall be calculated and a bill of quantities shall be prepared to be supported with detailed cost estimates based on the scope of work as defined under this Bid Documents which shall follow DPWH standard format, to include:

6. Architectural & Engineering Design Services fees

6.1. BOQ for the Construction of MACTAN RECOVERY FACILITY

a. Direct Costs

- General Requirements such as Temporary Facilities, etc.
- Health and Safety Requirements
- Cost of materials (cost of sources, transport, handling, storage, miscellaneous expenses and allowances for wastage);
- Cost of construction plant and equipment, including depreciation or rental rates, wages of operators, fuel, oil lubricants and maintenance;
- Cost of labor, including salaries, wages, cost of living allowance and all fringe benefits.
- All other incidental expenses necessary for the construction of the project

b. Indirect Costs

- Overheads
- Contingencies
- Miscellaneous
- Profit

- All applicable taxes
- *Note: The preparation of Cost Estimate shall conform with the DPWH D.O. No 197Series of 2016*

7. Contract Documentation

The winning bidder, hereinafter referred to as the contractor shall, upon receipt of the Notice of Award (NOA)

- Post a contract performance security.
- Secure a Contractor's All Risk Insurance (CAR) covering 100% of the infrastructure cost, from the GSIS General Insurance Fund or any private bonding corporation acceptable to PAGASA and maintains such insurance coverage up to the date of the Final Acceptance of the project. Such insurance shall be submitted to PAGASA together with the Official Receipt of Payment of premium evidencing enforceability.
- Construction Schedule (PERT/CPM, Gantt Chart and S-Curve) including Architectural and Engineering Design Plans submission shall not exceed 90 calendar days.
- Other requirements that may be required.

Upon compliance with the foregoing, shall execute the Design and Build Contract with the Head of the Implementing Unit.

7.1. Construction Phase

a. Permits and Clearances

The winning bidder shall upon authorization of the Implementing Unit, make representations with the government agencies concerned to expedite the processing of the necessary permits and certificates such as the following:

- Building/Electrical/Sanitary Permits
- Occupancy permit
- Environmental Clearance Certificate, if required
- All other permits/clearances as may be required for the construction and application for commercial power connection.

b. Temporary Structures & Facilities

The winning bidder shall provide and maintain the following:

- Temporary office and/or quarters for the contractor's project team personnel with water, light, telephone and toilet facilities.
- Temporary office for the Implementing Unit and Construction Management project team with water, light, telephone and toilet facilities.
- Temporary bunkhouse/quarters for the contractor's workforce complete with toilet and bath facilities

c. Mobilization

The winning bidder shall mobilize all the required project team personnel, equipment, tools, and manpower with the required skills and in sufficient number as may be necessary for his efficient undertaking of the project

d. Construction Stage

As a rule, contract implementation guidelines for procurement of infrastructure projects shall comply with Annex "E" of the Revised IRR of RA 9184. The following provisions shall supplement these procedures:

- No work shall commence unless the contractor has submitted the prescribed documentary requirements and implementing unit has given written approval. Work execution shall be in accordance with reviewed and approved documents.
- The winning bidder shall be responsible for obtaining all necessary information as to risks, contingencies and other circumstances which may affect the works and shall prepare and submit all necessary documents specified by the Implementing Unit to meet all regulatory approvals as specified in the contract documents.
- The winning bidder shall submit a detailed program of works within seven (7) calendar days after the issuance of the Notice to Proceed (NTP) for approval by the Implementing Unit that shall include, among others:
 - 1) The order in which it tends to carry out the work including anticipated timing for each stage or design/detailed engineering and construction;
 - 2) Periods for review of specific outputs and any other submissions and approvals;
 - 3) Sequence of timing for inspection and tests;
 - 4) General description of the design and construction methods to be adopted;
 - 5) Number of personnel to be assigned for each stage of the work;
 - 6) List of equipment required on site for each stage of the work; and
 - 7) Description of the quality control system to be utilized for the project
- Any errors, omissions, inconsistencies, inadequate or failure submitted by the contractor that do not comply with the requirements shall be rectified, resubmitted and reviewed at the contractor's cost. If the contractor wishes to modify any design or document which has been previously submitted, reviewed and approved, the contractor shall notify the Implementing Unit within a reasonable period of time and shall shoulder the cost of such changes.
- As a rule, changes in design and construction requirements shall be limited only to those that have not been anticipated in the contract signing and approval. The following guidelines shall govern approval for change or variation order:
 - 1) Change Orders resulting from design errors, omissions or non-conformance with the performance specifications and parameters and the contract documents by the contractor shall be implemented by the contractor at no additional cost to PAGASA.
 - 2) Provided that the contractor suffers delay and/or incurs costs due to changes or errors in the preparation of Performance specifications and parameters, the contractor shall be entitled to either one of the following:
 - An extension of time for any such delays under Section 10 of Annex "E" of IRR-A (RA 9184); or
 - Payments for such cost as specified in the contract documents, provided that the cumulative amount of the variation order does not exceed ten percent (10%) of the original project cost.
 - 3) The contract documents shall include the manner and schedule of payment specifying the estimated contract amount and installments in which the contract will be paid.

- 4) The winning bidder shall be entitled to 15% advance payment subject to the provisions of Section 4 of Annex "E of the Revised IRR of RA 9184.
- 5) The Implementing Unit shall monitor the quality control procedures for the design and construction in accordance with the Government Guidelines and shall issue the proper certificates of acceptance for sections of the works or whole of the works as provided for in the contract documents.
- 6) The winning bidder shall provide all necessary equipment, personnel, instruments, documents and others to carry out specified tests.
- 7) This design and build project shall have minimum Defects Liability period of one (1) year contract completion or as provided for in the contract documents. This is without prejudice to the liabilities imposed upon the engineer/architect who drew up the plans and specification for a building sanctioned under Section 1723 of the New Civil Code of the Philippines.
- 8) The winning bidder shall be held liable for design and structural defects and/or failure of the completed project within the warranty period of 15 years for permanent structures/buildings and 5 years for roads as specified in Section 62.2.2 of the Revised IRR of RA 9184

e. Material Testing

All material testing shall be conducted by the DPWH accredited testing laboratories.

f. As-built plans

The contractor shall cause the preparation and submission of as-built plans duly signed and sealed by all concerned parties involved in the construction in the same sheet size and scale as the original drawings in two (2) blue print copy and one (1) reproducible copy.

g. Workmanship

All the works shall be of the highest quality of the Engineering practice and in accordance with the provisions of the National Building Code and all existing code, laws and city rules and regulations. Any defects found or imperfection observed as a result of poor workmanship shall be corrected by the Contractor without any additional cost to PAGASA.

h. Safety and Security

- All standard safety measures and precautions shall be exercised by the Contractor in the course of the project for the protection of the public and its workers.
- All workers shall be equipped with proper working uniform and identification at all times. They must be registered with PAGASA Security and must comply with PAGASA Mactan Cebu Complex rules and regulations.
- The winning bidder shall secure their own equipment and materials on site. PAGASA shall not be liable to any losses incurred during the progress of the work.

IX. TESTING PROCEDURE

The prospective bidder shall include in its submissions **a detailed testing procedure or methodology**. The detailed testing procedure and methodology shall include the full validation and testing on-site.

Bench test procedures for alignment of circuits in PCA's modules, and the likes, shall also be provided. The procedure shall be accomplished using standard test equipment and external power supplies.

Test Scripts with Recorded Results

Winning bidder will provide complete testing scripts, as appropriate, Test Forms for all equipment and devices subjected to functional testing. These forms must conform to the Manufacturer's Testing Standards. Any deviations, additions and/or deductions may be allowed only upon presentation of reasons thereof and approval from PAGASA Authorized Representative. Test results must be recorded accurately in the test forms and these must form part of the Operations & Maintenance Manual.

X. FACTORY ACCEPTANCE TESTING (FAT) FOR SOFTWARE AND HARDWARE

Factory Acceptance Testing (FAT) for software and hardware shall be conducted at the factory site. The purpose of the test is to verify the performance of the software and hardware in accordance with the specifications and functional requirements. Any defect or deviation discovered during the factory acceptance test shall be rectified by the winning bidder immediately or within a maximum period of one (1) month from the completion of the test. After such rectification, another testing shall be made to verify the rectification.

FAT for the software shall be witnessed and accepted by at least three (3) PAGASA qualified technical personnel while for the hardware, there should be at least two (2) participants. It shall be conducted within a total of 5 (five) calendar days exclusive of travel time. Costs such as, roundtrip air fare, local transportation, accommodation and daily subsistence allowance based on UNDP rate, shall be borne by the winning bidder. FAT protocol should be provided to PAGASA no later than 60 days prior to the planned FAT.

XI. FACTORY AND SITE TRAINING

The winning bidder shall provide a 7-day Factory Technical Training (FTT) on all aspects of the hardware such as, but not limited to, trouble shooting and system administration. This FTT shall be attended by five (5) qualified technical personnel of PAGASA. All expenses that will be incurred in relation to the training and all travel related expenses (roundtrip airfare, local transportation, daily subsistence allowance based on UNDP rate and accommodation) shall be borne by the winning bidder.

The Site Acceptance Test (SAT) can be conducted simultaneously with the On-Site Training (OST). The SAT and OST shall be attended by ten (10) technical personnel for five (5) days. All expenses that will be incurred pertaining to SAT and OST including all travel-related expenses (roundtrip, airfare, local transportation) and accommodation for the technical personnel who will be coming from the PAGASA Central Office in Quezon City shall be borne by the winning bidder. Training materials and meals shall be provided to the participants by the winning bidder.

On-site refresher training on the 2nd and 3rd year for two (2) personnel for five (5) days shall be conducted and all expenses shall be borne by the winning bidder.

XII. SYSTEM COMMISSIONING

After the satisfactory conclusion of the Site Acceptance Test, the winning bidder shall demonstrate the capability of the supercomputer system which will be operated continuously for a 5-day period using the PAGASA generator set. The successful demonstration thereof shall mean that the supercomputer system has been commissioned.

All expenses incurred, such as, fuel or electric consumption shall be borne by the supplier.

XIII. WARRANTIES

All workmanship, system parts, accessories, other materials and equipment and services shall be warranted by the winning bidder for three (3) years. Any workmanship, system parts, accessories, other materials and equipment that fails to provide satisfactory operation during this warranty period shall be replaced at the winning bidder's expense. While the equipment is undergoing repair, a spare unit will be supplied to PAGASA.

The repair of the defective material or equipment shall be permitted; *provided*, however, that, the item(s) being repaired is/are restored to its/their original specifications.

Procedure: Upon receipt and acknowledgment of PAGASA's report of such defect or problem, the winning bidder warrants that it shall take the necessary remedial action/s within **seven (7) calendar days or any specified period acceptable to PAGASA.**

Failure on the part of the winning bidder to take appropriate action within the specified period shall render the winning bidder liable for penalty using the following formula: **[warranty bond / 1095 calendar days (3 years)] x number of days of delay**. Said penalty shall be charged against any collectible amount by the winning bidder to PAGASA or shall be deducted from the warranty bond posted by the winning bidder in favor of PAGASA.

Service Level/ Support Structure

Priority	Incident	Description/Basic Support	Response Time	Commitment
1	Production or development system down Technical Services Engineer on-site	An error that renders product inoperative or causes the product to fail catastrophically. Major system impact, system down. Inability to use the licensed product or a critical impact on operations requiring immediate solutions.	The winning bidder shall agree to use commercially reasonable efforts to respond to the Client's trouble calls within four (4) hours in Metro Manila area.	The winning bidder will commit the necessary resources around the clock to resolve the situation or obtain work-around.

2	Moderate system impact, system hanging Technical Services Engineer on-site	An error that substantially degrades the performance of the product or materially restricts business. Ability to use licensed product, but an important function is not available and operations are severely impacted.	Within six (6) hours in Metro Manila area.	The winning bidder will commit full-time resources during normal business hours to resolve the situation (or obtain workaround) and alternative resources.
3	Minor feature or function failure Telephone Support	The defect can be easily circumvented. The error can cause some functional restrictions but it does not have a critical or severe impact on operations.	Within 24 hours.	The winning bidder will commit full-time resources during normal business hours to restore service to satisfactory level.
4	Minor Question Telephone Support	Questions regarding product features, hardware sizing, performance issue, TCP/IP related questions, platform questions.	Within 24 hours.	The winning bidder will provide resources during normal business hours to provide information assistance as requested.

All works shall be free from material defects and poor workmanship for the period of one (1) year. Any defects or imperfections as a result of inferior materials and poor workmanship, within the specified warranty period, shall be repaired and/ or replaced by the Contractor. Any amount incurred in the repair as a result of the above defects shall be at the full expense of the Contractor.

XIV. AFTER SALES SUPPORT

The winning bidder shall include in its bid a commitment for at least ten (10) years support to PAGASA for the repair and maintenance of the supercomputer system to be supplied.

It shall include in its commitment a provision of a reliable, swift and efficient on-site support, available 24/7 trouble and ticketing and response system and ensure a quick and readily available supply of spare and replacement parts.

For Precision Air Conditioning Units and Comfort Air Conditioning Units

- a. Round the clock Service shall be guaranteed by supplier during defect liability period guarantee period. A certain minimum stock of spares shall be maintained by supplier at site.
- b. OEM of the UPS and PACU system shall also quote for 24 x 7 services through their authorized service engineer for a period of at least 3 years after guarantee period.
- c. OEM of the UPS and PACU system shall offer an unconditional guarantee warranty of equipment for a Period of 36 months against any failure.
- d. The equipment must carry OEM's on-site warranty for Three Years from the date of taking over of the equipment after the acceptance tests. Warranty period will stand extended for a period of total downtime of the UPS and/or PACU System.

- e. The batteries must carry on-site warranty for minimum period of 24 months from the date of installation.

XV. TERMS OF PAYMENT

(Please refer to Items 10 and 11 in Section IV of the General Conditions of Contract.)

XVI. SYSTEM DOCUMENTATION

The winning bidder shall likewise provide PAGASA with the supercomputer system's installation, operations and maintenance manuals. Said manuals shall contain among others the **complete and detailed schematic diagrams, theory of operations, calibration and maintenance procedures.**

All other hardware and software requirements shall also be turned-over to PAGASA prior to the issuance of the Final Inspection and Acceptance report.

In addition, the winning bidder shall provide a complete list of deliverables and installation materials, such as but not limited to mechanical, electrical, structured cabling, etc.