



TERMS OF REFERENCE

Comprehensive Upgrade of Lightning and Surge Protection Systems with Grounding Enhancement at PAGASA WFFC Compound

I. BACKGROUND:

PAGASA's WFFC compound is a critical hub for Philippine weather and climate services. It houses key divisions responsible for weather forecasting, hydrological monitoring, climate analysis, and agricultural weather forecasting. The Data Center, a central component of this facility, aggregates, processes, and stores crucial meteorological and hydrological data.

To ensure the uninterrupted operation of these vital services, the compound's infrastructure, including sensitive electronic equipment and critical data systems, must be protected from potential threats, particularly lightning strikes and voltage or current fluctuation and surges. The existing lightning and surge protection systems and the grounding infrastructure require a comprehensive upgrade to mitigate risks such as equipment damage, data loss, and operational downtime.

II. APPROVED BUDGET FOR THE CONTRACT:

The approved budget for the project amounts to **Twenty Million Five Hundred Pesos (PHP 20,500,000.00)**, inclusive of Value Added Tax (VAT) and all applicable government taxes.

III. PLACE OF DELIVERY AND CONTRACT PERIOD:

The winning bidder shall supply, deliver, install, test, and commission the Comprehensive Upgrade of Lightning and Surge Protection Systems with Grounding Enhancement at the PAGASA WFFC Compound for Enhanced Safety and Reliability, located at Sen. Miriam Defensor P. Santiago Ave., Diliman, Quezon City, and conduct the required training within **150 calendar days** from the receipt of the Notice to Proceed (NTP).

VI. ADDITIONAL DOCUMENTS TO BE SUBMITTED BY BIDDERS:

1. A proposed methodology, conceptual design plan/block, or schematic diagram of the entire system intended to be protected from lightning strikes, power surges, or voltage/current fluctuations. To have a full view of the project contract.



Such a conceptual plan will give a brief idea or picture to the project implementor or end user so that necessary inputs or amendments to the said conceptual plan can be made to meet the needed requirements for the contract.

2. Provide a methodology plan in the installation procedures based on engineering practices and standards for all devices, components, and accessories of the lightning protection system, TVSS/surge protection system, and grounding system in their Engineering design plan proposal, ensuring compliance with all applicable rules and regulations of the national and local governments, latest Philippine Electrical Code and relevant local and international standards including IEC, IEEE, and NFPA.
3. Site inspection certificate to be secured from an authorized or designated representative from the Engineering Technical Services Division (ETSD) after the prospective bidder has undergone full inspection in order to assess the site and have a full view of the system to be protected and satisfy the full coverage of the contract requirements.
4. Resume, certificate, and license of its Professional (Registered Electrical Engineer; Project Engineer) and Technical Personnel (Accredited Construction Occupational Safety and Health(COSH SO2); Certified Working at Heights(WAH); Certified Electrical Installation & Maintenance - NC II) indicating that they have conducted similar projects related to the lightning protection system, voltage fluctuation or current surge, harmonics, and grounding system.
5. PCAB Class “AA” and PCAB license showing that the prospective bidders are authorized to handle projects related to Electrical Engineering works.
6. Certificate of ISO 9001:2015 or ISO 14001-2015 from Manufacturer or Bidder whichever is applicable. All applicable international industry standards or regulatory bodies must be indicated in the brochures including but not limited to ANSI/IEEE/UL/IEC/CE marks or in the form of a certificate whichever is applicable.
7. Provide design of the 20M-guyed pole under the industry standard design of the bid-offer of the prospective bidder and capable of having good structural stability and integrity. Also, said pole must be properly treated with hot-deep galvanized, epoxy primer or other latest corrosion treatment technology to avoid pipeline breaks or failure due to oxidation.



8. Manufacturers warranty certificate for major equipment/devices and other components, in compliance with the specified warranty indicated in the brochures.
9. Service Level Agreement (SLA) for the completed project, detailing the terms of ongoing support, maintenance, and performance standards. The winning bidder is required to conduct quarterly maintenance or respond to emergency maintenance calls to avoid system downtime covered by the project contract.

V. TECHNICAL SPECIFICATIONS:

ITEM NO	DESCRIPTION	QTY	UNIT	TECHNICAL SPECIFICATION & FEATURES
1	Lightning Protection	3	sets	<ul style="list-style-type: none"> • Coverage Radius: 100m • Full Compliance to Industry Standards: IEC62305 Connector: • DC Electrical Resistance using 10A source: 0.170mΩ • Resistance after 3 current injections in accordance with EN IEC62305-1-2011annex c & 62561-1-2012: 0.180mΩ • Intensity: 100kA 10/350μs • Specific energy: 2500 KJ/Ω • Certified Standards: NE EN IEC 62305-1:2011; UL96; ISO 9001-2015
2	Lightning Strike Flash Counter	15	Sets	<ul style="list-style-type: none"> • Minimal Detectable Current: $I_d \geq 1kA$ • Maximum Detectable Current: $I_{max} \leq 100kA$ • Connection Type: Parallel • Operating temperature range: -40°C - +80°C • Accuracy of peak current measurement: $\pm 10\%$ • Average battery lifetime: 3 years • Remote contact alarms: Yes • IP Index: IP65 • Mounting Clamp
3	High-Frequency Filter	12	sets	<ul style="list-style-type: none"> • Materials: Copper, Ferrite, POM, and dielectric insulator

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				<ul style="list-style-type: none"> • High-Frequency Filter: High Reactance Filter (40Hz~2.7GHz) • DC Electrical Resistance using 10A source: 0.37mΩ • Resistance after 3 current injections of 100kA 10/350 according to standard EN IEC62305-1-2011annex c & 625621-1-2012: 0.38mΩ • Electrical Resistance value requirement of the filter using 10A sources before & after 3 current injections of 100kA 10/350: <1mΩ • Intensity: 100kA 10/350μs • Specific energy: 2500 KJ/Ω • Certified Standards: UNE EN IEC 62305-1:2011; UNE EN IEC 62561-1:2012
4	Surge Protection Device/TVSS 100 kA-1Ø, 240V, 2wire+G	2	Sets	<ul style="list-style-type: none"> • Surge currents per phase 8/20μs (Imax) 100kA • Nominal discharge surge current per phase 8/20μs (In) 50kA • Life Cycle Tested: 3,000 Cat. C3 20KV/10KA High Exposure Impulses • 100kAIC fault current rating • Maximum lightning current discharge per mode 10 /350μs(In): 40kA w/G option • All mode protection: L-G, L-N, N-G, L-L where applicable • LED Indicator per phase • Operating frequency: 47- 400MHz • Operating Temperature: 40°C to 65°C • Non condensing humidity: 5% to 95% • Enclosure: NEMA 4X (IP66); UL 94-5; fiberglass reinforced polyester • Pre-wired with #10AWG leads • Standard: ANSI/IEEE C62.41 Location C, B, & A • Standard Compliance: EN61643-11 Type 1 & 2; IEC 61543-1 Class I, II, II • Regulatory Listings: UL 3rd Edition Certified, Type 1 & Type 2; CE Marked 4th Edition compliant



	120 kA -3Ø, Delta, 240V/480V, TVSS	11	Sets	<ul style="list-style-type: none"> • 200kAIC fault current rating • Life Cycle Tested: 5,000 Cat. C3 20KV/10KA High Exposure Impulses • Surge currents per phase 8/20µs (Imax)120kA,160kA,200kA • Nominal discharge surge current 8/20µs(In):60kA, 80kA, 100kA • Maximum lightning current discharge per mode 10 /350µs(In): 40kA w/G option • All mode protection: L-G, L-N, N-G, L-L where applicable • LED Indicator per phase • Operating frequency: 47-400MHz • Operating Temperature: 40oC to 65oC • Non condensing humidity: 5% to 95% • Enclosure: NEMA 4X (IP66); UL 94-5; fiberglass reinforced polyester • Pre-wired with #10AWG leads • Standard: ANSI/IEEE C62.41 Location C, B, & A • Standard Compliance: IEC 61643-11 Type 2; IEC 61543-1 Class I, II, II • Regulatory Listings: UL1449 3rd Edition Certified, Type 1 & Type 2 SPD; CE Marked 4th Edition compliant
	160 kA -3Ø, Delta, 240V/480V, TVSS	7	Sets	
	200 kA -3Ø, Delta, 240V/480V, TVSS)	3	Sets	
	160 kA -3Ø, Wye, 277V/480V, TVSS	1	Set	
	320 kA -3Ø, Delta, 240V/480V, TVSS	1	Set	<ul style="list-style-type: none"> • 200kAIC fault current rating • Life Cycle Tested: 7,000 Cat.3 High Exposure Impulses with < 4% degradation • Surge currents per phase (Imax): 160kA, 200kA, 250kA, 320kA, 400Ka • Nominal discharge surge current (In): 80kA, 100kA, 125kA, 160kA, 200kA • All mode protection: L-G, L-N, N-G, L-L where applicable • Green LED Indicator per phase • Operating frequency: 47- 400MHz • Operating Temperature: -40oC to +65oC
	320 kA -3Ø, Wye, 277V/480V, TVSS	2	Sets	
	400 kA -3Ø, Wye, 277V/ 480V, TVSS	1	Set	



				<ul style="list-style-type: none"> • Non condensing humidity: 5% to 95% • Enclosure: NEMA 12 (IP52); Painted steel • Pre-wired with #10AWG leads • Standard: ANSI/IEEE C62.41 Location C & B • Standard Compliance: IEC 61643-1 Class I, II, III • Regulatory Listings: UL 3rd Edition Certified, Type 1 & Type 2 SPD; Tested to UL1283; CE Marked 4th Edition compliant
5	ECB, 30A, 2-pole, and Grounding busbar (ECB-30AT/100AF, 2P)	2	sets	<ul style="list-style-type: none"> • ECB-30AT/100AF, 2P Type: Enclosed Circuit Breaker 30A, 2-pole and Grounding busbar
	ECB, 30A, 3-pole, and Grounding busbar (ECB-30AT/100AF, 3P)	22	sets	<ul style="list-style-type: none"> • ECB-30AT/100AF, 3P Type: Enclosed Circuit Breaker 30A, 3-pole and Grounding busbar
	ECB, 30A, 3-phase w/ Neutral and Grounding busbar (ECB-30AT/100AF, 3P)	4	sets	<ul style="list-style-type: none"> • ECB-30AT/100AF, 3P Type: Molded Case Circuit Breaker (MCCB) Current Rating: 30A Poles: 3-pole configuration Voltage Ratings: AC Voltage: Up to 550 VAC DC Voltage: Up to 250 VDC Mounting: Suitable for panel Mounting Environments Certifications: Complies with international standards such as IEC 60947-2, ensuring reliability and safety
6	20M Guyed Pole	3	sets	<ul style="list-style-type: none"> • Tower Works, Civil Works • Design and Certifications <ul style="list-style-type: none"> ◦ Building Structural Investigation and Certification (signed and sealed of Documents) ◦ Pole Designs and Analysis with Certification (Signed and Sealed of Document) • Nondestructive Testing (NDT) • Soil Investigation (Soil Bearing Test SBT) • Foundation Design and Analysis



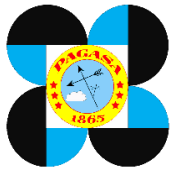
7	Earthing & Grounding Material	1	Lot	<ul style="list-style-type: none"> • Grounding Resistance: less or equal to 1 Ω
	Ground Rods			<ul style="list-style-type: none"> • Min. Length: 3000mm(10ft) • Diameter: 16mm (5/8") \varnothing • Grounding Electrode Type, Pure electrolytic copper high tensile steel • Certification: IEC 62561 Part 2; UL 467
	Grounding Conductors (outdoor)			<ul style="list-style-type: none"> • 50sq.mm (AWG 1/0) bare copper wire • 50sq.mm (AWG 1/0) Green Insulated stranded copper wire
	Inspection pit /Test pit			<ul style="list-style-type: none"> • made in concrete • Test pit have removable cover • IEC 62561 -5 Compliant High compressive strength (6000kg)
	Ground-enhancing cement			<ul style="list-style-type: none"> • Tested in compliance to IEC52561-7 • Environmentally Friendly
	Equipment Busbar			<ul style="list-style-type: none"> • L: 550mm, W: 100mm, T: 6.4mm • L: 245mm, W: 38mm, T: 3.2mm • w/ mounting brackets made of Galvanized Iron paired w/ 35mm red apple insulator. • 8mm bolt/nut & washers stainless steel • Bare solid alloy (99.9%) tinned copper • UL Listed
	Grounding Conductors			<ul style="list-style-type: none"> • 22mm² (AWG# 4) Green Insulated stranded copper wire
	Exothermic Mould			<ul style="list-style-type: none"> • Made of graphite • Reusable up to 50 times • In accordance with IEEE Std.837 • UL Listed
	Metal Powder			<ul style="list-style-type: none"> • Non-toxic w/ high conductivity • with at least 93% copper • Int'l standard UL 467 and IEC compliant



VII. SCOPE OF WORK:

1. Conducted site inspection and assessment.
2. Conduct an assessment and evaluation of the existing lightning protection, surge protection, and grounding systems to determine their effectiveness and compliance with relevant standards. Identify any vulnerabilities and highlight areas in need of improvement.
3. Secure all necessary approvals and permits from the relevant authorities, including the signature and seal of a Professional Engineer and the Structural Investigation certification, for the comprehensive engineering design of the upgraded lightning protection, surge protection systems, and grounding enhancements.
4. Supply, deliver, and install all required devices, components, and accessories for the lightning protection, surge protection, and grounding systems, in accordance with system designs that have been approved and signed by the appropriate authorities and the Head of the Procuring Entity (HOPE). The scope of work includes but is not limited to, the following system components and devices:
 - Guyed Tower 20M (3 sets)
 - Lightning Protection with connector (3 sets)
 - High-Frequency Filter (12 sets)
 - Lightning Strike Flash Counter (15)
 - 100 kA -1Ø, 240V TVSS (2 sets)
 - 120 kA -3Ø, Delta, 240V/480V, TVSS (11 sets)
 - 160 kA -3Ø, Delta, 240V/480V, TVSS (7 sets)
 - 200 kA -3Ø, Delta, 240V/480V, TVSS (3 sets)
 - 320 kA -3Ø, Delta, 240V/480V, TVSS (1 set)
 - 160 kA -3Ø, Wye, 277V/480V, TVSS (1 set)
 - 320 kA -3Ø, Wye, 277V/480V, TVSS (2 sets)
 - 400 kA -3Ø, Wye, 277V/ 480V, TVSS (1 set)
 - ECB, 30A, 2-pole and Grounding busbar (ECB-30AT/100AF, 2P) (2 sets)
 - ECB, 30A, 3-pole and Grounding busbar (ECB-30AT/100AF, 3P) (22 sets)
 - ECB, 30A, 3-phase w/ Neutral and Grounding busbar (ECB-30AT/100AF, 3P) (4 sets)
 - Earthing & Grounding System (1 lot)
 - Exothermic Weld
 - Inspection/test pit (5 sets)
 - Earth-enhancing cement (4 bags)

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- Ground Bus bar (245mm L x 38mm H x 3.2mm W) (5 pcs)
- Ground Bus bar (55cm L x 10cm H x 0.64cm W) (16 pcs)
- Ground rod copper 10ft x 5/8"Φ (20 pcs)
- 50 sq.mm Bare Copper Wire
- 50 sq.mm THHN Green Grounding cable
- 22 sq. mm THHN Green Grounding cable

5. Testing and Commissioning:

- Conduct a seven (7)-day test of the installed lightning protection system and its associated components to ensure proper functionality, effectiveness, and compliance with safety standards.
- Perform and finalize system commissioning to ensure optimal performance and full compliance with all specifications and requirements and provide a detailed report on the performance of the new systems.

6. Training and Documentation:

- Conduct a three-day training program for at least five personnel on the operation, maintenance, and troubleshooting of the lightning protection system and its components. Upon completion, issue training certificates to participants. The winning bidder will cover all associated costs, including meals and related expenses.
- Submit all required documentation, including installation manuals, maintenance procedures, testing results, training materials, as-built drawings, block diagrams, and design schematics. All documents must be signed and sealed by a Professional Electrical Engineer and provided in standard engineering format.
- Submit the design and certifications for the 20-meter guyed tower, including the Structural Analysis, Pole Design and Analysis, and Nondestructive Testing (NDT), all signed and sealed by a member of the Association of Structural Engineers of the Philippines, Inc. (ASEP).

VII. PROJECT IMPLEMENTATION

1. The winning bidder must submit a work schedule for the project's implementation to the end user upon receipt of the Notice to Proceed.



2. Before project implementation begins, the winning bidder must hold a kick-off meeting with the end users and an ETSD representative to review communication flow, procedures, protocols, and other technical contract details. The end user will set the meeting schedule and venue.

VIII. WARRANTY AND MAINTENANCE

1. All equipment, sensors, devices, and accessories comprising the Lightning Protection System and Grounding System shall be warranted against factory defects and poor workmanship for two (2) years, with a minimum of five (5) years for all Transient Voltage Suppressor Systems (TVSS), starting from the date of acceptance.
2. If any equipment, sensor, device, or accessory fails to function as intended within the warranty period, the winning bidder shall replace it at no cost to PAGASA.
3. The winning bidder must conduct quarterly preventive maintenance and respond to emergency requests 24/7 to prevent system downtime during the warranty period.

IX. FACTORY ACCEPTANCE TRAINING AND TESTING

A Factory Acceptance Training (FAT) will be conducted at the manufacturer's facility and attended by three (3) PAGASA representatives. The FAT, inclusive of travel time, will be completed within seven (7) calendar days.

The training will cover the management, maintenance, and testing procedures of the lightning protection system, power surge protection system, and grounding system. All expenses associated with the FAT, including airfare, transportation, lodging, training materials, and daily allowances (as per UNDP-DSA rates), will be borne by the winning bidder.

The Factory Acceptance Test is crucial to ensure that the lightning protection and power surge protection systems meet performance and safety standards, identify potential manufacturing defects, and provide necessary documentation for warranties and audits. A successful FAT instills confidence in the system's reliability and allows for the resolution of issues before delivery, minimizing risks during installation and operation.



Factory training empowers Users with comprehensive knowledge of the system, including its components, safety protocols, and maintenance techniques. This training enhances effective usage, reduces risks from electrical surges, extends system lifespan, and optimizes surge protection settings. Proper training also minimizes operational errors, reduces downtime, and improves overall reliability. Additionally, it provides access to manufacturer resources and support for effective operation and maintenance.

