

Notice to all Bidders

RE: ADDENDUM NO. 6: AMENDMENT OF BIDDING DOCUMENT

Contract Title: Design, supply, installation and commissioning of the 400/220 kV Kimuka Substation and Associated Transmission Lines

Contract No.: KE-KETRACO-416094-CW-RFB

In accordance with the Instructions to Bidders ITB 8 [Amendment of Bidding Document], the Employer, *Kenya Electricity Transmission Company Ltd. (KETRACO)* has amended the following sections/parts of the issued Bidding Document:

1. Section-VII-2E-Schedules of Technical Information- table cc) 400 kV OVERHEAD LINE INSULATOR SET has been added. Refer to Attachment 1.
2. Section-VII-2B-Specification, clause 22.1.7 (Vibration Dampers), 22.1.8 (Spacers) and 22.1.9 (Spacer Dampers) which reads as shown below:

22.1.7. Vibration dampers

Dampers of Stockbridge pattern shall be supplied. It shall be suitable to attach to the conductor without damaging the conductor strands at all line conductor suspension and tension points. The number of vibration dampers to be installed per span on each conductor shall be proposed by the Contractor for approval. Such numbers and locations to be fixed shall be in accordance with the instructions given by the manufacturer of the concerned vibration dampers.

They shall be designed to limit the amplitude of conductor vibrations at point of restraint to an applicable level. Clamping bolt shall be provided with domed self-locking nut designed to prevent corrosion to the threads. Dampers shall be suitable for maintenance under hot line working conditions.

The method of damper manufacture shall be such as to ensure freedom from subsequent drop of the "bells" in service. If considered necessary, the Employer may call for acceptance fatigue test to indicate proof of behaviour in service.

Evidence of the adequacy of the dampers shall be provided by copies of typical vibration recorder test carried out by the damper manufacture. The Contractor shall prove that the life expectancy of the conductors and overhead grounding wires to be more than 100 years.

22.1.8. Spacers

Spacers shall be fitted in order to maintain the specified distance between the sub-conductors under all working conditions. The distance between center to center of sub-conductors shall be 400mm for line conductors. Smaller distance for jumper loops may be proposed for approval. Spacers shall be provided in each span and installed in accordance with the manufacturer's recommendation. Notwithstanding these recommendations the distance between spacers shall not exceed 60 m and the spacers shall not normally be uniformly distributed within a span. Spacers in the span shall maintain the spacing of the subconductors in the bundle as specified in the Technical Schedules.

Jumpers shall be fitted with not less than two spacers having a spacing required and spaced evenly along the jumpers at intervals to permit not more than 4.5m of free conductor. Assuming that the sub conductors remain parallel to each other no spacer shall allow the conductor centres to become less than 200mm.

Spacers shall be designed to have the following features: -

- a) They are preferably to be of one-piece construction and shall not have separate small components. They shall be suitable for hot line maintenance. All bolts shall be captive; nuts shall only need slackening - not removal - in order to fit the spacer to the conductors. No bolt or nut shall require a tightening torque greater than 35 N-m.
- b) No rubbing shall take place between any parts of the spacer other than the conductor clamps hinges or clamp swing bolts. A joint incorporating a flexible medium is acceptable provided that such a medium cannot slip against any other component.
- c) As far as possible, spacers shall be made of aluminium alloy of an approved type; any ferrous metal parts shall be galvanized and shall withstand tests laid down in BS EN ISO 1481. Other materials may be used subject to satisfactory evidence being given to the Employer/ Employer's Representative that all components shall be suitably corrosion resistant and shall not cause any other components or the conductor to corrode and shall not otherwise unduly deteriorate in service.
- d) Spacer conductor clamps shall incorporate an approved arrangement to ensure that the correct clamping pressure is maintained when conductor strands move due to bedding down, creep and tension or temperature variation. Clamps shall not damage the conductor at any time.
- e) Any nuts or bolts used on spacers shall be locked in an approved manner against vibration loosening.
- f) At an early stage in the design of a spacer, where applicable, the limit of electrical resistance between the conductors and the individual parts of the spacer shall be agreed with the Employer. All the spacers except for jumper loop shall be capable of the following movements without damaging the conductors, assuming one conductor to be fixed and the other moving.

a	Longitudinal Movement ("L") parallel to the conductor	±90 mm minimum
b	Vertical movement ("V") in a vertical direction at right angles to the conductor	0 to ±50 maximum (preferably zero)
c	Torsional movement ("T") angular movement in a vertical plane parallel to the conductor	± 50 minimum

Contractor shall submit a full and complete specification of the spacers offered with drawings.

22.1.9. Spacer dampers

The Contractor may propose in addition to Stockbridge pattern dampers and rigid spacers, as specified above, an alternative system of spacer-dampers. Detail drawings of the proposed spacer damper together with laboratory test reports shall be provided and evidence must be given to show that the spacer-damper has been in successful and trouble-free use for a proof period of several years on similar transmission lines, which shall be named in the Bid. They shall be suitable for maintenance under hot line working conditions. If spacer dampers are accepted in principle by the Employer, they shall be subject to such tests as the Employer shall decide at no extra cost to the Employer, and the Contractor should indicate in his Bid the test specification he would propose. The Employer reserves the right to reject any proposed system of spacer damper without stating reasons.

has been revised as follows:

22.1.7 Vibration dampers

Dampers of Stockbridge pattern shall be supplied. It shall be suitable to attach to the conductor without damaging the conductor strands at all line conductor suspension and tension points. The number of vibration dampers to be installed per span on each conductor (Phase or earthwire-ACS/OPGW as applicable) shall be proposed by the Contractor for approval. Such numbers and locations to be fixed shall be in accordance with the instructions given by the manufacturer of the concerned vibration dampers and shall be supported by a damping study to be submitted by the Contractor. The damping study shall at the least provide detailed calculations of vibration amplitudes and strains for the case of conductors with and without dampers.

They shall be designed to limit the amplitude of conductor vibrations at point of restraint to an applicable level as well as limit strain levels of the conductors at the clamp positions under normal/aeolian vibration conditions. Clamping bolt shall be provided with domed self-locking nut designed to prevent corrosion to the threads. Dampers shall be suitable for maintenance under hot line working conditions.

The method of damper manufacture shall be such as to ensure freedom from subsequent drop of the "bells" in service. If considered necessary, the Employer may call for an acceptance fatigue test to indicate proof of behaviour in service.

Evidence of the adequacy of the dampers shall be provided by copies of typical vibration recorder tests carried out by the damper manufacture. The Contractor shall prove that the life expectancy of the conductors and overhead grounding wires to be more than 100 years.

22.1.8 Spacers

Spacers shall be fitted in order to maintain the specified distance between the sub-conductors under all working conditions. The distance between center to center of sub-conductors shall be 400mm for line conductors.

Spacers shall be provided in each span and installed in accordance with the manufacturer's recommendation. Notwithstanding these recommendations the distance between spacers shall not

exceed 60 m and the spacers shall not normally be uniformly distributed within a span. Spacers in the span shall maintain the spacing of the subconductors in the bundle as specified in the Technical Schedules.

Jumpers shall be fitted with not less than two spacers having a spacing required and spaced evenly along the jumpers at intervals to permit not more than 4.5m of free conductor. Assuming that the sub conductors remain parallel to each other no spacer shall allow the conductor centers to become less than 200mm.

Spacers shall be designed to have the following features: -

- a) They are preferably to be of one-piece construction and shall not have separate small components. They shall be suitable for hot line maintenance. All bolts shall be captive; nuts shall only need slackening - not removal - in order to fit the spacer to the conductors. No bolt or nut shall require a tightening torque greater than 35 N-m.
- b) No rubbing shall take place between any parts of the spacer other than the conductor clamps hinges or clamp swing bolts. A joint incorporating a flexible medium is acceptable provided that such a medium cannot slip against any other component.
- c) As far as possible, spacers shall be made of aluminum alloy of an approved type; any ferrous metal parts shall be galvanized and shall withstand tests laid down in BS EN ISO 1481. Other materials may be used subject to satisfactory evidence being given to the Employer/ Employer's Representative that all components shall be suitably corrosion resistant and shall not cause any other components or the conductor to corrode and shall not otherwise unduly deteriorate in service.
- d) Spacer conductor clamps shall incorporate an approved arrangement to ensure that the correct clamping pressure is maintained when conductor strands move due to bedding down, creep and tension or temperature variation. Clamps shall not damage the conductor at any time.
- e) Any nuts or bolts used on spacers shall be locked in an approved manner against vibration loosening.
- f) At an early stage in the design of a spacer, where applicable, the limit of electrical resistance between the conductors and the individual parts of the spacer shall be agreed with the Employer. All the spacers except for jumper loop shall be capable of the following movements without damaging the conductors, assuming one conductor to be fixed and the other moving.

a	Longitudinal Movement ("L") parallel to the conductor	±90 mm minimum
b	Vertical movement ("V") in a vertical direction at right angles to the conductor	0 to ±50 maximum (preferably zero)
c	Torsional movement ("T") angular movement in a vertical plane parallel to the conductor	± 50 minimum

Contractor shall submit a full and complete specification of the spacers offered with drawings.

22.1.9. Spacer dampers

Control of vibration and spacing within the phase conductor bundle shall be by means of a combination of vibration dampers (Stockbridge type) and flexible spacers or spacer dampers. Alternatively, combinations of spacer dampers, with or without end-span Stockbridge dampers, may be adopted provided that satisfactory performance data has been offered for the proposed system.

All spacer dampers shall be designed to maintain or restore the specified geometric configuration of the conductor bundle (i.e. distance between sub-conductors' center-to-center at 400mm), even when the latter is subjected to different actions (e.g. wind, short-circuit, etc). They shall also be designed to prevent any damage to the conductor arising from clamp slip occurring after conductor creep or long-term vibration.

Spacer dampers shall be designed, in addition to maintaining the correct spacings of subconductors in the bundle and to restoring their torsional stability after unfavourable conditions, to:

- introduce an additional damping effect to that of the conductor and to control aeolian vibration and subspan oscillation to ensure that the strain level in the conductor at the suspension clamp and at the clamp of the spacer dampers is below the fatigue limit of the conductor strands,
- prevent damage to each subconductor from vertical and horizontal vibration and oscillation,
- prevent physical contact between subconductors arising from wind and electro-magnetic forces (except short-circuit current),
- guarantee that conductor bending strain at suspension and tension clamps shall not exceed the limit of 150 microstrain,
- guarantee that conductor bending strain at spacer damper clamps shall not exceed the limit of 100 microstrain.

The approval of spacer dampers shall be conditional on the provision of evidence of satisfactory service life and performance. Evidence must be provided in respect of fatigue resistance, clamp to conductor grip, damping of aeolian vibration and control of subspan oscillation with disposition along the span as recommended by the manufacturers. Evidence shall be provided of resistance to ozone and ultraviolet light as well as to aging in the case of hardware employing elastomers. Further, full and complete specification together with laboratory test reports of the proposed spacer dampers along with the associated detail drawings shall be provided by the Contractor. The spacer dampers shall be suitable for maintenance under hot line working conditions.

The metallic material of spacer dampers shall be aluminium alloy of approved type; any ferrous metal parts shall be galvanized and shall withstand tests laid down in BS EN ISO 1481. The clamps shall not be less than 120 mm long and shall be provided with an adequate clamping surface secured by not less than two bolts and with a radius at the clamp mouth to prevent damage to the conductor. Alternative designs of clamping can be considered on evidence of satisfactory service experience. All screws and nuts on spacers and spacer dampers shall be locked in an approved manner against vibration loosening.

Elastomers or other non-metallic materials if used shall have good resistance to ageing and be capable of withstanding temperatures between +0°C and +110°C without change of essential properties. The

materials shall have adequate resistance to the effects of ozone, ultraviolet radiation and air pollution over the entire temperature range and shall have a semi-conductive property.

General Note Applicable for Vibration Damping Systems (Bundled Phase Conductors & Earthwire-ACS / OPGW):

- Earthwire conductors (ACS and OPGW) shall utilise Stockbridge type Vibration Dampers for control of vibrations
- Control of vibrations within the phase conductor bundle shall primarily be by means of a combination of vibration dampers (Stockbridge type), specified in clause 22.1.7 above, and spacer dampers. Alternatively, combinations of spacer dampers, with or without end-span Stockbridge dampers, may be adopted provided that satisfactory performance data has been offered for the proposed system. Any proposal shall be supported by detail damping study report to be submitted by the Contractor.
- Proposals as to the number of dampers (i.e. Stockbridge type and/or Spacer Dampers as shall be applicable) and their spacings / locations within the span shall be in accordance with the instructions given by the manufacturer and supported by a detailed damping study report to be submitted.

3. Section-VII-2B-Specification, clause 22.3.3.1 “General” which reads as shown below:

The insulator shall be of polymer insulators. The polymer suspension insulators shall be designed, manufactured and tested in accordance with the standards listed. Application of the polymer insulators shall be as per following table.

Table: Application of Polymer Suspension Insulator Set

Description	Unit	400kV	
		Suspension	Tension
Insulator string	-		
Electromechanical failing load	kN	210	210
Double or Single string	kN	Double	Double

Polymer suspension insulator set of 70 kN electromechanical failing load with single string shall be used for supporting all jumper conductor all transmission lines.

Polymer inverted tension insulator set of 210 kN electromechanical failing load with single string shall be used for supporting gantry conductor all transmission lines.

has been revised as follows:

The insulator shall be of polymer insulators. The polymer suspension insulators shall be designed, manufactured and tested in accordance with the standards listed. Application of the polymer insulators shall be as per following table.

Table: Application of Polymer Suspension Insulator Set

Description	Unit	400kV		
		Suspension	Tension	Jumper
Insulator string	-			
Electromechanical failing load	kN	240 (2x120kN)	420 (2x210 kN)	120 kN
Double or Single string	kN	Double	Double	Single

Polymer suspension insulator set of 120 kN electromechanical failing load with single string shall be used for supporting all jumper conductor all transmission lines.

Polymer inverted tension insulator set of 420 kN electromechanical failing load with single string shall be used for supporting gantry conductor all transmission lines.

4. Section-VII-2B-Specification clause 22.3.3.6 “Insulator string sets”, paragraph 2 which reads as shown below:

The withstand voltages below indicated are effective for <1000m altitude. Accordingly, correction for altitude at site need to be applied.

- | | |
|---|-----------|
| a) Power frequency withstand voltage: | 850 kV |
| b) Lightning impulse withstand voltage: | 1425 kV |
| c) Switching impulse withstand voltage phase-earth: | 1050 kV |
| d) Minimum mechanical and electro-mechanical failing load | |
| Suspension string: | 2x210 kN |
| Suspension clamp: | 3*120 kN |
| Tension string: | 2x210 kN |
| Inverted tension string: | 1x210 kN |
| Jumper support string: | 70 kN |
| e) Min. arcing distance with corona rings: | 4070 mm |
| f) Min. creepage distance: | 16,000 mm |

has been revised as follows:

The withstand voltages below indicated are effective for <1000m altitude. Accordingly, correction for altitude at site need to be applied.

- | | |
|---|----------|
| g) Power frequency withstand voltage: | 850 kV |
| h) Lightning impulse withstand voltage: | 1425 kV |
| i) Switching impulse withstand voltage phase-earth: | 1050 kV |
| j) Minimum mechanical and electro-mechanical failing load | |
| Suspension string: | 2x120 kN |
| Suspension clamp: | 3*120 kN |
| Tension string: | 2x210 kN |

Inverted tension string:	2x210 kN
Jumper support string:	120 kN
k) Min. arcing distance with corona rings:	4070 mm
l) Min. creepage distance:	16,000 mm

5. Section-VII-2B-Specification clause 25.5, 25.5. "Electrical Parameters for Earthing Calculation" which reads as shown below:

Parameter for	400 kV	220 kV	132 kV	33 kV
Fault current (kA)	40kA	40kA	31.5kA	25kA
Frequency (Hz)	50	50	50	50
Duration fault current for earthing conductor sizing (s)	1	1	1	3
Duration of shock for body current (s)	0.5	0.5	0.5	0.5

To ensure the lowest possible resistance to earth and to lower the surge impedance for lightning protection, buried electrodes shall be provided to bring the overall resistance to earth to less than 0.2 Ω . A value higher than 0.2 Ω shall be subject to the approval of the KETRACO/Engineer.

has been revised as follows:

Parameter for	400 kV	220 kV	132 kV	33 kV
Fault current (kA)	40kA	40kA	31.5kA	25kA
Frequency (Hz)	50	50	50	50
Duration fault current for earthing conductor sizing (s)	1	1	1	3
Duration of shock for body current (s)	0.5	0.5	0.5	0.5

To ensure the lowest possible resistance to earth and to lower the surge impedance for lightning protection, buried electrodes shall be provided to bring the overall resistance to earth to less than 1 Ω . A value higher than 1 Ω shall be subject to the approval of the KETRACO/Engineer.

6. Section-VII-2E-Schedules of Technical Information table i , 1) Earthing System, 1.1) General, Time Duration of Ground Fault, which reads as shown below:

i) EARTHING AND LIGHTNING PROTECTION	UNIT	DATA	
		Required	Offered
EARTHING SYSTEM			
General			
Time duration of ground fault	sec	3	

has been revised as follows:

i) EARTHING AND LIGHTNING PROTECTION	UNIT	DATA	
		Required	Offered
EARTHING SYSTEM			
General			
Time duration of ground fault	sec	1	

7. Section-VII-2E-Schedules of Technical Information table i , 1) Earthing System, 1.2) Ground Grid and Risers 1.2.1) ground grid conductor, item Material and 1.2.2) riser conductor, item Material which read as shown below:

i) EARTHING AND LIGHTNING PROTECTION		UNIT	DATA	
			Required	Offered
1.2	Ground Grid and Risers			
1.2.1	Ground grid conductor			
	– Material		Stranded soft drawn annealed copper	
1.2.2	Riser conductor			
	– Material		Stranded soft drawn annealed copper	

has been revised as follows:

i) EARTHING AND LIGHTNING PROTECTION		UNIT	DATA	
			Required	Offered
1.2	Ground Grid and Risers			
1.2.1	Ground grid conductor			
	– Material		Lead-sheathed stranded copper conductor /Stranded soft drawn annealed copper	
1.2.2	Riser conductor			

i) EARTHING AND LIGHTNING PROTECTION		UNIT	DATA	
			Required	Offered
	– Material		Lead-sheathed stranded copper conductor /Stranded soft drawn annealed copper	

8. Section-VII-2B-Specification clause 22.3.3.10 “Arcing Horns” paragraph 3 which reads as shown below:

Any special tests considered necessary to prove the correct setting of arcing fittings shall be carried out at the manufacture’s works without extra cost.

has been revised as follows:

The optional tests which are mentioned in the international related standards (IEC 61284, 61854, 61897 and BS 3288) considered necessary to prove the correct setting of arcing fittings shall be carried out at the manufacture’s works without extra cost.

9. Section-VII-2B-Specification clause 22.4.14 “Aircraft warning markers, obstruction lights and tower painting, c) Tower Painting” which reads as shown below:

Where required and to comply with requirements of Authorities certain towers may need to be painted with two coats of approved epoxy resin type paint with red and white strips of widths complying with ICAO Regulations. The life span of the paint system shall be not less than 10 years and the colours shall not fade within this time under strong sun radiation.

has been revised as follows:

Where required and to comply with requirements of Authorities certain towers may need to be painted completely (the entire tower) with two coats of approved epoxy resin type paint with red and white strips of widths complying with ICAO Regulations. The life span of the paint system shall be not less than 10 years and the colours shall not fade within this time under strong sun radiation.

10. Section-VII-2B-Specification clause 24.2.3 “control cables”, paragraph 3 which reads as shown below:

Control/ signalling cables shall be of bare copper wires, multi stranded acc. to IEC 60228 Class 5 and with standardised conductivity in accordance with IEC 60228. Cable cores shall be stranded concentrically; each cable core layer shall run in the opposite direction to the subjacent one.

has been revised as follows:

Control/signalling cables shall be of high-conductivity plain annealed copper wires, multi-stranded in accordance with IEC 60228 Class 5, ensuring flexibility and standardized

conductivity as per IEC 60228. Cable cores shall be stranded concentrically, with each cable core layer shall run in the opposite direction to the subjacent one.

11. Section-VII-2E-Schedules of Technical Information, table l, 2) AC Main and Distribution Panels, 2.7) Continuous rating of busbars which read as shown below:

I)LOW VOLTAGE AC SYSTEM		UNIT	DATA	
			REQUIRED	OFFERED
2	AC Main and Distribution Panels			
2.7	Continuous rating of busbars	A	1000	

has been revised as follows:

I) LOW VOLTAGE AC SYSTEM		UNIT	DATA	
			REQUIRED	OFFERED
2	<u>AC Main and Distribution Panels</u>			
2.7	Continuous rating of busbars	A	1250	

12. Section-VII-2E-Schedules of Technical Information, table m, 2) DC MAIN AND DISTRIBUTION PANEL, 2.10) Rated short time withstand current which reads as shown below:

m)LOW VOLTAGE DC SYSTEM		UNIT	DATA			
			REQUIRED		OFFERED	
			110V	48V	110V	48V
2	<u>DC MAIN AND DISTRIBUTION PANEL</u>					
2.10	Rated short time withstand current (1 sec)	KA	10	6		

has been revised as follows:

m)LOW VOLTAGE DC SYSTEM		UNIT	DATA			
			REQUIRED		OFFERED	
			110V	48V	110V	48V
2	<u>DC MAIN AND DISTRIBUTION PANEL</u>					
2.10	Rated short time withstand current (1 sec)	KA	10	10		

13. Section-VII-2A-Scope & General Requirements, Part 35, which reads as shown below:

The contractor shall undertake a tree growing exercise at location(s) to be identified in consultation with KETRACO and relevant authorities. The contractor shall plant 50,000 trees. The cost shall be deemed to cover the entire exercise which shall involve the following:

1. Selection of trees species with highest survival rate and can grow with baseline environmental conditions at the selected planting locations.
2. Transportation of the seedlings to the selected planting locations.
3. Preparation of the land including but not limited to clearing the site of invasive species and preparing the hole.
4. Planting the seedlings at the onset of long rains.
5. Protection and care of the planted tree for a period of 12 months.

has been revised as follows:

The contractor shall undertake a tree growing exercise at location(s) to be identified in consultation with KETRACO and relevant authorities. The contractor shall plant trees worth KES 5,000,000 or at least 30,000 trees, whichever is less. The cost shall be deemed to cover the entire exercise which shall involve the following:

1. Identification & purchase of select trees species with highest survival rate and can grow with baseline environmental conditions at the selected planting locations.
2. Transportation of the seedlings to the selected planting locations.
3. Preparation of the land including but not limited to clearing the site of invasive species and preparing the hole.
4. Planting the seedlings at the onset of long rains.
5. Protection and care of the planted tree for a period of 12 months.

14. The tables on pages 32 to 44 and pages 45 to 56 of Section VII-2C: Environmental and Social Requirements, Chapter 14, have been withdrawn and replaced with the table provided in Attachment 2.
15. Section-VII-2B-Specification clause 22.4.14 Aircraft warning markers, obstruction lights and tower painting, b) Air Traffic Obstruction Lights on Towers which reads as shown below:

Where required ATOLs shall be installed on the towers defining the span, of International Standard red in colour, and having the following general features:

conforming to Chapter 6 of Annex 14 to the ICAO Regulations

two lamps per tower of which only one may be lit at a time (by utilizing a switch-over relay)

having minimum luminous flux of approximately 10 candela, steady aviation red light

having minimum lamp life time of approximately 20 000 hours

all components shall be corrosion-proof for use in marine and damp tropical climate conditions.

The system offered shall be comprehensive and complete in every respect. If a system fed by cables is proposed, it shall be designed to withstand the induced high voltage that can occur during earth fault conditions. It shall consist of a constant current regulator, high voltage cable, dimmer switch, protection equipment, insulating transformers, lightning arresters, etc. The connection and cabling to the nearest available safe mains supply shall be deemed to be included.

Should a solar powered system be proposed, the battery supplied shall be able to maintain the minimum luminous flux of 10 candela under the condition of dusty solar cells. A battery maintenance interval of 5 years minimum shall be guaranteed. Photovoltaic panel output shall be de-rated, over and above age de-rating, by 40%, on account of dust accumulation on the panel surface. The upper edges of the solar panels shall be fitted with stainless steel needle strips, effectively preventing birds from sitting in these Locations.

It shall be noted that the supply of equipment shall include the necessary spare parts as per the manufacturer's recommendations, for a service period of five years, the cost of which is to be included in the price quoted. The tower obstruction light system shall be to the approval of the Employer's representative.

has been revised as follows

Where required ATOLs shall be installed on the towers defining the span, of International Standard, red in colour, and having the following general features:

- conforming to Chapter 6 of Annex 14 to the ICAO Regulations
- two lamps per tower of which only one may be lit at a time (by utilizing a switch-over relay)
- having minimum luminous flux of approximately 10 candela, steady aviation red light
- having minimum lamp life time of approximately 20 000 hours
- all components shall be corrosion-proof for use in marine and damp tropical climate conditions.

The system offered shall be comprehensive and complete in every respect. Both Mains supply power type (or an inductive type as an alternative) and solar powered type are required.

For a system fed by cables is proposed, it shall be designed to withstand the induced high voltage that can occur during earth fault conditions. It shall consist of a constant current regulator, high voltage cable, dimmer switch, protection equipment, insulating transformers, lightning arresters, etc. The connection and cabling to the nearest available safe mains supply shall be deemed to be included.

For a solar powered system, the battery supplied shall be able to maintain the minimum luminous flux of 10 candela under the condition of dusty solar cells. A battery maintenance interval of 5 years minimum shall be guaranteed. Photovoltaic panel output shall be de-rated, over and above age de-rating, by 40%, on account of dust accumulation on the panel surface. The upper edges of the solar panels shall be fitted with stainless steel needle strips, effectively preventing birds from sitting in these Locations.

It shall be noted that the supply of equipment shall include the necessary spare parts as per the manufacturer's recommendations, for a service period of five years, the cost of which is to be included in the price quoted. The tower obstruction light system shall be to the approval of the Employer's representative.

16. Section-VII-2E-Schedules of Technical Information, table m, 3)Battery , 3.3) Batteries withstand current which reads as shown below:

m)LOW VOLTAGE DC SYSTEM		UNIT	DATA			
			REQUIRED		OFFERED	
			110V	48V	110V	48V
3	Batteries					
3.3	Rated discharge capacity :					
	1 hr rate	Ah	Discharge characteristic to be provided by manufacturer	Discharge characteristic to be provided by manufacturer		
	10 hr rate	Ah	Min 250Ah	Min 200 Ah		

has been revised as follows:

m)LOW VOLTAGE DC SYSTEM		UNIT	DATA			
			REQUIRED		OFFERED	
			110V	48V	110V	48V
3	Batteries					
3.3	Rated discharge capacity :					
	1 hr rate	Ah	Discharge characteristic to be provided by	Discharge characteristic to be provided by		

m)LOW VOLTAGE DC SYSTEM		UNIT	DATA			
			REQUIRED		OFFERED	
			manufac turer	manufac turer		
	10 hr rate	Ah	Min 1250Ah	Min 200 Ah		

17. Price Schedules have been revised as attached in Attachment 3.
18. Telecommunication System Layout has been revised as attached in Attachment 4.
19. Kimuka-400-220kV-SS-220kV-SLD drawing has been revised as attached in Attachment 5.
20. The following clause has been added to Section IX - Particular Conditions of Contract:

PCC 23. Test and Inspection	23.2 The Employer and the Project Manager or their designated representatives shall be entitled to attend the test and/or inspection as detailed in the Employer's Requirements. The Contractor shall bear all costs and expenses incurred in connection with such attendance including, but not limited to, all traveling and board and lodging expenses as detailed in the Employer's Requirements.
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21. Section-VII-2B-Specification, clause 22.4.10, paragraph 7 which reads as shown below:

No standard rolled steel section shall be less than 4.75mm thick. Bolt-holes shall not be more than 1.5mm larger in diameter than the corresponding bolt diameter. The design shall be such as to keep the number of different parts as small as possible, and shall facilitate transport, erection and inspection.

has been revised as follows:

No standard rolled steel section shall be less than 4 mm thick. Bolt-holes shall not be more than 1.5mm larger in diameter than the corresponding bolt diameter. The design shall be such as to keep the number of different parts as small as possible, and shall facilitate transport, erection and inspection.

22. Section-VII-2B-Specification, clause 22.4.12, paragraph 2 which reads as shown below:

On each double circuit tower, two diagonally opposite legs, shall be provided with step bolts of approved type fixed at equal centres of between 300 mm and 380 mm throughout the height of the tower starting immediately above the anti-climbing device and continuing to the earth conductor peak. Where, for structural reasons, it is not possible to maintain the equal centres it shall be acceptable to change the centres by not more than 30 mm. Below the anti-climbing devices, holes shall be provided for removable step bolts at the centres stated above. Sets of step bolts to fit these holes shall be provided where required by the Engineer.

has been revised as follows:

On each double circuit tower, two diagonally opposite legs, shall be provided with step bolts of approved type fixed at equal centres of between 300 mm and 380 mm throughout

the height of the tower starting immediately above the anti-climbing device and continuing to the earth conductor peak. Where, for structural reasons, it is not possible to maintain the equal centres it shall be acceptable to change the centres by not more than 30 mm. Below the anti-climbing devices, holes shall be provided for removable step bolts at the centres stated above. Sets of step bolts to fit these holes shall be provided where required by the Engineer. Step bolts shall be a minimum of 16mm in diameter, at least 180mm in length, and of grade 5.6 or higher.

23. Section-VII-2B-Specification, clause 22.3.3.9, paragraph 5 which reads as shown below:

Adequate bearing area between fittings shall be provided and "point" and "line" contacts shall be avoided. Split pins for securing attachment of fittings of insulator set shall be of stainless steel and shall be backed by washers of approved size and gauge. All insulator strings shall be attached to cross-arms by means of shackles. Hooks shall not be used.

has been revised as follows:

Adequate bearing area between fittings shall be provided and "point" and "line" contacts shall be avoided. Split pins for securing attachment of fittings of insulator set shall be of stainless steel and shall be backed by washers of approved size and gauge. Suspension and tension string tower attachments shall be of the 'hinge' type. Hooks shall not be used.

24. Section-VII-2B-Specification, clause 22.6, paragraph 13 which reads as shown below:

All attachments shall be of 'hinge' type. Ubolt/shackle attachment type shall not be allowed

has been revised as follows:

The attachment for the Earth conductor/OPGW assemblies can be of the shackle/hinge type.

25. Section-VII-2E-Schedules of Technical Information, table y, item 1.3 which reads as shown below:

y) DIESEL GENERATOR		UNIT	DATA	
			REQUIRED	OFFERED
1.3	Installation		indoor	

Has been revised as follows

y) DIESEL GENERATOR		UNIT	DATA	
			REQUIRED	OFFERED
1.3	Installation		500 kVA generator-Indoor 200 kVA generator- Outdoor	

SENIOR MANAGER, SUPPLY CHAIN



Attachments:

Attachment 1: **Technical data sheet of 400 kV OVERHEAD LINE INSULATOR SET**

Attachment 2: **Environmental and Social (ES) requirements**

Attachment 3: **Revised Section_IV-Price_Schedule**

Attachment 4: **Telecommunication System Layout**

Attachment 5: **Revised Kimuka-400-220kV-SS-220kV-SLD**

Attachment 1

cc) 400 kV OVERHEAD LINE INSULATOR SET		UNIT	DATA	
			Required	Offered
6	Insulator and fittings			
6.1	Insulator units: Long Rod			
6.1.1	Suspension units			
6.1.1.1	Shed profile			
6.1.1.2	Appropriate IEC Number		IEC 61109	
6.1.1.3	Material		Silicone rubber	
6.1.1.4	Coupling a. Standard b. Type (recommended only) c. Size (recommended only)		IEC 60120	
			clevis & tongue20	
6.1.1.5	Minimum failing load	kN	2x120	
6.1.1.6	Outside diameter:	mm		
6.1.1.7	Mass of unit	kg		
6.1.1.8	Minimum dry lightning impulse withstand	kV		
6.1.1.9	Minimum wet power frequency withstand	kV		
6.1.2	Tension units			
6.1.1.10	Creepage distance	mm	16000	
6.1.2.1	Shed profile			
6.1.2.2	Appropriate IEC Number		IEC 61109	
6.1.2.3	Material		Silicone rubber	
6.1.2.4	Coupling a. Standard b. Type (recommended only) c. Size (recommended only)		IEC 60120	
			clevis & tongue20	

cc) 400 kV OVERHEAD LINE INSULATOR SET		UNIT	DATA	
			Required	Offered
6.1.2.5	Minimum failing load	kN	2x210	
6.1.2.6	Outside diameter:	mm		
6.1.2.7	Mass of unit	kg		
6.1.2.8	Minimum dry lightning impulse withstand	kV		
6.1.2.9	Minimum wet power frequency withstand	kV		
6.1.2.10	Creepage distance	mm	16000	
6.2	Insulator sets complete			
6.2.1	Suspension sets			
6.2.1.1	Number of insulator V strings			
6.2.1.2	Minimum failing load, complete set	kN	2x120	
6.2.1.3	Overall length of set including clamps and all fittings	mm	According to tower clearance	
6.2.1.4	Arcing Gap	mm	4070	
6.2.1.5	Mass of set, complete with all fittings	kg		
6.2.1.6	Overall length of creepage path per string:	mm	16000	
6.2.1.7	50 Hz voltage tests: a. Dry withstand voltage of complete set:	kV	850	
	b. One minute wet withstand voltage of complete set :	kV	680	
6.2.1.8	50% Impulse withstand: a. 1.2/50 us negative wave:	kV	1425	
	b. 1.2/50 us positive wave:	kV	1425	
6.2.1.9	Corona test voltage	kV	265	
6.2.1.10	Set RI test voltage	kV	248	

cc) 400 kV OVERHEAD LINE INSULATOR SET		UNIT	DATA	
			Required	Offered
6.2.1.11	Set radio noise level	dB	45	
6.2.1.12	Short circuit current withstand for 1 second (any part of set)	kA	63	
6.2.2	Tension sets			
6.2.2.1	Number of insulator strings in parallel	kN		
6.2.2.2	Elastic limit load of set fittings for double tension string: a. Common to each string b. Common to conductor	kN		
6.2.2.3	Minimum failing load, complete set	kN	2*210	
6.2.2.4	Overall length of set including clamps and all fittings	mm		
6.2.2.5	Arcing Gap	mm		
6.2.2.6	Mass of set, complete with all fittings	kg		
6.2.2.7	Overall length of creepage path per string: 50 Hz voltage tests:	mm	16000	
6.2.2.8	50Hz Voltage test: a. Dry withstand voltage of complete set:	kV	850	
	b. One minute wet withstand voltage of complete set: 50%	kV	680	
6.2.2.9	50Hz Impulse test: a. 1.2/50 us negative wave:	kV	1425	
	b. 1.2/50 us positive wave:	kV	1425	
6.2.2.10	Corona test voltage	kV	265	
6.2.2.11	Set RI test voltage	kV	248	
6.2.2.12	Set radio noise level	dB	45	
6.2.2.13	Short circuit current withstand for 1 second (any part of set)	kA	63	
□ All flashover and withstand voltage levels corrected to normal temperature and pressure in accordance with IEC 60383				

Attachment 2

Environmental and Social (ES) requirements

Clause/Sub-Clause	Remarks
Training of Contractor's and its Subcontractors' Personnel	The Contractor is obligated to provide comprehensive training to personnel to ensure awareness of relevant aspects in this Section.
Design and Engineering	<p>The Contractor shall align all design and construction activities with climate-resilient principles. This encompasses the consideration of present and future climate change impacts, the integration of adaptive design strategies, and the use of resilient materials and technologies. The infrastructure must be designed and built to endure extreme weather conditions, temperature fluctuations, and other climate-associated risks.</p> <p>The contractor shall ensure that the design and construction of the transmission infrastructure adheres to principles of universal access. The contractor shall comply with all relevant laws and regulations regarding universal access and shall implement best practices to promote inclusivity.</p> <p>The contractor shall incorporate robust safeguards to mitigate risks associated with public exposure to operational accidents or natural hazards.</p>
Rates of wages and conditions of labor	<p>The Contractor shall comply with all applicable labor laws and regulations in Kenya, including but not limited to the Employment Act, 2007 and any subsequent amendments.</p> <p>The Contractor shall commit to formulating a robust Health and Safety Policy statement that aligns with local regulations and international best practices. This policy shall outline the Contractor's commitment to ensuring the well-being of all personnel involved in the project. The policy statement will be prominently displayed at the project site and communicated to all employees, subcontractors, and relevant stakeholders.</p> <p>The Contractor shall establish a dedicated Health and Safety Committee comprised of qualified and experienced individuals. The committee's composition shall include representatives from different levels of the workforce.</p> <p>The Contractor shall commit to allocating a dedicated budget specifically earmarked for health and safety initiatives.</p>

Clause/Sub-Clause	Remarks
	<p>The Contractor shall commit to implementing specific measures to prevent the spread of communicable diseases.</p> <p>The Contractor shall commit to continuously reviewing and adapting health and safety protocols in response to emerging information about infectious diseases.</p> <p>The Contractor shall establish and maintain an emergency response team specifically tasked with managing potential outbreaks of communicable diseases.</p> <p>A transparent and accessible grievance redress mechanism shall be established to address any concerns, queries, issues, complaints, or sense of injustices raised by project personnel. The Contractor shall investigate and resolve grievances promptly and fairly.</p> <p>The Contractor shall commit to refraining from employing workers below the legal working age (below 18 years) and shall not engage in any form of forced or compulsory labor. Adequate measures, including age verification protocols, will be implemented to ensure that all workers voluntarily participate in the workforce and are above the legal working age.</p> <p>The Contractor shall commit to providing equal opportunities for all workers, regardless of gender, ethnicity, religion, or any other characteristic protected by the Employment Act of 2007 and the Sexual Offences Act of 2006. Discrimination, harassment, or any form of unfair treatment based on these characteristics is strictly prohibited.</p> <p>The Contractor shall implement comprehensive prevention, reporting, and response mechanisms to address instances of sexual exploitation, abuse, gender-based violence, and sexual harassment. This includes the provision of confidential reporting channels, awareness training, and immediate, impartial investigations into reported incidents.</p>
Facilities for Staff and Labor	<p>The Contractor is obligated to ensure the provision of adequate and suitable accommodation for project personnel, giving due consideration to local standards and regulations..</p> <p>the contractor shall provide adequate security measures in place to ensure the safety of project personnel, including provisions for well-lit areas, security personnel, and emergency response plans.</p>

Clause/Sub-Clause	Remarks
	<p>Facilities and services shall be designed to be accessible to persons with disabilities, ensuring equal opportunities for all project personnel.</p> <p>The contractor shall undertake Environmental and Social Impact Assessments for accommodation facilities.</p>
Security of the Site	<p>The Contractors must commit to developing and implementing a comprehensive security plan for the project site. The submitted security plan should address all relevant aspects of security, encompassing personnel, equipment, and infrastructure. The Contractor shall submit the security plan to KETRACO for thorough review and approval before the commencement of any construction activities. Compliance with this bidding condition is imperative to ensure the safety and security of the project site, personnel, and assets. This condition underscores the project's commitment to maintaining a secure environment and mitigating potential risks during the project's execution.</p> <p>The Contractor shall develop and implement a comprehensive Traffic Management Plan as part of the CESMP that outlines the safe flow of construction-related traffic, including ingress and egress points, signage, and designated pedestrian pathways. This plan shall be regularly updated as construction activities progress.</p>
Protection of the Environment	<p>As part of the C-ESMP, the contractor shall develop a tree planting plan. The contractor will carry out a tree planting exercise at locations identified in consultation with KETRACO, the community, and relevant authorities. The contractor will plant trees worth KES 5,000,000 or a minimum of 30,000 trees. The cost covers the entire process, which includes identification and purchasing tree species with high survival rates, transporting seedlings, preparing the land, planting the seedlings at the start of the rainy seasons, and caring for the planted trees for 12 months.</p> <p>The contractor shall outline the planned methods and schedule for vegetation clearing in the C-ESMP, with specific approval from the Project Manager required before any clearing work begins.</p> <p>The contractor shall guarantee that pollutant emissions from construction activities with EMCA (Air Quality) 2014.</p> <p>The contractor shall ensure that surface discharges and effluents from the project site comply with the Water Act of 2016 and EMCA (Water Quality) Regulations of 2006.</p> <p>The contractor shall be obligated to take effective steps to prevent soil contamination during construction. The contractor must use best practices and technologies to comply with these limits, and regularly monitor and assess soil quality.</p>

Clause/Sub-Clause	Remarks
	<p>The contractor is required to comply with EMCA (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009 on permissible noise levels, with specific limits for daytime and nighttime operations.. The contractor must strictly follow the Noise and Excessive Vibrations Regulations of 2006, using best practices, appropriate technologies, and precautionary measures to prevent adverse environmental effects and impacts on surrounding communities.</p> <p>The contractor shall implement the 3R principle (Reduce, Reuse, Recycle) for solid waste management as per the Sustainable Waste Management Act 2022.</p> <p>The contractor shall be required to minimize the use of hazardous chemicals during the project, ensuring they are handled according to safety and environmental guidelines.</p> <p>The contractor shall use construction methods that minimize adverse effects on the environment, including vegetation, soils, groundwater, surface water, biodiversity, and natural drainage.</p> <p>For the approval of borrow pits and access roads, the contractor shall submit the following to the Project Manager as part of the ESMP Framework: the proposed locations of borrow areas or excavation sites, any excavation or blasting permits obtained from regulatory bodies, proposed locations for stockpiling backfill material or zones designated for demolition debris, a map indicating the access routes to the Project Areas, and a rehabilitation plan.</p> <p>The contractor shall adhere to ecological impact & biodiversity protection through implementation of ESIA recommendations, and ensure personnel are trained in protecting fauna and flora. Clearing methods must prevent trapping animals, and interaction with wildlife or collection of flora is prohibited.</p> <p>The contractor shall ensure water resource management through prioritizing local communities' water demands and only abstract surface and underground water with community consultation and a permit from the Water Resource Authority.</p>
Cultural Heritage Findings	<p>The Contractor shall commit to incorporate the cultural heritage findings from the ESIA seamlessly into the CESMP. This entails utilizing the baseline information provided by the ESIA to guide decision-making during construction, implementing measures to mitigate potential impacts on cultural heritage, and engaging with local communities and experts for collaborative input.</p> <p>The Contractor shall commit to conducting meaningful engagement with local communities and relevant stakeholders wherever possible to gather comprehensive information on cultural heritage sites and practices.</p>

Clause/Sub-Clause	Remarks
	In the event of any unexpected discovery of cultural heritage artifacts or features during construction activities, the Contractor shall immediately report the same to the project environmental and social experts through the Project Manager.

Management and Safety of Hazardous Materials

The Contractor shall;

- *Comply with all applicable laws, regulations, permit and approval conditions and requirements relevant to the storage, use, and proper disposal of hazardous materials.*
- *Conduct Hazardous risk assessment to identify, assess and control the risk from hazardous substances.*
- *Implement control measures to prevent or reduce workers' exposure to harmful substances.*
- *Train and inform workers about the risks associated with the hazardous substances they work with, and they shall be trained on how to work safely with the substances.*
- *Have plans in place to for dealing with accidents, and emergencies involving hazardous substances.*
- *Regularly monitor workers' exposure to to hazardous substances and carry out health surveillance where appropriate.*
- *Keep records of risk assessments, control measures and workers' training*

Resource Efficiency and Pollution Prevention and Management

- ***Resource efficiency***

- ***Energy:***

The contractor shall;

- *Use materials and equipment that are more energy efficient, durable and require less maintenance.*
- *Conduct regular training and sensitization on measures to enhance energy efficiency.*
- *Monitor and document its energy efficiency and institute measures to enhance it where possible.*

- ***Water:***

The contractor shall;

The contractor shall implement measures to enhance water efficiency. This includes using water-saving devices, educating the workforce on water conservation, appointing a water controller, and monitoring and documenting water use.

- ***Raw materials:***

The contractor shall;

- The contractor shall implement measures to enhance the efficiency of raw material use. This includes designing the project to minimize the use of raw materials, using sustainable or recycled materials, implementing effective waste management strategies, and monitoring and documenting raw material use.
- **Pollution prevention and management (See also GCC Sub-Clause 22.9 and the table above)**
- **Management of air pollution:**
 - All personnel working on the project will be trained prior to starting construction on methods for minimizing air quality impacts during construction.
 - The Contractor to protect stockpiles of friable material subject to wind-throw by wetting, or with a barrier, vegetation, or windscreen.
 - Cover loads of friable material during transportation.
 - Restrict speed on loose surface roads during dry or dusty conditions.
 - Suppress dust during dry periods by use of water sprays.
 - Maintain equipment and machinery in good running condition – no vehicles to be used that generate excessive black smoke.
 - A maintenance plan for the construction of machinery and vehicles shall be prepared and implemented to prevent excessive emissions.
 - Burning of woody debris & construction waste to be prohibited within the wayleave.
 - The Contractor to ensure that all equipment used, and all facilities erected on site are designed and operated to control the emission of smoke, dust, fumes and any other air impurity into the atmosphere.
 - Use of personnel protective equipment (PPE)
 - Keep stockpiles and exposed soils compacted and re-vegetate as soon as possible.
 - Regular air quality tests
- **Management of hazardous and nonhazardous wastes:**
The Contractor shall;
 - Manage all hazardous materials and waste in a safe and responsible manner, and shall prevent contamination of soils, pollution of water and/or harm to people or animals because of the use of these materials.
- **Management of chemicals and hazardous materials:**
The contractor shall;
 - Consider using mechanical methods for vegetation clearing, which can be more environmentally friendly and less harmful to non-target species. Vegetation clearing using chemicals is not permitted.
 - Commit to minimizing the use of hazardous chemicals throughout the project, ensuring their handling adheres to established safety and environmental guidelines.
 - Implement best practices for the storage, transportation, and disposal of hazardous materials, prioritizing safety, environmental protection, and compliance with relevant regulations. The details of these measures will be incorporated into the CESMP.
 - Not only monitor and report on compliance with hazardous material usage limits and spill prevention protocols, but also set clear, measurable goals for reducing hazardous material usage.

- **Biodiversity, renewable resources, and ecosystem services**

The contractor shall;

- Take all necessary steps to protect and enhance biodiversity in and around the construction sites..
- Prioritize the use of renewable resources wherever possible. This includes using renewable materials and energy sources in the construction process.
- Take into account the value of ecosystem services when planning and implementing the project. This includes avoiding negative impacts on ecosystem services and implementing measures to enhance these services where possible.

- **Road Safety**

The contractor shall implement measures to enhance road safety on the construction site. This includes providing safety training, organizing the site to allow safe movement of vehicles and pedestrians, increasing worker and worksite visibility, controlling traffic, ensuring the use of safety equipment, and having emergency and first aid plans in place.

Monthly Monitoring Reports

The contractors and supervising firms to provide monthly monitoring reports in accordance with the metrics specified in the respective bidding documents and contracts, and submit such reports to the World Bank through KETRACO. The report should include a schedule of statutory permits, licenses, incident/accident if any and any other requirements as agreed by the World Bank such as Contractor shall prepare and submit one (1) Monthly Environmental, Social, Health and Safety Monitoring Report and one (1) Monthly Health based on CESMP, CESMoP, and H&S Plan. The Monthly Report should cover executive summaries, construction activities, monitoring results, interpretations, graphical representations, the status of mitigation measures, corrective and preventive actions, action on recommendations, a summary of complaints, investigation results, and future key issues.

