ANNEX 4.3

BILL OF QUANTITIES - BOOSTER PUMPING STATION

Line No.	Description	Qty	Unit	Unit Cost	Total Cost
1	Power and Grounding System Analysis Report Perform a comprehensive power and grounding system analysis, short circuit calculation, protection coordination and harmonics analysis using an electrical network modeling and simulation software-tool as the design basis for this project. Reports, calculations and analysis shall be signed and sealed by Professional Electrical Engineer (PEE).	1	set		
2	Energy Audit Report (Before and after project phase) Conduct a Level 2 Energy Audit for RA-11285 (Energy Efficiency and Conservation Act) compliance. Bidder shall employ a full time Certified Energy Auditor (CEA) and recognized by Department of Energy as CEA to sign the audit report.	1	set		
3	Motor control panel, metal enclosure, Gauge 16, powder coated, free-standing, indoor type, with 7 vertical sections (4 veticals for VFDs, 1 vertical for Main distribution, 1 vertical for PLC system and 1 vertical for Harmonics filter), free standing indoor type. Complete with: 1 unit Main MCCB 4 units VFD MCCB disconnect 2 units Generator manual changeover switch 2 units MCCB for other loads 1 lot bus bar for distribution and grounding system.	1	assy		
4	Termination cabinet, for Main feeder and Motor cables, metal-powder coated, free standing, complete with main bus bars and motor lead terminal blocks.	1	assy		
5	Variable Frequency Drives (VFD), 200Hp, 460Vac, 3 Phase, 60Hz with Five (5) years Manufacturer's Warranty as standard. Manufacturer or vendor extended warranty for up to 5 years (with or without premiums) is not accepted.	4	units		
6	Variable Frequency Drives (VFD), Spare unit, 200Hp, 460Vac, 3 Phase, 60Hz with Five (5) years Manufacturer's Warranty as standard. Manufacturer or vendor extended warranty for up to 5 years (with or without premiums) is not accepted.	1	unit		
7	Active Harmonics Filter to be connected to Point of Commom Coupling (PCC). Size to be determined during power analysis to meet IEEE 519 Standard	1	set		

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Line No.	Description	Qty	Unit	Unit Cost	Total Cost
8	Digital Power Meter for Main Feeder, with Power Quality Analysis capable for the following requirements: a). conforming to EN 50160: 2010 compliance report b). conforming to IEEE 519: 2014 compliance report c). conforming to IEC 61000-4-30: class S power quality measurement d). up to the 63rd harmonic e). harmonic distortion f). waveform capture g). voltage sag and swell detection h). programmablity (logic and math functions) i). conforming to IEC 62586 power quality monitoring j). Accuracy Class 0.2 for Energy and Power	1	set		
9	Digital Power Meter for Branches, with Power Quality Analysis capable for the following requirements: a). up to the 31st harmonic b). Apparent power min/max, total c). Active and reactive power min/max, total d). Current min/max, avg e). Voltage min/max, avg f). Frequency min/max, avg g). Total current harmonic distortion THD (I) per phase h). Total voltage harmonic distortion THD (U) per phase i). Power factor min/max, avg j). Apparent energy total k). Active and reactive energy tota j). Accuracy Class 1 for Energy	8	sets		
10	Communication gateway/server for Power Meters, Serial to Ethernet	1	unit		
11	Human Machine Interface (HMI), 10 inches colored graphics touchscreen display	1	unit		

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Line No.	Description	Qty	Unit	Unit Cost	Total Cost
12	Prewired Redundant and Hot-standby Main PLC System, complete with the following: 2 units Main CPU, Redundant and Hot-Standby Processor module. Compliant with IEC – 62443 standard. With Achilles Level 2 Cybersecurity Certification. With 64 MB of integrated non-volatile memory 1 unit PLC Module, Remote IO controller 3 units PLC Module, Power supply, 100-240Vac 3 units PLC Module, Base rack 1 unit PLC Module, 64 Points Digital input 1 unit PLC Module, 32 Points Digital output 1 unit PLC Module, 12 Channels Analog Input 1 unit PLC Module, 4 Channels Temperature Input 1 unit PLC Module, 2 channel, Serial communication 1 unit PLC Module, Ethernet communication 1 unit Potential transformer, 1000VA, 460/230Vac, 1 phase 4 units Miniature Circuit Breaker, DIN rail mounted, 2 pole, 6Amp 1 unit 24Vdc power supply, 10Amp, 100-240Vac input 1 unit 24Vdc UPS System, 10Amp, 10 minutes backup storage time, DIN rail mounted 1 unit Surge protection device 32 pcs Interposing relays, 24Vdc, 1 Pole	1	assy		
13	Network switch, Industrial type, 8 x Gigabit port, 2 x Gigabit RJ-45 / SFP shared ports for Fiber Optic	1	unit		
14	Pressure Transducer, 0-10Bars, 4-20mA, 24Vdc loop powered, IP65, 1/2NPT 316L SST process connection	4	units		
15	Flow Switch, Paddle-insertion Type, IP66, 316 Stainless Steel Wetted parts, 2 inches process connection	4	units		
16	Vibration Transmitter, Velocity type, 0-25.4mm/sec, 4-20mA Output, 15-30Vdc power supply, with temperature measurement ouput, Stainless Steel material, IP66 connector	4	units		
17	Temperature Sensor, Single element motor stator winding RTD, PT100, 3 wire	4	units		
18	Floor Weighing Scale platform (for Gas-Chlorine Tank), 3,000KG Capacity, Stainless steel material, with controller, RS-485 communication	1	unit		

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Line No.	Description	Qty	Unit	Unit Cost	Total Cost
19	Inline Residual Chlorine Analyzer, 0-20ppm, 4-20mA output, Amperometric Cell measurement technology, with Modbus communication	1	unit		
20	Chlorine gas detector and alarm system, System Detector, 0 to 10 PPM, 4-20mA output and alarm relay output	1	unit		
21	Network Video Recorder (NVR), 8 channels, with 1TB HDD	1	unit		
22	IP Camera, Bullet, Outdoor type	4	units		
23	CCTV LED Monitor, 42 inches	1	unit		
24	Lightning protection system, complete with lightning rod, down cable and dedicatedgrounding rod	1	set		
25	Equipment and electrical grounding system - complete with ground bar, bare cable and grounding rod	1	set		
26	Low potential/signal communication grounding system - complete with ground bar, bare cable and grounding rod	1	set		
27	Feeder cable from existing Main breaker to new MCC panel - 14 x 200mm sq. + Gnd Stranded Copper wire, THHN/THW, 600V in cable tray	30	lm		
28	Motor extension cable from New Termination cabinet to new MCC panel - 16 x 200mm sq. + Gnd Stranded Copper wire, THHN/THW, 600V in cable tray	30	lm		
29	Cable and conduit from Suction Pressure sensor to Main PLC Cabinet - Instrumentation Cable, Single Twisted pair, 1.0mm sq. Stranded Copper wire, Shielded with drain wire, PVC Insulated in 3/4" diameter Conduit	120	lm		
30	Cable and conduit from Flow switch to Main PLC Cabinet - Instrumentation Cable, Single Twisted pair, 1.0mm sq. Stranded Copper wire, Shielded with drain wire, PVC Insulated in 3/4" diameter Conduit	120	lm		
31	Cable and conduit from Inline Chlorine Analyzer to Main PLC Cabinet - Instrumentation Cable, Single Twisted pair, 1.0mm sq. Stranded Copper wire, Shielded with drain wire, PVC Insulated in 3/4" diameter Conduit	70	lm		
32	Cable and conduit from Chlorine Gas Detector to Main PLC Cabinet - Instrumentation Cable, Single Twisted pair, 1.0mm sq. Stranded Copper wire, Shielded with drain wire, PVC Insulated in 3/4" diameter Conduit	70	lm		

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Line No.	Description	Qty	Unit	Unit Cost	Total Cost
33	Cable and conduit from Chlorine Weigh Scale to Main PLC Cabinet - RS485 cable, Single Twisted pair, 1.0mm sq. Stranded Copper wire, Shielded with drain wire, PVC Insulated in 3/4" diameter Conduit	70	lm		
34	Cable and conduit from Motor winding temperature sensor to Main PLC Cabinet - RTD Extension Wire, 3Cx20AWG Nickel Plated conductor, PT100, Twisted and shielded, PVC Insulated in 3/4" diameter conduit	120	lm		
35	Cable and conduit from IP camera to NVR - Ethernet Copper Cable, CAT5e, Outdoor Type in 3/4" diameter conduit	300	lm		
36	Cable for Facility network from Booster PS to Bucal area - Ethernet Fiber Optic Cable, Outdoor type, 6 Core, Steel wire reinforce, Single mode	200	lm		
37	Cable for Facility network from Booster PS to Elevated Reservoir area - Ethernet Fiber Optic Cable, Outdoor type, 6 Core, Steel wire reinforce, Single mode	600	lm		
38	Labor which includes: 1. Detailed engineering and design 2. Site mobilization and demobilization 3. Mounting and installation of New MCC and Termination cabinet 4. Mounting and installation of field instruments 5. Installation of temperature sensor for motor stator windings 6. CCTV camera installation 7. Cable, cable tray and conduit pipe installations 8. Dismantling of existing MCC 9. PLC, HMI, VFD, Network Swicth and Powermeter programming 10. Testing and commissioning 11. Project turn-over	1	lot		
39				**SUB-TOTAL**	-