



**भाकृअनुप - केन्द्रीय बारानी कृषि अनुसन्धान संस्थान**  
**ICAR - Central Research Institute for Dryland Agriculture**  
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INVITATION FOR EXPRESSION OF INTEREST

ICAR-Central Research Institute for Dryland Agriculture invites Expression of Interest (EoI) from competent firms/organizations having requisite technical and financial capabilities for Repair and 3-year Annual Maintenance Contract of its research facility ' SCADA-based Rainfall Simulator including Lysimeter '. For details, please visit [www.icar-crida.res.in](http://www.icar-crida.res.in).

Chief Administrative Officer

## 1. INTRODUCTION

Central Research Institute for Dryland Agriculture (CRIDA) is a National Research Institute under the Indian Council of Agricultural Research (ICAR) established in 1985 with a mandate to carry out basic and applied research in rainfed farming. The Institute also undertakes National / International Collaborations and Consultancy Projects. All India Coordinated Research Programmes (AICRPs) of ICAR on Dryland Agriculture and Agrometeorology with 25 partners each are in CRIDA. This is the lead Institute and the National Nodal point for the National Innovations in Climate Resilient Agriculture (NICRA) which is being implemented at large number of Research Institutes of ICAR, State Agricultural Universities and 100 KVKs.

This Institute office functions 5-days a week during 0900-1730 hrs except Saturdays, Sundays and closed holidays. The list of closed holidays may be seen on the Institute website.

ICAR-CRIDA solicits Expression of Interest (EOI) from competent firms/organizations for Repair and Annual Maintenance Contract (AMC) for its research facility **SCADA-based Rainfall Simulator including Lysimeter** located at its Research Farm at Hayathnagar, RR District, Telangana.

## 2. BRIEF PARTICULARS OF THE FACILITY

SCADA based Rainfall Simulation Facility and Precision type Lysimeters with open top climate chambers for studying the Climate Change Impacts on Resource losses and Soil water balance Supervisory Control and Data Acquisition (SCADA) is a Human Machine Interface (HMI) software which has the animated layouts along with necessary controls and data acquisition from the sensors installed in the Rainfall simulation facility and lysimeters. The rainfall simulation facility has been designed to simulate artificial rain intensities from 25 to 150 mm/hr at different durations. Three soil bins of 6x3x1 m size have been designed with hydraulic lift facility to have varying slopes from 1 to 10% of the most agricultural lands have in rainfed agro eco systems. The system has the measurement of intensity, duration, soil moisture and temperature at 15, 30, 45, 60 and 90cm in the soil bins through high precision sensors with 4-20mA signal output. The controls are provided through process automation instrumentation using Programmable Logic Controllers (PLC) and drives to control motor, rainfall simulator movement and swing mechanism of

simulator. It is online data acquisition facility designed and developed by CRIDA scientists for studying the climate change impacts on rainfed crops damage, production losses, soil, water and nutrient losses in the soil bins. These systems are developed to study the impact of extreme rainfall events during crop growth period for resource losses.

The precision lysimeters with open top chambers (4 x4 m) have been designed to study the CC impacts on soil water balance along with nutrient losses from the soil column with dynamic growth of rainfed crops. The facility is designed for three events of CO<sub>2</sub> increase upto 550 ppm, CO<sub>2</sub>+Temperature at 550ppm + 1 to 5°C increase from ambient temperature, Temperature increase alone from 1 to 5°C and control without CO<sub>2</sub> and temp increase. These systems are also connected to SCADA through PLC for temperature and CO<sub>2</sub> control in the chambers. These systems are basically designed to study the CC impacts on soil and water balance and crop growth coefficients under CC for different crops. The systems include the sensors for CO<sub>2</sub> measurement within chambers with auto control valve and perforated PP tubing in chambers (2 Nos), UV heaters for increase in chambers (2 Nos), soil moisture sensors which measure soil moisture content at different depths of 15, 30, 45, 60, and 90 cm and soil temperature at 15, 30 and 45 cm. These sensors work on 4-20 mA signal output and are connected to SCADA through data loggers. This facility also has central room for measuring the leachate from the lysimeters (1.2 m dia and 2m long made of SS) at the bottom and installed data loggers. All the data are recorded in SCADA and Co2 and temp controls are made from SCADA. There are strain gauges installed at the bottom for continuous recording of the weight of the lysimeters.

### **3. SCOPE OF WORK**

- a. Assessment of repairs/replacements of each component of the facility
- b. Undertaking Repair and replacement of components of the facility
- c. Make the facility functional after completion of repairs
- d. Undertaking Annual Maintenance Contract of facility for three years

### **4. FUNCTIONAL STATUS OF THE RESEARCH FACILITY**

Please see Annexure I

## INSTRUCTIONS TO PROSPECTIVE PARTICIPATING FIRMS/ ORGANIZATIONS

### 5. ONLINE SUBMISSION OF EXPRESSION OF INTEREST (EoI)

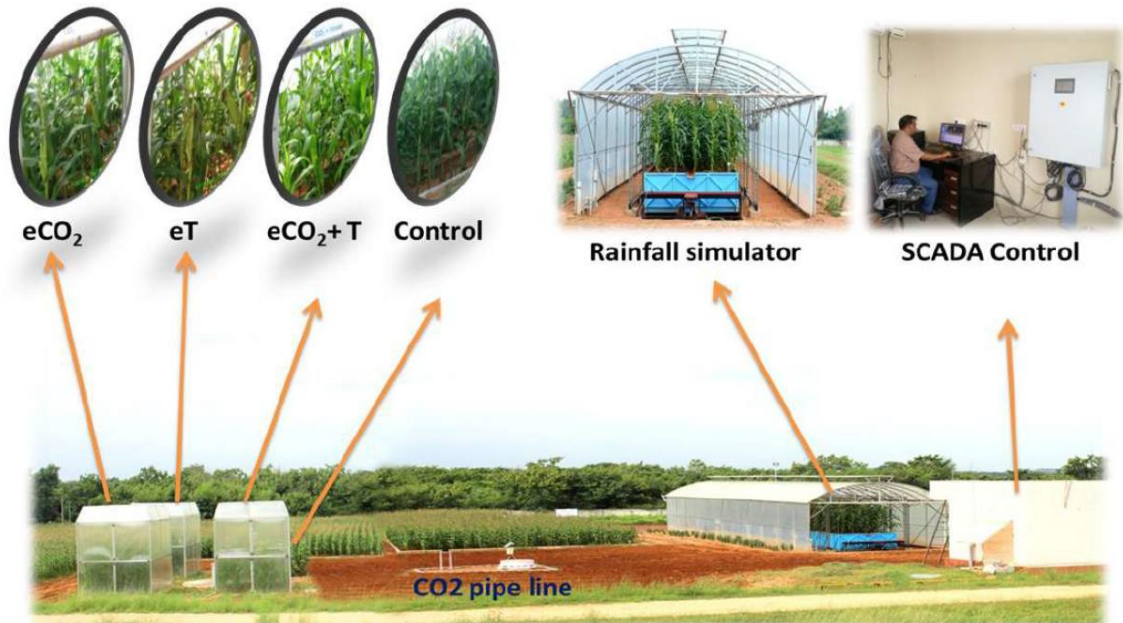
- (i) **Inspection of Site:** Interested firms/organizations may inspect the research facility on any working day during **03-08-2023 to 14-08-2023** between 1000-1600 hrs with prior e-mail intimation to [hoa.crida@icar.gov.in](mailto:hoa.crida@icar.gov.in) and confirmation by this Institute. This office functions 5 days a week and remains closed on Saturdays and Sundays.
- (ii) **Clarifications:** An interactive meeting with prospective EoI participants shall be held through Online at **11:00hrs** on **08-08-2023**. All participating firms/organizations are advised to attend the meeting without fail and get all their queries addressed and documented. All revisions, clarifications, corrigenda, addenda, etc. to the Invitation for Expression of Interest, arising out of the discussions held in the meeting, shall be published on ICAR-CRIDA website as well as CPP Portal on or before **10-08-2023**. No technical clarification shall be provided individually to any firm and no correspondence in this regard shall be entertained thereafter.
- (iii) Interested firms/organizations may thereafter, submit EoI by way of a detailed technical work-plan for repair of the facility with timelines as well as its 3-year maintenance, without mention of any financial aspect, **latest by 1700 hrs on 14-08-2023**.
- (iv) EoI submitted on e-procurement portal will only be considered. EoI submitted in any physical form or sent through fax/email/courier/post/personal-delivery etc. will not be considered.
- (v) The participating firms/organizations are requested to visit the Institute website (<http://www.icar-crida.res.in/>) or the Central Public Procurement Portal (<http://www.eprocure.gov.in>) regularly. Any changes/modifications in EoI enquiry will be intimated by corrigendum through these websites only.

## **6. SELECTION PROCESS**

- (i) The proposals of firms/organizations found technically sound by an Expert Committee constituted by Director, ICAR-CRIDA, will be invited for a detailed presentation of their proposal before the Expert Committee in person or through video-conferencing mode.
- (ii) Director, ICAR-CRIDA, reserves the right to reject any or all proposals without assigning any reason thereof.
- (iii) Based on the presentation, the firms/organizations recommended by the Expert committee shall be shortlisted and invited to submit their Financial Proposals/Bids.
- (iv) The lowest bidder will be awarded the contract for Repairs of the facility and Annual Maintenance Contract for a period of 3 years, subject to fulfilment of all stipulated terms & conditions.
- (v) Any dispute, arising out of award of contract, shall be subject to the jurisdiction of Courts located at Hyderabad.

## 7. PHOTOS OF THE FACILITY

SCADA based rainfall simulator facility and precision Lysimeter system



**Functional Status and Requirement of Repairs of SCADA based Lysimeters Facility with Open Top chambers before awarding AMC**

SI No	Item	Make (Present)	Qty	Specifications	Present Status of System		
					Working	Not-Working needs Replacement	Needs Repairing / Servicing
	<b>The Lysimeter with drainage systems, a supervisory control and data acquisition system, a soil and temperature moisture monitoring system, a control sump well for all the four lysimeters. Three of the lysimeters are in controlled Open Top chambers. One lysimeter in ambient.</b>						
1.	<p><b>i) Lysimeter-1 Ambient</b> Fabricated Stainless-steel cylindrical soil tank of size 1.2 dia and 2 m depth with 6.4mm thick stainless steel along with drain tubes. It includes necessary trenching, civil work for mounting the Load cell, common soil Service well, with surface cover on Lysimeter tank. <b>The present way of measuring percolation/leeching from 4 lysimeters need to be modified and redesigned with semi-automatic drain water ejecting means and incline-way into underground Service well with masonry pathway included.</b></p>	Fabricated	1	Fabricated	yes	--	Modification and redesign leeching collection from all lysimeters and Service well access control needed and stagnation of water must be avoided in lysimeter sump bottom
	<b>ii)</b> Load cell Precision weighing system 6T with 10 g digital resolution-three 2T sensors placed at 120° apart, load on a common triangular bar.	JJ Chennai	1		yes	--	Cleaning/ OEM servicing if any
	<b>iii)</b> Ambient Weather Precise Air Temperature Class A sensor IP68 includes a digital Modbus RS-485 output, 3 or 4-wire PT100 temperature probe for air waterproof stainless-steel sensor tip with Protection Shield & outdoor Mount	--	1	0-100 °C of standard make of ISI certified with high accuracy/ Any International make with high accuracy	--	Yes	Calibration, Data logging, SCADA control check needed
2.	<b>i) Lysimeter-2 e-Temp</b> Fabricated Stainless-steel cylindrical soil tank of size 1.2 dia and 2 m depth with 6.4mm thick stainless steel along with drain tubes. Elevated infrared temperature over and above ambient temperature selectable through SCADA. It includes necessary trenching, civil work for mounting the Load cell, and common soil Service well, with surface cover on Lysimeter tank.	Fabricated	1	Fabricated			Modification and redesign leeching collection from all lysimeters and Service well access control needed and stagnation of water must be avoided in lysimeter sump

							bottom
	<b>ii)</b> Load cell Precession weighing system 6T with 10 g digital resolution-three 2T sensors placed at 120° apart, load on a common triangular bar.	JJ Chennai	1		Yes	--	Cleaning/ OEM servicing if any
	<b>iii)</b> Ceramic IR Heaters in SS Enclosure twelve numbers with power controller and cabling. Needs to maintain a temperature selectable through SCADA (generally ambient +2 to 5°C).	Elstein FSR	12	FSR1000, 230 V 1000Watt / Any International make with high accuracy	--	12	Calibration, Data logging, SCADA control check needed
	<b>iv)</b> Infrared Temperature Sensor Compact Non-Contact with optional Dual Output, Temperature range approximately: -20°C to 100°C, Two-wire 4-20 mA output or four-wire voltage/thermo-couple output with Field of view 15:1 or 30:1, high stability, SS housing, IP65, Accuracy ±1% of reading or ±1°C, Repeatability ± 0.5% of reading or ± 0.5°C, Emissivity Fixed at 0.95, Spectral 800 to 1400 nm, Ambient Temp Range 0°C to 70°C	Raycmltj3m, 24v 20ma cat-ii	1	Rayteck US fluke US / Callex Electronics Limited / Omega UK / Any International make with high accuracy	--	Yes	Calibration, Data logging, SCADA control check needed
	<b>v)</b> Open top Chamber 4mx4mx3m fabricated with 65mm GI coated flanged MS Pipes Class-B. IR heaters mounting arrangements	Fabricated	1	Fabricated	Yes	--	Cleaning/ servicing if any
	<b>vi)</b> 6mm Thick multi wall UV Stabilized Polycarbonate sheet for 85% PAR Clear-for all side. (with 10year onsite Warranty for 85% PAR, yellowing, breaking etc.)	Lexon	1	LEXAN make XL102UV Clear model or similar certified / Any International make with standards certified	Yes	--	Cleaning/ servicing if any
3.	<b>i) Lysimeter-3 e-Co2</b> Fabricated Stainless steel cylindrical soil tank of size 1.2 dia and 2 m depth with 6.4mm thick stainless steel along with drain tubes. Elevated CO2 concentration over and above ambient concentration selectable through SCADA. It includes necessary trenching, civil work for mounting the Load cell, and common soil Service well, with surface cover on Lysimeter tank.	Fabricated	1	Fabricated	Yes	--	Modification and redesign leeching from all lysimeters and access control needed
	<b>ii)</b> Load cell Precession weighing system 6T with 10 g digital resolution-three 2T sensors placed at 120° apart, load on a common triangular bar.	JJ Chennai	1		Yes	--	Cleaning/ OEM servicing if any
	<b>iii)</b> CO2 Piped arrangement with flexible SS connector release valve	Fabricated	1		Yes	--	Yes
	<b>iv)</b> CO2 PU distribution tube in open top chamber all sides Size-8X12 A*U27 *574112 (Appox 17 meters)	LEGRIS	1	PU CALIBRATED	--	Yes	Replacement of PU, Service



				98 SHORE/ any standard PU of international make certified			Needed
	<b>v)</b> Replacement needed with <b>Fuji CO2 NDIR analyser</b> suitable approved model in Enclosure with sample suction gas pump, gas conditioner, Gas moisture removal filters etc., <b>one complete Unit for both chambers Lysimeter-3 e-Co2 &amp; Lysimeter-4 e-Temp+Co2</b> to be housed in control room with suction tubes. <b>A suitable SCADA program rearrangement also needed for display of CO2 in each chamber.</b>	Fuji	1	High standard make with high accuracy of Co2 measurement in chambers	--	Yes	Co2 analyser Calibration, Data logging, SCADA control check needed
	<b>vi)</b> Electrically operated solenoid valve release through SCADA control to maintain 550PPM	Fluid Control	1	Rotex automation/ Any standard make with ISI certified	--	Yes	SCADA control data check needed
	<b>vii)</b> Open top Chamber 4mx4mx3m fabricated with 65mm GI coated flanged MS Pipes Class-B. Co2 distribution arrangements	Fabricated	1	Fabricated	Yes	--	Cleaning/ servicing if any
	<b>viii)</b> 6mm Thick multi wall UV Stabilized Polycarbonate sheet for 85% PAR Clear-for all side. (with 10year onsite Warranty for 85% PAR, yellowing, breaking etc.) LEXAN Clear model or similar certified	Lexan	1	LEXAN make XL102UV Clear model or similar certified/ Any International make with standards certified	Yes	--	Cleaning/ servicing if any
	<b>ix)</b> Ambient Weather Precise Air Temperature Class A sensor IP68 includes a digital Modbus RS-485 output, 3 or 4-wire PT100 temperature probe for air waterproof stainless-steel sensor tip with Protection Shield & outdoor Mount	--	1	--	--	Yes	Calibration, Data logging, SCADA control check needed
4.	<b>i)</b> <b>Lysimeter-4 e-Temp+Co2</b> Fabricated Stainless steel cylindrical soil tank of size 1.2 dia and 2 m depth with 6.4mm thick stainless steel along with drain tubes. Elevated CO2 concentration over and above ambient concentration selectable through SCADA. It includes necessary trenching, civil work for mounting the Load cell, and common soil Service well, with surface cover on Lysimeter tank.	Fabricated	1	Fabricated	Yes	--	Modification and redesign leeching from all lysimeters and access control needed
	<b>ii)</b> Load cell Precision weighing system 6T with 10 g digital resolution- three 2T sensors placed at 120° apart, load on a common triangular bar.	JJ Chennai	1		Yes	--	Cleaning/ OEM servicing if any

iii) Ceramic IR Heaters in SS Enclosure with cabling. Needs to maintain a temperature selected through SCADA (generally ambient +3°C).	Elstein FSR	12	FSR1000, 230 V 1000Watt / Any International make with high accuracy	--	12	Calibration, Data logging, SCADA control check needed
iv) Infrared Temperature Sensor Compact Non-Contact with optional Dual Output Temperature range: -20°C to 100°C, Two-wire 4-20 mA output or four-wire voltage/thermo-couple output with Field of view 15:1 or 30:1, Fast response & high stability, SS housing, sealed to IP65 Accuracy ±1% of reading or ±1°C, Repeatability ± 0.5% of reading or ± 0.5°C, Emissivity Fixed at 0.95, Spectral 800 to 1400 nm, Ambient Temp Range 0°C to 70°C	Raycmltj3m, 24v 20ma cat-ii	1	Rayteck fluke company Or Calex Electronics Limited/Omega UK / Any International standard make with high accuracy	--	Yes	Calibration, Data logging, SCADA control check needed
v) CO2 Piped arrangement with flexible SS connector release valve	Fabricated	1	-	Yes	--	--
vi) CO2 PU distribution tube in open top chamber all sides Size-8X12 98 SHORE A*U27 *574112 (Appox 20 meters)	LEGRIS	1	PU CALIBRATED 98 SHORE / any standard PU of international make certified	--	Yes	Service Needed
vii) Replacement needed with <b>Fuji CO2 NDIR analyser</b> suitable approved model in Enclosure with sample suction gas pump, gas conditioner, Gas moisture removal filters etc., <b>one complete Unit for both chambers Lysimeter-3 e-Co2 &amp; Lysimeter-4 e-Temp+Co2. A suitable SCADA program rearrangement also needed for display of CO2 in each chamber.</b>	Fuji	---	---	---	---	Calibration, Data logging, SCADA control check needed
viii) Electrically operated solenoid valve release through SCADA control to maintain 550PPM	Fluid control system	1	Rotex automation/ Any standard make with ISI certified	--	Yes	SCADA integration, control, data check needed
ix) Open top Chamber 4mx4mx3m fabricated with 65mm GI coated flanged MS Pipes Class-B. IR heaters mounting and Co2 distribution arrangements	Fabricated	1		Yes	--	Cleaning/ servicing if any

	<b>x)</b> 6mm Thick multi wall UV Stabilized Polycarbonate sheet for 85% PAR Clear-for all side. (with 10year onsite Warranty for 85% PAR, yellowing, breaking etc.) LEXAN make XL102UV Clear model or similar certified	Lexan	1	LEXAN make XL102UV Clear model or similar certified	Yes	--	Cleaning/ servicing if any
5.	Supply installation and integration of data for Portable soil moisture, electrical conductivity and temperature profile sensor-TDR/TDR high frequency pulse based for Measurement of VWC, permittivity, EC, and temperature with up to 100cm. measurement depth, built in data logger, data storage and battery pack with charger. All desired/optional required accessories for multiple site and depth measurements 1.Profile Probe with sensors – 2 nos 2. Accuracy ±1% of reading , Repeatability ± 0.5% of reading 2.Access tubes with Caps up to 100c.m. for profile probe accessibility quantity -30 nos. 3.Pilot-Hole Maker For access tubes-1no, 4.All accessory Cables etc. 5.Complete onsite warranty – Two years.	Campbell	1set	Research Grade TDR profile probe with sensors at different depths of any Reputed company meeting international standards with high accuracy.	--	1set	Calibration, Data logging, Data check needed
6.	Data logger module measures sensors, drives direct communications and telecommunications, reduces data, controls external devices, and stores data and programs in on-board, non-volatile storage. <b>Alternatively, cost effective proposal with Indian or imported New SCADA, New PLC, New Data logger, for complete system replacement may also be suggested</b>	Campbell	1	CR1000 with NL120	To Examine by Tenderer	<b>Yes With suitable Cost-effective alternative approach also admitted</b>	Re-configuration of all sensors, Data check with scada
7.	Load cell Data module PCB 4nos for each lysimeter. Load cell sensors drives direct communication with PCB, converts it to suitable RS232/RS485 data for connecting to control room Omron modules. Mounted in lysimetric sump control box-2.	Fabricated	1	Load Cell Manufacturer's Proprietary part	Yes	--	OEM Service Back UP Needed
8.	Outdoor Electrical panel IP65 in SS enclosure comprising of self-standing with all Voltages, frequencies, Temp local indication selection, manual control and SCADA control for temperature. i)3ph 415v80A BTH SCR power controller with4-20ma,1-5V-DC,0-10V-DC connectivity -2nos ii) 3ph 415v100A DU100 MCCB -1no iii) 3p TP MCB - C32-2nos iv) 3p TP MCB - C-6-1no, v) SP MCB - C-4-1no <b>Note:-This unit is vital for IR heating elements gradual and intermittent heating buildup function. In-case, with modified SCADA programming, could take care of these functions, this stand-alone unit could be made redundant. Quote may be made accordingly for cost effectiveness.</b>	Fabricated	1		--	Yes-2Nos (SCR power controller units with I/O 4-20ma communication)	SCADA integration and Data Control check Needed
							<b>Note: Instead of Repairing this stand-alone unit for IR heater control, same can also be achieved, through proper SCADA programming also. Quote may be made accordingly as per convenience for cost effectiveness.</b>
9.	All interconnecting electrical, Standard signal cable connecting sensors data logger and power cabling. Control & RJ45 Cable At point certain over	Standard ISI	1		Yes	yes	Repair/Replacement &Service needed

	ground and underground terminals, some rat damages could be seen at few places. Tenderer requested to carefully examine before quoting the price.						
10	Digital Pan Evaporimeter Kaizen Imperial with standard Evaporimeter pan and probe, Solar Panel Charging for 2x7.2Ah SMF batteries, RS232 Data Link, with EEPROM memory and data saved in Ms-Excel files.	Kaizen Imperial	1	Kaizen Imperial DER 59		Yes Replacement needed	Data integration into SCADA needed. As per NWS/IMD standards
11.	Digital Recording Rain gauge for rain fall times and duration as well as momentary contact events stored in memory. Ms-Excel based tabulated data form retrieved through USB port of PC/laptop. Standard tipping bucket type Catch area 330CM <sup>2</sup> Collector.	Kaizen Imperial	1	Kaizen Imperial Product Code 80		Yes Replacement needed	Data integration into SCADA needed. As per NWS/IMD standards
12.	HP workstation Intel XeonE-5 1603 2.8 10M 1066 4C CPU, C602, 64Gb RAM, SATA500GB 7200RPM, AMD FirePro V3900 1GB GFX, 16xDVD RW-SATA,600W SMPS-90%Effcy, USB-KBD, USB-Mouse, Monitor 24" 32Bit-Windows 7 Prof Licensed, Image Recovery.	HP	1	Z420	Yes	--	System became slow. Replacement/ Restoration needed.
13.	OMRON SCADA System with Data Management- FA communications software licensed CX-Supervisor Run Plus V3 Tweaking of few points absolutely needed. <b>Alternatively, cost effective proposal with New SCADA, PLC Data logger, for complete system replacement may also be suggested</b>	Omron	1	CX-Compolet / Sysmac gateway	Yes	--	Altering in PLC / SCADA configurations and re programming needed.
14.	HP LaserJet pro 200 Colour Printer	HP	1	M251N	Yes	Yes Cartridges-Set	--
15.	Online UPS 10KVA, 3phase i/p 3phase o/p, 12v 26ah-30nos SMF batteries with Batteries replaced in 2019 May. UPS failed. Ii) 3phase servo stabilizer for UPS connection, One of three servo coils burnt. A suitable Easy UPS 3S 10 kVA 400 V 3:3 UPS of APC/Snider/Emerson make Replacement needed	AB Power make	1	Any standard reputed make with ISI certified	No	Yes APS/Eton/Emerson/Numeric/DB power	Replacement of UPS with Replacement of Batteries as needed for it.
16.	Electric Control Panel for PLC and Controls IP55 in SS enclosure wall mounted with all Voltages, frequencies, local indication, selection, SCADA control for PLC, VFD, other sensors.		1		Yes	--	Cleaning/ OEM servicing if any
	i)Omron Interactive Display source -rs232c/rs485/rs422 Lot No:14513M, 24V DC 7W	Omron Corporation	1	NB7W-TW00B	Yes	--	Cleaning/OEM servicing if any
	ii)Omron Programmable Controller with Modules ID232, OD211, OD211, AD081, DA041, Input Card-40pin Cable,	Omron Corporation	1	OmranSysMac CJ1M CPU11-ETN	Yes	--	Servicing & performance check Needed
	iii) Relay unit Isolated/driver R-12, 8881113-\$relay, R-13-8Relay, R-11 6Relay, R-14 8 Relay, Isolated 29 Relay Units	Omron Corporation	1	Omron Corporation	Yes	--	Replacing/ servicing if any
	iv)3ph MCB TPN-1	Siemens	1	C32	Yes	--	--
	v)3ph MCB TP -2 Main, Logger	Schneider	1	C32, C6A	Yes	--	--
	vi) DP MCB -1 no Control	Schneider	1	C6	Yes	--	--
	vii) Mains Power on sensor	Seltzer	1	MKP28	Yes	--	--
viii) 3phase Protector and Phase Sequence	Minilec	1	VSP-D2	Yes	--	--	

	ix) Control Power transformers, Switching Power supply 24v DC sources, 29 Relay Units Misc etc		1		Yes	--	--
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