ONGC TRIPURA POWER COMPANY LIMITED

TECHNICAL SPECIFICATION

FOR

ONLINE MONITORING SYSTEM FOR BUS REACTOR

TECHNICAL SPECIFICATIONS FOR ONLINE MONITORING SYSTEM FOR BUS REACTOR AT OTPC PLANT, PALATANA, TRIPURA

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1.0 Scope:

The scope of supply and implementation of complete online Transformer Monitoring System for BUS REACTOR shall include design, manufacture, testing, supply, erection and commissioning. The intended system shall be suitable for monitoring the transformers in whole. All sensors, acquisition units, cables, processors, software, computers, cabinets and other accessories required for successful operation and performance are included in the scope of the contractor. All control & instrumentation cables shall be screened and armored. All power cables shall be steel armored.

Transformers identified for implementation of "Real Time Condition Monitoring Solution". The specifications of this transformer is given below:

BUS REACTOR

Power Rating: 80 MVAR, Voltage Rating: 400 KV, Vector Group: YN, (3 HV + 1 Neutral Bushing).

2.0 General Requirements:

2.1 Bus reactors should be equipped with an on-line condition monitoring and expert system. Such a system should support the operation and maintenance of a transformer/reactor with regard to at least following aspects:

(a) With use of sensors, sophisticated modeling and diagnostic functions it should help to detect incipient faults at an early stage, in order to avoid a catastrophic outage of the transformer/reactor.

(b) It should provide tools which enable the user to operate a transformer/reactor close to its thermal limits, with taking into account thermal aging and avoiding critical hot spot temperature. It should support advanced management of possible overload conditions. Unit can continuously measure other critical parameters such as oil temperatures, load current, water content in oil, and cooling status which are complementary to the DGA information. It further incorporates on-board calculations based on the very latest IEC®/IEEE® thermal and moisture models standards and computed from the specific transformer characteristics obtained from the name-plate and test reports of the transformer

(c) It should enable the user to perform condition-based maintenance of the reactor transformer.

(d) It should enable the user to have an overview at a glance about the transformer by clear visualization of transformer condition by traffic lights within software user interface and with LEDs on control cubical in the field.

2.2 All components of the reactor (active part, bushings, cooling system) should be monitored by one single fan-less Intelligent Electronic Device (IED), so that correlations can be built between the information coming from various components in order to build consistent, comprehensive diagnostics. It should be possible to monitor all transformers and reactors at one substation with one single monitoring IED to allow data correlation of adjacent transformers/reactors.

2.3 Configuration of a monitoring system consisting of sub-systems for condition monitoring of bushing not produced by the manufacturer of the offered monitoring system is not permitted.

2.4 The monitoring modules for data acquisition shall be installed at the transformer/reactors. All monitoring modules at one substation shall be connected to one single monitoring IED which shall be installed either in the control room or in the monitoring module at the power transformer by means of field bus ring topology in order to ensure the communication, even the field bus communication between the monitoring modules is interrupted at any point. The IED shall be equipped with a redundant flash memory and should have the capability of monitoring up to a minimum of 15 transformer/reactor units at one substation. The use of a monitoring IED/server equipped with moving parts such as fans and hard disks is not permitted.

2.5 The heart of the system shall be comprehensive and advanced numerical models of the transformer/reactor implemented on the monitoring IED, taking into account design, results of design calculation as well as results of comprehensive tests of the power transformer/reactor such as but not limited to the following:

(a) Thermal model

(b) Aging model

(c) Tap changer model

(d) Moisture model

(e) Bushing model

(f) Overload model

(g) Cooling model

3.0 Scope of Work:

The scope includes design, development, supply, installation, commissioning, testing and onsite training of OTPC personnel for implementation of a "Real Time Condition Monitoring Solution" for 400 KV Bus Reactor.

The solution shall include On Line Monitoring of the following parameters for Bus Reactor:

(a) 9 Gas in oil and moisture

(b) Partial Discharge of the Transformer

(c) Tan Delta & capacitance of the Bushings

(d) Load current

(e) Ambient temperature

(f) Top oil temperature

(g) Bottom oil temperature

(h) Transformer winding moisture tracking

(i) Radiator Bank Temperature monitoring.

The acquired data shall be available over OTPC Intranet and necessary alarms can be integrated with the existing SCADA (MaxDNA) network.

All equipment provided by the manufacturer shall be new, free from defects and of same type standard and quality set forth in the specifications. The scope of equipment to be furnished and services to be provided under the contract are outlined hereinafter and the same is to be read in conjunction with the provisions contained in other clauses. The scope of work under the contract shall be deemed to include all such items, which although are not specifically mentioned in the bid documents and / or in Bidder's proposal, but are required to make the equipment / system complete for its safe, efficient, reliable and trouble free operation. NO EXTRA COST implication to OTPC shall be considered on account of supply & installation of these unaccounted items. The Contractor must consider the cost of technicians and labors required for commissioning of equipment's along with materials at site as complete erection and commissioning is in Contractor's scope.

4.0 Technical Specifications:

The on-line monitoring device shall combine in a single system and measure the following:

(a) Partial Discharge (PD) in the transformer main tank and bushings;

(b) Relative variations of capacitance and power factor of each bushing;

(c) Gas contents in the insulating oils in the transformer main tank using photo-acoustic spectroscopy or NIR technology. The equipment shall measure each gas individually and give results in ppm. Moisture should also be measured in ppm.

4.1 The monitoring system shall be housed in a single IP56 acquisition box, wall or stand mounted, to be placed near the transformer.

4.2 No additional software shall be required for commissioning the system and to visualize the data.

4.3 Central Server/ Computer must be supplied to manage multiple online DGA, Bushing monitor and Partial Discharge system.

4.4 Dissolved Gas analysis, Partial Discharge and Bushing monitoring results can be displayed in different formats in which all the data points are linked together.

4.5 Furthermore, the system shall:

(a) Include data storage (>1 year)

(b) web-server and integrated modem

(c) be GPS free and no active electronics placed on the top of transformer

(d) be connected to SCADA or DCS using known protocols such as Modbus, DNP3 or IEC61850

(e) support RS232, RS485, Fiber optic, 3G, Ethernet carriers

(f) include 3 x LED Indicators (Power, Service, Alarm) and Alarm relay contacts

4.6 Dissolved Gas Analysis:

(a) Be capable of correlating all 9 fault gases, moisture-in-oil, oil temperature, and ambient temperature to the transformer load.

(b) Gas Analyzing shall be on the Photo Acoustic Spectroscopy (PAS) or NIR (Near Infra-Red) Spectro-photometry or any other competing technology without the need of any consumables.

(c) Be required to have a separate oil inlet pipe and separate oil return pipe to ensure quality of oil sampling.

(d) Have an embedded web-server to allow remote access using any smart device (such as smart phone or tablet) based on the user providing access via Ethernet or SIM.

(e) Not require download and install of any third party software for communication with the online DGA monitor.

(f) Have an on board 7 inch color touchscreen HMI to allow review of data, graphs and the password protected control of settings.

(g) Supply access to Instructions on how to take a manual oil sample accessible via the touch screen HMI

(h) The supplier shall be capable of providing a team of transformer experts to support and enhance the customer experience providing monitor support and technical transformer service. Costs for these services will be agreed with the customer in advance based on a per project or transformer basis.

(i) The user interface shall provide the following Dissolved Gas Analysis via its 7" on board

(j) HMI:

- DGA Graph Trending
- DGA Instantaneous Values
- DGA Scheduling
- DGA Online Monitor Alarm Management
- Cross Data Trending
- Data Export to User device

4.7 Software:

The monitoring IED should allow generating HTML-based web pages in English language that provide an easy and user-friendly presentation of the acquired and analyzed on-line data as well as historical data. It shall include a built-in web server generating HTML5 web pages to support access the user interface using any popular Internet browser without use of any proprietary software.

The operating software used in the monitoring server shall be the multitasking and real-time operating system such as QNX.

The software of the monitoring IED must include and not limiting to the following:

(a) The expert system provides the user with recommendations and information to optimize the operation and maintenance of the transformer/reactor by means of algorithms for analyzing the on-line acquired variables which are implemented in the software.

(b) Dissolved gas analysis and diagnostic tool according to MSS, Doernenburg, Rogers, extended Rogers, IEC 60599, Duval and Key Gas.

(c) Diagnostic tools:

- Furfural determination
- Oil conditions acc. VDE 0370/IEC60422
- Classification of risk acc. IEEE C57.104-2008
- Evaluation of paper insulation condition acc. IEC 60599

(d) Report generator, which automatically creates protocols with status information about the transformer/reactors and its main components.

(e) Simulator tool, which predict chosen parameters such as but not limited to load factor, hot-spot temperature, aging rate, losses and moisture of insulation paper to analyze the transformer and monitoring system´s behavior.

(f) The monitoring IED shall provide long term storage of all acquired and analyzed data (15 years plus) from all connected transformer/reactors at one substation. It must be possible to download the contents of the data memory to a remote PC through Ethernet.

(g) In case the values will exceed individually defined limits the system generates an alarm record which is also saved in the database. In addition the alarm signal can be sent to the control room by either standard protocols or closing of relay contacts. E-mail notifications and alarm massages should be customizable to specific local needs.

Initially, the on-line data acquired by means of the monitoring modules are to be held in the RAM memory of the monitoring IED with a high timely resolution. The monitoring system should have the capability of resolution and processing of the measured values in millisecond grid. In order to optimize the storage capacity, the individual data of the different on-line channels are stored as timely mean or maximum values in the historical database (data reduction). However, events, e.g. tap changing, shut down of the transformer, energizing of the transformer, or alarms, are to be saved with time stamp and high timely resolution in millisecond grid.

The system shall provide the capability of synchronizing its internal clock from an external source.

It must be possible to communicate with SCADA by means of standard protocols such as IEC 60870-5-101, IEC 60870-5-104, IEC 61850 (reports) certified by KEMA, Modbus or DNP3.0.

4.8 Bushing Monitoring shall:

(a) By direct measurement of bushing capacitance and Tan Delta by Schering bridge principle.

(b) be connected at the bushings Test Tap, through properly designed adaptors, including protections in order to disallow the Test Tap pin to remain floating, even with the signal cable disconnected from the adaptors.

(c) Provide hourly summary, indicating:

- Transformer Status (ON/OFF)
- Current Polar Plot (through web app)
- Relative (%) and Referenced (pf) Capacitance, Relative (%) and Referenced (%) Power Factor
- Top oil, Bottom oil, Tap Changer and Environmental Temperatures, plus Humidity. Data shall be provided through additional sensors added to the system.

4.9 PD solution must have:

(a) Each partial discharge monitoring system shall be based on UHF technique and immune from noise from electrical connections at bushings, line corona etc.

(b) PD monitoring should be done by providing 2 nos. of UHF sensors of drain valve type suitable for PD frequency range of 100MHz to 1500MHz with fully shielded sensor and extra port for functionality check and calibration signal.

(c) PD monitoring module shall be based on wide band signal processing technique and should be immune from noise by using transformer tank as faraday cage.

(d) The PD monitoring system should be provided with PD monitoring software for trending of PD activity and generating advance warning.

(e) PD monitoring shall be installed and commissioning by Contractor to existing drain valve of DN50/DN80 size based on availability.

(f) Contractor to submit the PD data analysis within 15 days of system commissioning and also provide PD assessment once every 6 months for next three years since first commissioning free of charge

(g) Simultaneous (no multiplexing) and 24-hours-continuous acquisitions (not scheduled) in all 4 channels (with option for additional 4)

(h) Automatic and real time noise rejection (no manual clustering), with gating option on fourth channel

(i) >50 MS/s sampling rate, >20 V peak-peak input measuring range, <1 mV Sensitivity at full scale with 12 bit resolution

(j) Hourly summary, indicating:

- Transformer Status (ON/OFF)
- Amplitude (Volts and nC) and Repetition Rate of PD signals in each Phase
- Additional PRPD pattern in both Volt and nC for each phase,

(k) The system must be commissioned, configured and interrogated without installing any software, by just using common web-browser

4.10 Central Server:

It must:

(a) Display the list of all monitored devices

(b) Display the status of all monitored devices (connected, not connected, alarm active)

(c) Allow direct connection to the monitored device

(d) Periodically retrieve the data from each monitoring device

(e) Display the Condition Group of each monitoring device (good, normal, defective, faulty, failure)

(f) Upgrade each device when a new software release is available

(g) Notify alarms through email

(h) Provide secure connection with proper user credentials and user roles

4.11 Parameters

H_2	5 - 5,000 PPM
CH_4	1 – 50,000 PPM
C_2H_6	1 – 50,000 PPM
C_2H_4	1 – 50,000 PPM
C_2H_2	0.1 – 50,000 PPM
CO	1 – 50,000 PPM
CO2	3 – 50,000 PPM
O2	100 - 50,000 (± 10%)
N2	100 - 150,000 (± 15%)
H20 (RS)	1 - 100% RS
Accuracy	± 5% or ± LDL (whichever is greater)

4.12 DATA- DGA

Measurement frequency	1 - 24 hrs.
Data Storage	GB micro SD card, 15+ years

4.13 Bushing Monitoring

Input channels	2 sets of 3 phases, simultaneous acquisition on all channels
Simultaneous channels	3 (up to 6)
Sensors	Bushing Tap Adaptors
Input measuring range	0 - 200mA
Accuracy	Amplitude: 0.1%, Relative Phase Angle: 0.05°
Resolution	12 bit
Sampling rate	>10 kS/s
Power system frequency	50 - 60Hz, ± 0.01 Hz

4.14 DATA- Partial Discharge and Bushing

Acquisition mode	Continuous
Trending	Hourly, daily, weekly, monthly
Storage	> 1 year

4.15 Alarms

High-vis LED's	Red, Amber, Green
Alarm relay contact	4 x NO or NC, user configurable

4.16 I/O

Analog inputs	3 x PT100, 3 x 4 - 20 mA, 1 x Load CT
Digital inputs	5 x 24V isolated

4.17 Communication Options

Protocols	Modbus, DNP3 & IEC61850
Carriers	RS232, RS485, Ethernet, Fiber, 3G
HMI	7" High Resolution Colour LCD

4.18 Power

Power	90 - 250 VAC, 47 - 63 Hz, 300W max

4.19 Environment

Operating temperature	-40 to +55 °C (option for -60 °C)
Operating humidity	5 - 95% RH, non-condensing
Oil temperature range	-40 to +120 °C

IP Rating	IP56

4.20 Data to be Acquired by the Monitoring system:

The following acquired variables should be recorded by the monitoring system:

(a) Load current on HV side

(b) Over currents and short circuit currents on HV side

(c) Top oil temperature

(d) Bottom oil temperature

(e) Winding temperatures (from Fiber-Optic Temperature Indicator)

(f) Gas-in-oil content [ppm]

(g) Relative moisture of oil (water activity) [%]

(h) Operating voltages on HV side directly at the bushing test tap by means of sensing devices installed at the bushing test tap

(i) Transient over-voltages detection (up to 1.2/50 micro second lightning impulse)

(j) Ambient temperature

(k) Circuit state of each fan and pump

(l) In- and outlet temperatures of cooling unit

(m) Circuit state of protection devices (e.g. Buchholz-Relay, overpressure relief device, …)

It must be possible to retrofit additional sensors in the future in order to extend the monitoring functionalities. It should be also possible to integrate existing transformers in the monitoring system.

The transformer monitoring system shall be able to fully integrate DGA equipment for individual detection of Hydrogen (H2), Methane (CH4), Ethane (C2H6), Ethylene (C2H4), Acetylene (C2H2), Carbon monoxide (CO), Carbon dioxide (CO2), Oxygen (O2), Nitrogen (N2) and moisture (H2O), based on PAS (Photo Acoustic Spectroscopy) or NIR (Near Infra-Red).

The DGA sensor shall not use any consumables like carrier or calibration gases.

4.21 Information to be provided by the System:

On the base of received on-line measurements, it should calculated/analyzed for each transformer/reactor individually:

(a) Apparent power (MVA)

(b) Load factor

(c) Number of over currents and short-circuit currents on HV side
(d) Last over current and short-circuit current on HV side

(e) Actual losses

(f) Top oil temperature according to thermal model

(g) Hot spot temperature in accordance with IEC 60076-7

(h) Ageing rate in accordance with IEC 60076-7

(i) Lifetime consumption in accordance with IEC 60076-7

(j) Gas in oil gradient [ppm/day]

(k) Water content in oil [ppm]

(l) Moisture of insulation paper

(m) Bubbling temperature

(n) Bubbling safety margin

(o) Breakdown voltage of insulation oil

(p) Overload capacity

(q) Emergency overloading time when overloading

(r) Number of transient over-voltages on HV bushings (up to 1.2/50 micro second lightning impulse)

(s) Last transient over-voltage on HV bushings (up to 1.2/50 micro second lightning impulse)

(t) Change of capacitance of condenser bushings on HV bushings

(u) On-line capacitance of condenser bushings on HV bushings

(v) Capacitive displacement currents on HV bushings

(w) Cooling efficiency (thermal resistance Rth)

(x) Cooling Power

(y) In- and outlet temperatures difference of cooling unit

(z) Sum of switched load current until service

(aa) Time of inrush current

(bb) Switching time

(cc) Index of switched energy

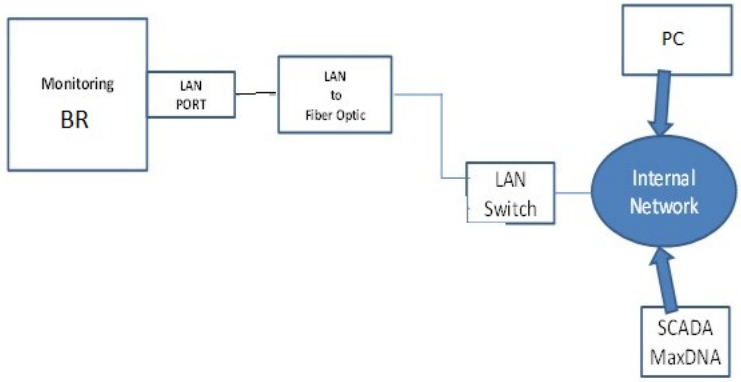
(dd) Maximum power consumption of sector 1

(ee) Maximum power consumption of sector 2

(ff) Maximum power consumption of sector 3

5.0 Schematic Diagram

The Monitoring Unit shall have a configuration as shown below:



6.0 Sensor Schedule:

Following sensors shall be minimum provided for Bus Reactor:

Sl no	Type of sensor	Quantity Per Transformer	Application	Performance Parameter
1	RTD/Pt100	1	Top oil temperature	To measure top oil temperature as a function of load
2	RTD/Pt100	1	Bottom oil temperature	To measure bottom oil temperature and evaluating the cooling efficiency of the Transformer
3	RTD/Pt100	1	Ambient temperature	To measure the ambient temperature to evaluate the differential of the top oil temperature and the ambient temperature to understand the extent of heating of the Transformer oil.
4	Humidity sensor	1	Humidity in the atmosphere	To understand the moisture content in air and its associated impact on the Transformer oil
5	Bushing Tap Coupler Sensors	4	Tan Delta, Capacitance of the Bushings and Partial Discharge	To measure the overall health of the Bushings and the insulation level/defects of the Transformer (Partial Discharge)

			of the Transformer Tank	
6	Load CT	3	Load Current	To measure the load current of the Transformer.

7.0 Bill of Material, Approved Makes and Services for Bus Reactor:

Sl.	Item	Qty	Make/Model	Remarks
1.	Total Transformer Monitoring Solution as per the specifications for Reactor Transformer and consisting of the following: • Partial Discharge (PD) in the transformer main tank and bushings; • Bushing Monitoring System - Relative variations of capacitance and power factor of each bushing; • On-line DGA - Gas contents in the insulating oils in the transformer main tank using photo-acoustic spectroscopy technology or NIR (Near Infra-Red) Spectro-photometry. The equipment shall measure each gas individually and give results in ppm. Moisture should also be measured in ppm. The monitoring system shall be housed in a single IP56 acquisition box, wall or stand mounted, to be placed near the transformer. Schematic Drawing is attached in the Specifications for reference	01	Camlin/GE/MTE or equivalent make	
2.	Sensors i. Top Oil Temperature Sensor ii. Bottom Oil Temperature Sensor iii. Ambient Temperature Sensor iv. Humidity Measuring Sensor	 1 nos. 1 nos. 1 nos. 1 nos.	Camlin/GE/MTE or equivalent make	

Sl.	Item	Qty	Make/Model	Remarks
	v. Bushing Tap Coupler Sensors vi. Load CT vii. PD CT in Neutral	4 nos. 3 nos. 1 nos		
3	LAN Switch	1 Lot.	Moxa / Advantech / Cisco	
4	Installation & Commissioning and Integrated Testing	1 Lot		

The above list is tentative. Contractor must provide all the additional materials for fulfillment of the technical specification.

8.0 Compliance sheet:

The bidder must fill the Compliance Sheet given below for the ease of evaluation.

General Compliance for Bus Reactor

Sl. No.	Description	Yes / No	Remarks
1.	On-line monitoring device to measure a. Partial Discharge (PD) in the transformer main tank and bushings;		
	b. relative variations of capacitance and power factor of each bushing		
	c. gas contents in the insulating oils in the Bus Reactor.		
	d. shall combine together in a single system		
2.	The Monitoring system shall be housed in a single wall or stand mounted IP56 enclosure near to transformer		
3.	Solution should include data storage(>1yr)		
4.	System should have embedded web server & integrated modem		
5	System should have 3 LED Indicators (Power, Service and Alarm)		
6	System should have 4 X NO or NC user configurable Alarm Relay Contact		
7	On board 7 inch colour touch screen HMI to review		

	data, graphs and password protected control of setting		
8	Other than web server based application no other software shall be used to commission, configure and interrogate		

A. Dissolved Gas Analysis

Sl. No.	Description	Yes / No	Remarks
1.	System is capable to correlate all 9 fault gases, moisture in oil, oil temperature and ambient temperature to the transformer load		
2.	System should have a separate oil inlet and oil return pipe for Bus Reactor		
3.	Should have remote access using smart device(smart phone or tablet)		
4.	Not required to download or install any third party software to communicate with DGA monitor		
5.	Supplier is capable to provide a team of transformer experts to support and enhance the customer experience providing monitor support and technical service.		

B. Bushing Monitoring System

Sl. No.	Description	Yes / No	Remarks
1.	Bushing Monitoring system shall be connected at the bushings Test Tap, through properly designed adaptors, including protections in order to disallow the Test Tap pin to remain floating, even with the signal cable disconnected from the adaptors.		
2.	Provide Hourly Summary indicating (a) Transformer Status (ON/OFF) (b) Current Polar Plot (through web app) (c) Relative (%) and Referenced (pf) Capacitance, Relative (%) and Referenced (%) Power Factor.		

C. PD solution

Sl. No.	Description	Yes / No	Remarks
1	Simultaneous (no multiplexing) and 24 hours continuous data acquisition in all 4 channels		
2	Automatic and real time noise rejection (no manual clustering),		
3	>50 MS/s sampling rate, >20 V peak-peak input measuring range, <1 mV Sensitivity at full scale with 12 bit resolution		
4.	Provide Hourly Summary indicating: (a) Transformer Status (ON/OFF) (b) Amplitude (Volts and nC) and Repetition Rate of PD signals in each Phase (c) Additional PRPD pattern in both Volt and nC for each phase		

D. Sensors & Others

Sl. No.	Description	Yes / No	Remarks
1	Should provide sensors to measure a) Top oil, b) Bottom oil, c) Environmental Temperatures d) Humidity e) Load CT		
2	Data shall be provided through additional sensors added to the system.		

E. Integrated System & Communication

Sl. No.	Description	Yes / No	Remarks
1	Display the list of all monitored device		
2	Display the status of all monitored device		
3	Direct access to the monitored device		
4.	Periodical retrieval of data from each monitoring device		
5	Display of Condition Group (good, normal,		

Sl. No.	Description	Yes / No	Remarks
	defective, faulty, failure) of each monitoring device		
6	Firmware upgradation of each device when a new software release is available		
7	Notify alarm through email		
8	Secure connection with proper user credential and user role		
9	SCADA or DCS compatible using standard protocols like Modbus, DNP3 or IEC61850		
10	Data Communication carriers Supports RS232, RS485, Fibre Optic, Ethernet and 3G		

9.0 Warranty Requirement

Contractor shall be liable for any defects in the materials supplied and workmanship of services provided by it for period of 60 months from the date of commissioning of the online monitoring system for the bus reactor.

10.0 SERVICE LEVEL AGREEMENT (SLA)

10.1 Contractor shall give operational guarantees covered in the contract. This includes Transformer Monitoring System availability.

10.2 Availability / Uptime will be computed based on availability of the Transformer Monitoring System including accessories supplied and implemented by Contractor to the OTPC users.

10.3 Response may be telephonic, email, remote or onsite. In case the issue cannot be resolved telephonically or by email or by remote support, the Contractor shall need to provide onsite assistance within response resolution window.

10.4 Typical resolution time will be applicable if Transformer Monitoring Systems are not available to the OTPC's users.

10.5 A monthly report shall be submitted at the end of every month indicating availability / uptime etc. Tools / in-built facility to measure availability / uptime of system shall be provided by the Contractor.

10.6 **Availability Measurements:**

Priority	Measurement / Criteria	Response time	Maximum Resolution Time

	Priority	Measurement / Criteria	Response time	Maximum Resolution Time
10.6.1	Priority 1	The defect results in the failure of the complete Transformer Monitoring System, and/or of a sub-system, and/or of a software unit (program or module) within the system where impact on business is severe; there is an interruption of an important business process for one or several business units that cannot be remedied by a manual workaround.	Up to thirty (30) minutes	Four (04) Hours
10.6.2	Priority 2	The defect results in the failure of the complete Transformer Monitoring System, and/or of a sub-system, and/or of a software unit (program or module) within the system. There is no way to make the failed component(s) work completely. However, there are acceptable processing alternatives which will yield the desired result.	Within one (01) hour	Eight (08) Hours
10.6.3	Priority 3	The defect does not result in a failure, but causes the system to produce incorrect, incomplete, or inconsistent results, or the defect impairs the system usability. No significant effect on the business is expected and a manual workaround is available. A general improvement in the system is required.	Within four (04) hours	Twenty Four (24) Hours