

PQR REV-01**PQR FOR TVM+MODEM AS PER ANNEXURE-A PI NO. 240932368**

S. No	Description of requirement	Document to be attached
1	Bidder should have supplied same or similar type of TVM/(TVMs+MODEMs) in any one of the last five financial years to BHEL or any Central / State Govt Organization / Electricity distribution/transmission/generation utility	Purchase Order copy(s)/ Invoice(s)
3	Average annual turnover of FY2019-20, FY2020-21 and FY2021-22 should not less than Rs.75 Lakhs.	Single CA Certificate with UDIN No. for average annual turnover details for relevant period.

ANNEXURE-A TO PURCHASE INDENT 240932368 FOR RC		REV.NO.- 00
BHEL Bhopal SWE	Technical Specification of: Tri-vector meter & Modem	
	PI No.:240932368	Enq. No.:
W.O. Nos. : Rate Contract		PO No.:

It-01 - 3 phase, 4 wire Static HT Tri vector

Annexure-I

Three phase 4 wire Static Trivector Meter of reputed make of class 0.2S accuracy suitable to work on 110V/√3 AC, 50 Hz, 400-200-100/1A for balanced and as well as unbalanced loads at all power factors i.e., Zero-lag-Unity-Zero lead to suit to be installed on 11KV outdoor feeder panels and to suit the CT range mentioned above. The meter should be capable of performing function of metering in all 4 quadrants, load survey etc. The meter shall conform to latest version of IS: 14697/99 CBIP Technical report 88/IEC 687 for accuracy and environmental and other relevant standards.

The meter should be capable of measuring the following electric parameters of poly phase supplies in all 4 quadrants at all power factors lagging or leading.

1. KWH Import and export
2. KVRH Import and export (lag & lead)
3. KVAH Import and export
4. Voltage of individual phases.
5. Currents in each individual phase.
6. Average Power factor.
7. Maximum demand (15 Minutes Integration)
8. Cumulative demand with No. of resets.
9. Real time.
10. Power off and power fully on and power partially on periods.

The meter should be capable of recording the full supply period, partial supply period and no supply period and display the same in separate tables with date, time and duration.

The meter should log the following parameters with 15 min, integration for the last **36 days** in its memory and it should be possible to transfer this data on to a base computer station through a DOS based hand held CMRI.

Parameters for logging shall be in import and export modes

1. KWH
2. Currents in all the three phases
3. KVARH
4. Voltage in all phases.

ANNEXURE-A TO PURCHASE INDENT 240932368 FOR RC			REV.NO.- 00
BHEL Bhopal SWE	Technical Specification of: Tri-vector meter & Modem		Page 2 of 9
	PI No.:240932368	Enq. No.:	PO No.:
W.O. Nos. : Rate Contract			

The base computer shall give complete details of load survey particulars both in numeric data form and in graphic form. Necessary software for invoking the base computer station should be provided.

The meter shall be provided with a galvanically isolated optical communication port (such as IEC-1107, PACT, ANSI etc.,) with removable cover and with locking arrangement so that it can be easily connected to a CMRI for data transfer or transfer of data through remote metering device such as modem/ multiplexer etc. The optical communication port shall also have sealing provision.

The meter shall also be provided with a sealable RS 232 Port with DLMS open protocol in addition to optical port which can be used for AMR metering along with 9 pin D-type male connector so that it can be easily connected to a hand held meter reading instrument for data transfer or subsequently hooked to remote metering device such as modem etc. Necessary protocol software should be loaded into the CMRI and Base computer station of the Board for the purpose of reading and programming the specific make(s) of static meters and accepting data from hand held terminal/CMRI and processing, generating reports and downloading instructions from the base computer station to CMRI respectively.

The supplier is responsible for maintaining the security of the data extracted from the meters using manufacturer's specific algorithms in the software upto down loading it to the base computer station.

The meter shall have minimum legible 8-digit display of LCD. The display shall be digital type with nondestructive readout and shall be possible to display legend for identification of display. The meter shall have facility of auto display mode where all parameters automatically scroll within the specified time. The number of parameters and the scrolling period shall be field programmable. It shall also be possible to read the parameters by a manual switch.

The nonvolatile memory shall have a minimum retention time of 10 years.

NOTE: All protocols are to be handed over to purchaser in advance and the memory map of the meter shall be furnished before supply of meters.

ANNEXURE-A TO PURCHASE INDENT 240932368 FOR RC			REV.NO.- 00
BHEL Bhopal SWE	Technical Specification of: Tri-vector meter & Modem		Page 3 of 9
	PI No.:240932368	Enq. No.:	PO No.:
W.O. Nos. : Rate Contract			

GUARANTEED TECHNICAL PARTICULARS OF ITEM-01

Sl. No	Characteristics	REQUIREMENT	Vendor Compliance
1	Makers name and country	Vendor to mention	
2	Type of Meter/model	Static/As per Supplier make	
3	Accuracy class & CT, PT ratios	0.2s as per IS 14697/99/Meter PTR : 11KV/110V CTR : 400-200-100/1A	
4	Power consumption for phase		
	i) Voltage Circuit	1 Watts & 8 VA per phase	
	ii) Current circuit	Less than 1VA/Phase	
5	Minimum starting current (%Ib)	0.1% Ib per IS 14697/99	
6	Parameters measured	1. Lamp test	
		2. Date & Time	
		3. Active energy-kwh/Mwh import & Export	
		4. Active Energy lag-KVArh/MVArh import & Export	
		5. Active Energy lag-KVArh/MVArh import & Export	
		6. Apparent energy –Kvah/Mvah import & Export	
		7. Max. demand (00.00-24.00hrs) (KVA)	
		8. Max. demand (00:00 24 hrs) occurrence time	
		9. Inst. Avg. power factor	
		10. Aggregate Power factor	
		11. Rising demand with Elapsed time (KVA/MVA) import & Export	
		12. Cumulative MD resets	
		13. Cumulative MD (KVA/MVA) import/export	
		14. Inst. Phase Voltage – R,Y, B phase	
		15. Inst. Phase Current – R,Y, B phase	
		16. MD with 15 minutes integration.	
		17. Real time	
		18. LED test	
		19. Power off, Power fully On and Power partially On Periods	
7	No of digits of display and height of character	Vendor to mention	
8	P.F. range	0 Lag – UPF – 0 Lead	
9	Variation of voltage at which	-30% to + 20%	

ANNEXURE-A TO PURCHASE INDENT 240932368 FOR RC			REV.NO.- 00
BHEL Bhopal SWE	Technical Specification of: Tri-vector meter & Modem		Page 4 of 9
	PI No.:240932368	Enq. No.:	PO No.:
W.O. Nos. : Rate Contract			

	meter functions normally		
	Particulars of read out		
	a) Continuous display	As per Sl.No.6 of above.	
10	b) manually on display	1. Supply frequency	
		2. Present PT & CT status	
		3. Last occurrence tamper ID	
		4. Time and date of last occurrence	
		5. Time & date of last tamper restoration	
		6. Cumulative tamper occurrence counts	
	c) auto display parameters		
	i) Scrolling period	10 Sec.	
	ii) Display off period between two cycles	2 Sec	
	d) CMRI/RMR suitability	As per Annexure-I	
	Details of Meter base and cover		
11	a) Type of material	1. base : Poly Carbonate 2. Top : Polycarbonate Transparent	
	b) Dimensions and weight	Mounting and termination details to be furnished with offer	
12	Nonvolatile memory retention time in absence of power	10 Years	
13	Memory capacity	Suitable for 36 days data with 15 min integration	
14	Communication protocol	DLMS on RS 232 port in addition to optical port.	

It-02:- Modem for Automatic Meter Reading

Sl no	Specification requirement	Vendor's compliance
1	AMR Modem with integrated software to be provided. Modem shall be a plug and play device which automatically retrieves all the meter data and send to server.	
2	Offered modem shall provide automatic meter reading of various kinds of meters on RS232/RS485 or connecting through an external optical port cable.	
3	Offered modems shall have the facility to implement any of the open protocol such as MODBUS/DLMS/COSEM.	
4	Auxiliary Supply (if required) shall be 24V DC.	
5	Mounting and termination details to be furnished with offer.	
6	Offered modem should be working satisfactorily with the offered tri-vector meter at site.	

ANNEXURE-A TO PURCHASE INDENT 240932368 FOR RC		REV.NO.- 00
BHEL Bhopal SWE	Technical Specification of: Tri-vector meter & Modem	
	PI No.:240932368	Enq. No.:
W.O. Nos. : Rate Contract		PO No.:

It-03 - 3 phase, 4 wire Static HT Tri vector

Annexure-II

Three phase 4 wire Static Trivector Meter of reputed make of class 0.2S accuracy suitable to work on 110V/√3 AC, 50 Hz, 400-200/1A for balanced and as well as unbalanced loads at all power factors i.e., Zero-lag-Unity-Zero lead to suit to be installed on 11KV outdoor feeder panels and to suit the CT range mentioned above. The meter should be capable of performing function of metering in all 4 quadrants, load survey etc. The meter shall conform to latest version of IS: 14697/99 CBIP Technical report 88/IEC 687 for accuracy and environmental and other relevant standards.

The meter should be capable of measuring the following electric parameters of poly phase supplies in all 4 quadrants at all power factors lagging or leading.

1. KWH Import and export
2. KVRH Import and export (lag & lead)
3. KVAH Import and export
4. Voltage of individual phases.
5. Currents in each individual phase.
6. Average Power factor.
7. Maximum demand (15 Minutes Integration)
8. Cumulative demand with No. of resets.
9. Real time.
10. Power off and power fully on and power partially on periods.

The meter should be capable of recording the full supply period, partial supply period and no supply period and display the same in separate tables with date, time and duration.

The meter should log the following parameters with 15/30 min, integration for the last **90 days** in its memory and it should be possible to transfer this data on to a base computer station through a DOS based hand held CMRI. OEM having mobile app-based data transfer will be preferred if the same can be uploaded to the Meter Data Management System of the utility.

Parameters for logging shall be in import and export modes

1. KWH
2. Currents in all the three phases
3. KVARH

ANNEXURE-A TO PURCHASE INDENT 240932368 FOR RC			REV.NO.- 00
BHEL Bhopal SWE	Technical Specification of: Tri-vector meter & Modem		Page 6 of 9
	PI No.:240932368	Enq. No.:	PO No.:
W.O. Nos. : Rate Contract			

4. Voltage in all phases.

The base computer shall give complete details of load survey particulars both in numeric data form and in graphic form. Necessary software for invoking the base computer station should be provided.

The meter shall be provided with a galvanically isolated optical communication port (such as IEC-1107, PACT, ANSI etc.,) with removable cover and with locking arrangement so that it can be easily connected to a CMRI for data transfer or transfer of data through remote metering device such as modem/ multiflexer etc. The optical communication port shall also have sealing provision.

The meter shall also be provided with a sealable RS 232 Port with DLMS open protocol in addition to optical port which can be used for AMR metering along with 9 pin D-type male connector so that it can be easily connected to a hand held meter reading instrument for data transfer or subsequently hooked to remote metering device such as modem etc. Necessary protocol software should be loaded into the CMRI and Base computer station of the Board for the purpose of reading and programming the specific make(s) of static meters and accepting data from hand held terminal/CMRI and processing, generating reports and downloading instructions from the base computer station to CMRI respectively.

The supplier is responsible for maintaining the security of the data extracted from the meters using manufacturer's specific algorithms in the software upto down loading it to the base computer station.

The meter shall have minimum legible 8-digit display of LCD. The display shall be digital type with nondestructive readout and shall be possible to display legend for identification of display. The meter shall have facility of auto display mode where all parameters automatically scroll within the specified time. The number of parameters and the scrolling period shall be field programmable. It shall also be possible to read the parameters by a manual switch.

The nonvolatile memory shall have a minimum retention time of 10 years.

NOTE: All protocols are to be handed over to purchaser in advance and the memory map of the meter shall be furnished before supply of meters. The Software, if any required for change of integration period, lead/lag blocking in all quadrants etc., shall be provided by the successful bidder/OEM.

GUARANTEED TECHNICAL PARTICULARS OF ITEM-03

ANNEXURE-A TO PURCHASE INDENT 240932368 FOR RC			REV.NO.- 00
BHEL Bhopal SWE	Technical Specification of: Tri-vector meter & Modem		Page 7 of 9
	PI No.:240932368	Enq. No.:	PO No.:
W.O. Nos. : Rate Contract			

Sl. No	Characteristics	REQUIREMENT	Vendor Compliance
1	Makers name and country	Vendor to offer	
2	Type of Meter/model	Electronic/Digital/Static	
3	Accuracy class & CT, PT ratios	0.2s as per IS 14697/99/Meter PTR : 11KV/110V CTR : 400-200/1A	
4	Power consumption for phase		
	i) Voltage Circuit	1 Watts & 6 VA per phase or as per latest IS/IEC whichever is less	
	ii) Current circuit	Less than 1VA/Phase	
5	Minimum starting current (%Ib)	0.1% Ib per IS 14697/99	
6	Parameters measured	1. Lamp test	
		2. Date & Time	
		3. Active energy-kwh/Mwh import & Export	
		4. Reactive Energy lag-KVARh/MVARh import & Export	
		5. Reactive Energy lead-KVARh/MVARh import & Export	
		6. Apparent energy –Kvah/Mvah import & Export	
		7. Max. demand (00.00-24.00hrs) (KVA)	
		8. Max. demand (00:00 24 hrs) occurrence time	
		9. Inst. Avg. power factor	
		10. Aggregate Power factor	
		11. Rising demand with Elapsed time (KVA/MVA) import & Export	
		12. Cumulative MD resets	
		13. Cumulative MD (KVA/MVA) import/export	
		14. Inst. Phase Voltage – R,Y, B phase	
		15. Inst. Phase Current – R,Y, B phase	
		16. MD with 15/30 minutes integration.	
		17. Real time	
		18. LED test	
		19. Power off, Power fully On and Power partially On Periods	
7	No of digits of display and height of character	Vendor to mention	
8	P.F. range	0 Lag – UPF – 0 Lead	
9	Variation of voltage at which	-30% to + 20%	

ANNEXURE-A TO PURCHASE INDENT 240932368 FOR RC			REV.NO.- 00
BHEL Bhopal SWE	Technical Specification of: Tri-vector meter & Modem		Page 8 of 9
	PI No.:240932368	Enq. No.:	PO No.:
W.O. Nos. : Rate Contract			

	meter functions normally		
	Particulars of read out		
	a) Continuous display	As per Sl.No.6 of above.	
10	b) manually on display	1. Supply frequency	
		2. Present PT & CT status	
		3. Last occurrence tamper ID	
		4. Time and date of last occurrence	
		5. Time & date of last tamper restoration	
		6. Cumulative tamper occurrence counts	
	c) auto display parameters		
	i) Scrolling period	10 Sec.	
	ii) Display off period between two cycles	2 Sec	
	d) CMRI/RMR suitability	As per Annexure-II	
	Details of Meter base and cover		
11	a) Type of material	1. base : Poly Carbonate 2. Top : Polycarbonate Transparent	
	b) Dimensions and weight	Mounting and termination details to be furnished with offer	
12	Nonvolatile memory retention time in absence of power	10 Years	
13	Memory capacity	Suitable for 90 days data with 30 min integration	
14	Communication protocol	DLMS on RS 232 port in addition to optical port.	

S.NO	NOTE	Vendor to give compliance in Yes/No
001	2 copies of panel cutout, terminal diagram are to be furnished along-with offer.	
002	1 copy of type test reports along with order acceptance (less than 5 years old).	
003	2 copies of routine test certificates are to be furnished at the time of delivery.	
004	The supplier shall guarantee the satisfactory performance of the Trivector meter and modem for a period of 66 months from the date of receipt at BHEL Bhopal or 60 months from the date of commissioning, whichever is earlier.	
005	Item 01 and 02 as per annexure should be procured from same source for communication compatibility.	

ACCEPTANCE CRITERIA:

ANNEXURE-A TO PURCHASE INDENT 240932368 FOR RC			REV.NO.- 00
BHEL Bhopal SWE	Technical Specification of: Tri-vector meter & Modem		Page 9 of 9
	PI No.:240932368	Enq. No.:	PO No.:
W.O. Nos. : Rate Contract			

1. Visual checks for cracks and surface finish.
2. Rating plate as per specification parameters.
3. Availability of all routine test certificates.