SPECIFICATION FOR 50 KVA AUTOMATIC VOLTAGE REGULATOR
SECTION I (GENERAL)

1	**GENERAL :**
	The unit shall be self-contained, compact, efficient and highly reliable for 100% duty cycle at full load, working round the clock, 365 days a year based on field proven design using modern technology. All materials used in the construction shall be of high quality and as per relevant Indian Standard Specifications. The manufacturer should have ISO 9001/ISO 14001 certificates.
1.1	**SCOPE :**
	Supply of indoor , servo controlled automatic voltage regulator of 415 Volts,3 Phase, 50 Hz, 50 KVA capacity conforming to the technical specifications in Section II
1.2	**SALIENT FEATURES OF AVR :**
1.2.1	Modular construction of control circuitry for easy replaceability.
1.2.2	Control voltage device designed using solid state electronic circuits.
1.2.3	High speed step less correction of output voltage using A.C synchronous motors, without hunting or overshooting.
1.2.4	Independent controls for each of three phases to avoid unbalance in output load voltage in any phase affecting the output of AVR.
1.2.5	Built in overloads and short circuit protection.
1.2.6	Should not introduce waveform distortion.
1.2.7	Front & Rear access for installation and servicing.
1.2.8	Compact in size
1.2.9	Full complement of meters, controls, alarms and indicators.
1.2.10	All moving contacts designed to give long and trouble-free service life.
1.2.11	Rugged construction and field proven design requiring minimum maintenance.
1.3	**GENERAL CONDITIONS:**
1.3.1	The 50 KVA AVR offered shall generally conform to the technical specifications in Section II against each clause.
1.3.2	The AVR shall be designed for efficient and trouble-free service for continuous day & night operation. All materials used in the construction shall be of high quality and conform to the IS specifications No 9815- 1981 amended up to date.
1.3.3	The unit shall be designed for easy maintenance and complete safety to operating personnel.
1.3.4	The tenderer should undertake to make available spares and replacement parts as and when required for the period of ten years.
1.4	**COMPLETENESS OF CONTRACT :**
	All fittings and accessories which may not have been specifically mentioned or which the tenderer may not explicitly mention in his tender but are necessary for the operation of the AVR shall be deemed to be included in the contract and be provided by the contractor without any extra charge.
1.5	**DOCUMENTS TO BE SUBMITTED WITH TENDER :**
	The tenderer shall submit the following documents with the tender
1.5.1	The tenderer should clearly mention Make and Model of the equipment being offered. The technical pamphlets, Front view, Back view, Side view giving layout of components should be enclosed with tender.

1.5.2	A schedule of technical particulars shall be furnished by the manufacturer in the Performa as shown in Section II
1.5.3	The tenderer should have experience in having supplied same capacity or higher to other institutions. Satisfactory completion certificate from the clients should be enclosed with the tender.
1.5.4	Copy of ISO certification
1.6	**DOCUMENTS TO BE SUBMITTED AFTER ACCEPTANCE OF TENDER**
	Following documents has to be supplied to the consignee along with AVR at the time of delivery.
1.6.1	Two copies of the book of instructions for the installation, operation, testing, commissioning and maintenance of AVR.
1.6.2	Factory test certificates showing the results of the following tests actually conducted on the AVR.
	a) Insulation Resistance Test
	b) No Load Current
	c) No Load Losses Measurement
	d) Output Voltage
	e) Test for continuous operation
	f) High Voltage Test
	g) Induced Voltage Test
	h) Load loss and efficiency measurement
	i) Temperature rise Test
	j) Test for rate of correction
	k) Locked rotor test for servo motor
	l) Leakage current test
1.7	**DELIVERY:**
	Delivery of the AVR ordered shall be completed within **two months at AIR site.** This period shall be effective from the date of acceptance of the tender and shall be independent of any other factors.
1.8	**PACKING:**
	The packing shall be suitable to withstand transportation hazards. A copy packing slip giving the list of items included in the package together with the package number shall be mailed in advance to the consignee.
1.9	**GUARANTEE:**
	The AVR shall be guaranteed in all respects for satisfactory operation under load conditions for **30 Months from the date of supply or 24 Months from commissioning whichever is earlier.**
1.10	**INSPECTION :**
	The successful tenderer will have to get the AVR inspected by Inspectors authorized by AIR and also undertake to arrange to conduct the following tests on the AVR in his workshop/factory before dispatch.
1.11.1	**TEST FOR CONTINUOUS OPERATION**
	The AVR shall be subjected to a continuous run for 24 hours on load. while the input voltage is varied from minimum to maximum of the input voltage and back to minimum.
1.11.2	**OUTPUT VOLTAGE TEST:**
	A voltmeter of accuracy better than 0.5, shall be connected across the output terminals, for this test. The output voltage shall be recorded for different input voltages both at full load & at no load covering specified input range. Not less than 5V reading at approximately equal interval shall be taken at AVR input/output points excluding the mains lead. The voltage shall not suffer by more than 1% of the rated output voltage.

1.11.3	**TEST OF RATE OF CORRECTION:**		
	The sensing & control arrangement shall be disconnected and the AVR shall be set for manual operation. The output voltage shall be decreased to the minimum. The servo motor shall be energized & the time required to raise the output voltage to the set value shall be measured & recorded. The rate of correction shall be calculated from rated range of input voltage divided by the time so measured. The test shall be repeated as above for lowering it to the minimum.		
1.11.4	**LOCKED ROTOR TEST FOR SERVO MOTOR:**		
	It is necessary to ensure that the servo motor is capable of withstanding the application of full rated voltage under locked rotor condition, before protective device acts to save the motor from damage due to excessive temperature raise.		
	SECTION II		
	TECHNICAL AND OTHER PARTICULARS TO BE SUPPLIED BY THE TENDERERS AGAINST AIR REQUIREMENTS AS GIVEN BELOW		
	The AVR shall generally conform to all provisions of IS 9815-1981 amended up to date.		
S.NO	ITEM	AIR SPECIFICATIONS	TENDERER'S OFFER WITH EXCACT VALUE WHEREEVER REQUIRED
1.0	Capacity of AVR	50 KVA (continuous)	
1.1	Input Voltage	300 V to 460 V Three Phase, 50 Hz, 4 wire	
1.2	Output Voltage	415 V +/- 1% adjustable 5% for 3 phase	
1.3	Voltage regulation	plus/minus 1 % from no load to full load	
1.4	Frequency	47- 60 Hz	
1.5	Duty Cycle	Continuous	
1.6	Distortion	AVR should not introduce any output distortion (to be shown on dual trace CRO)	
1.7	AVR Type	Indoor, free floor standing, servo controlled or any other state of art technology (sensing and control details to be indicated) with individual phase sensing and control for regulating unbalance incoming voltage and suitable for unbalanced loads. The unbalance in load can be of the order of 50% of rated load. The output voltage stability with this unbalance (up to 50%) should be within +/- 5% of the Nominal voltage.	
1.8	No load current	Shall not exceed 5% of the rated output current.	
1.9	Overloading	Up to 20 % more rated current for 30 minutes	
1.10	Speed of correction	> 25 V / sec	
1.11	Efficiency	Better than 95 %	
1.12	Transformer Winding	Electrolytic prime grade copper of 99.9 % certificate to be provided during inspection	

1.13	Lamination of Transformer & Dimmer stat	M4 Grade - CRGO 0.27 mm thickness Watt loss/Kg 1.2W	
1.14	Insulation level	The power components of the AVR shall be capable of withstanding high voltage of 2.5 KV at the rated frequency for 1 minute applied between line parts and body.	
1.15	Insulation Class	As per IS amended up to date	
1.16	Mode of operation	Automatic and Manual mode selection	
1.17	Type of cooling	Air cooled	
1.18	Output protection with Audio Visual Alarms	Short circuit, single phase preventer, over current/over load protection with earth fault protection, high cut and low cut feature so that the unit gives minimum output in case of output feedback failure. Over load and short circuit protection should be through MCCB of suitable rating of reputed make. The unit should have auto restoration feature after time delay in case of tripping due to over voltage. Both audio and visual alarms to be provided.	
1.19	Operating Temperature	AVR shall work satisfactorily under ambient temperature of 0 - 50 deg and relative humidity of 95%	
1.20	Front panel Controls	Auto/Manual selection Switch, Voltage Buck-Boost Switch, Voltmeter input/output phase wise selector switch, Ammeter phase to phase & phase to neutral wise selector switch. The switches are of reputed make.	
1.21	Front panel displays	True RMS Voltmeter & Ammeter preferably digital, indicating lamps on each phase, over-load indicator, high cut-low cut indicator, phase reversal/failure indicator. The indicators should be of LED type.	
1.22	Rear panel terminals	Separate heavy duty terminal blocks for input and output connections.	
1.23	Time - Delay switching	An adjustable time delay device shall be provided so that the output is connected to load about 10 to 20 sec (adjustable) after the input is / switched on/restored after Power Supply failure or momentary interruption during which period the AVR output voltage will stabilize to the desired preset value.	
1.24	No Load Losses at 415 V & 50 Hz	1 % of the rated KVA	

1.25	Max loss at full load current	3% of rated KVA	
1.26	Designation Lables	Suitable designation labels for all control & indicating lamps etc shall be engraved on the panel and shall be distinctly visible.	
1.27	MECHANICAL CONSTRUCTION		
1.27.1	Enclosure	The body of AVR shall be made of MS sheet of minimum 16 SWG thickness capable to with stand transit hazards and to provide mechanical protection to the sensitive parts.	
1.27.2	Outer Finish	First quality paint after the initial primer coat shall be used to prevent rusting, corrosion etc.	
1.27.3	Facility for movement	The AVR has to be provided with sturdy wheels for ease of movement	
1.27.4	Life of roller carbon brush	Minimum 5 years. Roller carbon with minimum wear & tear. Angular Pressure roller carbon brush assembly which should protect the winding from vertical pressure deformation.	
1.28	Accessories	All the accessories like earthing terminals, lifting hook, terminal marking plate, diagram plate, rating plate etc are to be provided.	
1.29	Special Requirements	a) The AVR has to work in a strong VHF RF field laid by Broadcast Transmitter system. Therefore, it is necessary to provide fool-proof earthing for the control electronics including RF bypass arrangement for servo motor and other sensitive circuits of the AVR.	
		b) The AVR shall be free from hunting in auto mode operation on account line & switching surges as well as instantaneous variation in current due to broadcast transmitter.	

List of Consignee:

1. All India Radio , Bengaluru , Karnataka - 3No.s
2. All India Radio, Dharwad , Karnataka - 1No.
3. All India Radio , Mysuru , Karnataka - 1No.
4. All India Radio, Mangalore , Tamilnadu - 1No
5. All India Radio, Tiruchirapalli, Tamilnadu - 1No.
6. All India Radio, Dharmapuri, Tamilnadu - 1No
7. All India Radio, Kozikode, Kerala - 1No.

Total Requirement of 50 KVA - 9No.s

SPECIFICATION FOR 40 KVA AUTOMATIC VOLTAGE REGULATOR
SECTION I (GENERAL)

1	**GENERAL :**
	The unit shall be self-contained, compact, efficient and highly reliable for 100% duty cycle at full load, working round the clock, 365 days a year based on field proven design using modern technology. All materials used in the construction shall be of high quality and as per relevant Indian Standard Specifications. The manufacturer should have ISO 9001/ISO 14001 certificates.
1.1	**SCOPE :**
	Supply of indoor , servo controlled automatic voltage regulator of 415 Volts,3 Phase, 50 Hz, 40 KVA capacity conforming to the technical specifications in Section II
1.2	**SALIENT FEATURES OF AVR :**
1.2.1	Modular construction of control circuitry for easy replaceability.
1.2.2	Control voltage device designed using solid state electronic circuits.
1.2.3	High speed step less correction of output voltage using A.C synchronous motors, without hunting or overshooting.
1.2.4	Independent controls for each of three phases to avoid unbalance in output load voltage in any phase affecting the output of AVR.
1.2.5	Built in overloads and short circuit protection.
1.2.6	Should not introduce waveform distortion.
1.2.7	Front & Rear access for installation and servicing.
1.2.8	Compact in size
1.2.9	Full complement of meters, controls, alarms and indicators.
1.2.10	All moving contacts designed to give long and trouble-free service life.
1.2.11	Rugged construction and field proven design requiring minimum maintenance.
1.3	**GENERAL CONDITIONS:**
1.3.1	The 40 KVA AVR offered shall generally conform to the technical specifications in Section II against each clause.
1.3.2	The AVR shall be designed for efficient and trouble-free service for continuous day & night operation. All materials used in the construction shall be of high quality and conform to the IS specifications No 9815- 1981 amended up to date.
1.3.3	The unit shall be designed for easy maintenance and complete safety to operating personnel.
1.3.4	The tenderer should undertake to make available spares and replacement parts as and when required for the period of ten years.
1.4	**COMPLETENESS OF CONTRACT :**
	All fittings and accessories which may not have been specifically mentioned or which the tenderer may not explicitly mention in his tender but are necessary for the operation of the AVR shall be deemed to be included in the contract and be provided by the contractor without any extra charge.
1.5	**DOCUMENTS TO BE SUBMITTED WITH TENDER :**
	The tenderer shall submit the following documents with the tender
1.5.1	The tenderer should clearly mention Make and Model of the equipment being offered. The technical pamphlets, Front view, Back view, Side view giving layout of components should be enclosed with tender.

1.5.2	A schedule of technical particulars shall be furnished by the manufacturer in the Performa as shown in Section II
1.5.3	The tenderer should have experience in having supplied same capacity or higher to other institutions. Satisfactory completion certificate from the clients should be enclosed with the tender.
1.5.4	Copy of ISO certification
1.6	**DOCUMENTS TO BE SUBMITTED AFTER ACCEPTANCE OF TENDER**
	Following documents has to be supplied to the consignee along with AVR at the time of delivery.
1.6.1	Two copies of the book of instructions for the installation, operation, testing, commissioning and maintenance of AVR.
1.6.2	Factory test certificates showing the results of the following tests actually conducted on the AVR.
	a) Insulation Resistance Test
	b) No Load Current
	c) No Load Losses Measurement
	d) Output Voltage
	e) Test for continuous operation
	f) High Voltage Test
	g) Induced Voltage Test
	h) Load loss and efficiency measurement
	i) Temperature rise Test
	j) Test for rate of correction
	k) Locked rotor test for servo motor
	l) Leakage current test
1.7	**DELIVERY:**
	Delivery of the AVR ordered shall be completed within **two months at AIR site.** This period shall be effective from the date of acceptance of the tender and shall be independent of any other factors.
1.8	**PACKING:**
	The packing shall be suitable to withstand transportation hazards. A copy packing slip giving the list of items included in the package together with the package number shall be mailed in advance to the consignee.
1.9	**GUARANTEE:**
	The AVR shall be guaranteed in all respects for satisfactory operation under load conditions for **30 Months from the date of supply or 24 Months from commissioning whichever is earlier.**
1.10	**INSPECTION :**
	The successful tenderer will have to get the AVR inspected by Inspectors authorized by AIR and also undertake to arrange to conduct the following tests on the AVR in his workshop/factory before dispatch.
1.11.1	**TEST FOR CONTINUOUS OPERATION**
	The AVR shall be subjected to a continuous run for 24 hours on load. while the input voltage is varied from minimum to maximum of the input voltage and back to minimum.
1.11.2	**OUTPUT VOLTAGE TEST:**
	A voltmeter of accuracy better than 0.5, shall be connected across the output terminals, for this test. The output voltage shall be recorded for different input voltages both at full load & at no load covering specified input range. Not less than 5V reading at approximately equal interval shall be taken at AVR input/output points excluding the mains lead. The voltage shall not suffer by more than 1% of the rated output voltage.

1.11.3	**TEST OF RATE OF CORRECTION:**		
	The sensing & control arrangement shall be disconnected and the AVR shall be set for manual operation. The output voltage shall be decreased to the minimum. The servo motor shall be energized & the time required to raise the output voltage to the set value shall be measured & recorded. The rate of correction shall be calculated from rated range of input voltage divided by the time so measured. The test shall be repeated as above for lowering it to the minimum.		
1.11.4	**LOCKED ROTOR TEST FOR SERVO MOTOR:**		
	It is necessary to ensure that the servo motor is capable of withstanding the application of full rated voltage under locked rotor condition, before protective device acts to save the motor from damage due to excessive temperature raise.		
	SECTION II		
	TECHNICAL AND OTHER PARTICULARS TO BE SUPPLIED BY THE TENDERERS AGAINST AIR REQUIREMENTS AS GIVEN BELOW		
	The AVR shall generally conform to all provisions of IS 9815-1981 amended up to date.		
S.NO	ITEM	AIR SPECIFICATIONS	TENDERER'S OFFER WITH EXCACT VALUE WHEREEVER REQUIRED
1.0	Capacity of AVR	40 KVA (continuous)	
1.1	Input Voltage	300 V to 460 V Three Phase, 50 Hz, 4 wire	
1.2	Output Voltage	415 V +/- 1% adjustable 5% for 3 phase	
1.3	Voltage regulation	plus/minus 1 % from no load to full load	
1.4	Frequency	47- 60 Hz	
1.5	Duty Cycle	Continuous	
1.6	Distortion	AVR should not introduce any output distortion (to be shown on dual trace CRO)	
1.7	AVR Type	Indoor, free floor standing, servo controlled or any other state of art technology (sensing and control details to be indicated) with individual phase sensing and control for regulating unbalance incoming voltage and suitable for unbalanced loads. The unbalance in load can be of the order of 50% of rated load. The output voltage stability with this unbalance (up to 50%) should be within +/- 5% of the Nominal voltage.	
1.8	No load current	Shall not exceed 5% of the rated output current.	
1.9	Overloading	Up to 20 % more rated current for 30 minutes	
1.10	Speed of correction	> 25 V / sec	
1.11	Efficiency	Better than 95 %	
1.12	Transformer Winding	Electrolytic prime grade copper of 99.9 % certificate to be provided during inspection	

1.13	Lamination of Transformer & Dimmer stat	M4 Grade - CRGO 0.27 mm thickness Watt loss/Kg 1.2W	
1.14	Insulation level	The power components of the AVR shall be capable of withstanding high voltage of 2.5 KV at the rated frequency for 1 minute applied between line parts and body.	
1.15	Insulation Class	As per IS amended up to date	
1.16	Mode of operation	Automatic and Manual mode selection	
1.17	Type of cooling	Air cooled	
1.18	Output protection with Audio Visual Alarms	Short circuit, single phase preventer, over current/over load protection with earth fault protection, high cut and low cut feature so that the unit gives minimum output in case of output feedback failure. Over load and short circuit protection should be through MCCB of suitable rating of reputed make. The unit should have auto restoration feature after time delay in case of tripping due to over voltage. Both audio and visual alarms to be provided.	
1.19	Operating Temperature	AVR shall work satisfactorily under ambient temperature of 0 - 50 deg and relative humidity of 95%	
1.20	Front panel Controls	Auto/Manual selection Switch, Voltage Buck-Boost Switch, Voltmeter input/output phase wise selector switch, Ammeter phase to phase & phase to neutral wise selector switch. The switches are of reputed make.	
1.21	Front panel displays	True RMS Voltmeter & Ammeter preferably digital, indicating lamps on each phase, over-load indicator, high cut-low cut indicator, phase reversal/failure indicator. The indicators should be of LED type.	
1.22	Rear panel terminals	Separate heavy duty terminal blocks for input and output connections.	
1.23	Time - Delay switching	An adjustable time delay device shall be provided so that the output is connected to load about 10 to 20 sec (adjustable) after the input is / switched on/restored after Power Supply failure or momentary interruption during which period the AVR output voltage will stabilize to the desired preset value.	
1.24	No Load Losses at 415 V & 50 Hz	1 % of the rated KVA	

1.25	Max loss at full load current	3% of rated KVA	
1.26	Designation Lables	Suitable designation labels for all control & indicating lamps etc shall be engraved on the panel and shall be distinctly visible.	
1.27	MECHANICAL CONSTRUCTION		
1.27.1	Enclosure	The body of AVR shall be made of MS sheet of minimum 16 SWG thickness capable to with stand transit hazards and to provide mechanical protection to the sensitive parts.	
1.27.2	Outer Finish	First quality paint after the initial primer coat shall be used to prevent rusting, corrosion etc.	
1.27.3	Facility for movement	The AVR has to be provided with sturdy wheels for ease of movement	
1.27.4	Life of roller carbon brush	Minimum 5 years. Roller carbon with minimum wear & tear. Angular Pressure roller carbon brush assembly which should protect the winding from vertical pressure deformation.	
1.28	Accessories	All the accessories like earthing terminals, lifting hook, terminal marking plate, diagram plate, rating plate etc are to be provided.	
1.29	Special Requirements	a) The AVR has to work in a strong VHF RF field laid by Broadcast Transmitter system. Therefore, it is necessary to provide fool-proof earthing for the control electronics including RF bypass arrangement for servo motor and other sensitive circuits of the AVR.	
		b) The AVR shall be free from hunting in auto mode operation on account line & switching surges as well as instantaneous variation in current due to broadcast transmitter.	

List of Consignee:

1. All India Radio, Macherla, (A.P) - 1No.
2. All India Radio, Majeeri, Kerala - 1No.

Total Requirement of 40 KVA - 2Nos.

SPECIFICATION FOR 80 KVA AUTOMATIC VOLTAGE REGULATOR
SECTION I (GENERAL)

1	**GENERAL :**
	The unit shall be self-contained, compact, efficient and highly reliable for 100% duty cycle at full load, working round the clock, 365 days a year based on field proven design using modern technology. All materials used in the construction shall be of high quality and as per relevant Indian Standard Specifications. The manufacturer should have ISO 9001/ISO 14001 certificates.
1.1	**SCOPE :**
	Supply of indoor , servo controlled automatic voltage regulator of 415 Volts,3 Phase, 50 Hz, 80 KVA capacity conforming to the technical specifications in Section II
1.2	**SALIENT FEATURES OF AVR :**
1.2.1	Modular construction of control circuitry for easy replaceability.
1.2.2	Control voltage device designed using solid state electronic circuits.
1.2.3	High speed step less correction of output voltage using A.C synchronous motors, without hunting or overshooting.
1.2.4	Independent controls for each of three phases to avoid unbalance in output load voltage in any phase affecting the output of AVR.
1.2.5	Built in overloads and short circuit protection.
1.2.6	Should not introduce waveform distortion.
1.2.7	Front & Rear access for installation and servicing.
1.2.8	Compact in size
1.2.9	Full complement of meters, controls, alarms and indicators.
1.2.10	All moving contacts designed to give long and trouble-free service life.
1.2.11	Rugged construction and field proven design requiring minimum maintenance.
1.3	**GENERAL CONDITIONS:**
1.3.1	The 80 KVA AVR offered shall generally conform to the technical specifications in Section II against each clause.
1.3.2	The AVR shall be designed for efficient and trouble-free service for continuous day & night operation. All materials used in the construction shall be of high quality and conform to the IS specifications No 9815- 1981 amended up to date.
1.3.3	The unit shall be designed for easy maintenance and complete safety to operating personnel.
1.3.4	The tenderer should undertake to make available spares and replacement parts as and when required for the period of ten years.
1.4	**COMPLETENESS OF CONTRACT :**
	All fittings and accessories which may not have been specifically mentioned or which the tenderer may not explicitly mention in his tender but are necessary for the operation of the AVR shall be deemed to be included in the contract and be provided by the contractor without any extra charge.
1.5	**DOCUMENTS TO BE SUBMITTED WITH TENDER :**
	The tenderer shall submit the following documents with the tender
1.5.1	The tenderer should clearly mention Make and Model of the equipment being offered. The technical pamphlets, Front view, Back view, Side view giving layout of components should be enclosed with tender.

1.5.2	A schedule of technical particulars shall be furnished by the manufacturer in the Performa as shown in Section II
1.5.3	The tenderer should have experience in having supplied same capacity or higher to other institutions. Satisfactory completion certificate from the clients should be enclosed with the tender.
1.5.4	Copy of ISO certification
1.6	**DOCUMENTS TO BE SUBMITTED AFTER ACCEPTANCE OF TENDER**
	Following documents has to be supplied to the consignee along with AVR at the time of delivery.
1.6.1	Two copies of the book of instructions for the installation, operation, testing, commissioning and maintenance of AVR.
1.6.2	Factory test certificates showing the results of the following tests actually conducted on the AVR.
	a) Insulation Resistance Test
	b) No Load Current
	c) No Load Losses Measurement
	d) Output Voltage
	e) Test for continuous operation
	f) High Voltage Test
	g) Induced Voltage Test
	h) Load loss and efficiency measurement
	i) Temperature rise Test
	j) Test for rate of correction
	k) Locked rotor test for servo motor
	l) Leakage current test
1.7	**DELIVERY:**
	Delivery of the AVR ordered shall be completed within **two months at AIR site.** This period shall be effective from the date of acceptance of the tender and shall be independent of any other factors.
1.8	**PACKING:**
	The packing shall be suitable to withstand transportation hazards. A copy packing slip giving the list of items included in the package together with the package number shall be mailed in advance to the consignee.
1.9	**GUARANTEE:**
	The AVR shall be guaranteed in all respects for satisfactory operation under load conditions for **30 Months from the date of supply or 24 Months from commissioning whichever is earlier.**
1.10	**INSPECTION :**
	The successful tenderer will have to get the AVR inspected by Inspectors authorized by AIR and also undertake to arrange to conduct the following tests on the AVR in his workshop/factory before dispatch.
1.11.1	**TEST FOR CONTINUOUS OPERATION**
	The AVR shall be subjected to a continuous run for 24 hours on load. while the input voltage is varied from minimum to maximum of the input voltage and back to minimum.
1.11.2	**OUTPUT VOLTAGE TEST:**
	A voltmeter of accuracy better than 0.5, shall be connected across the output terminals, for this test. The output voltage shall be recorded for different input voltages both at full load & at no load covering specified input range. Not less than 5V reading at approximately equal interval shall be taken at AVR input/output points excluding the mains lead. The voltage shall not suffer by more than 1% of the rated output voltage.

1.11.3	**TEST OF RATE OF CORRECTION:**		
	The sensing & control arrangement shall be disconnected and the AVR shall be set for manual operation. The output voltage shall be decreased to the minimum. The servo motor shall be energized & the time required to raise the output voltage to the set value shall be measured & recorded. The rate of correction shall be calculated from rated range of input voltage divided by the time so measured. The test shall be repeated as above for lowering it to the minimum.		
1.11.4	**LOCKED ROTOR TEST FOR SERVO MOTOR:**		
	It is necessary to ensure that the servo motor is capable of withstanding the application of full rated voltage under locked rotor condition, before protective device acts to save the motor from damage due to excessive temperature raise.		
	SECTION II		
	TECHNICAL AND OTHER PARTICULARS TO BE SUPPLIED BY THE TENDERERS AGAINST AIR REQUIREMENTS AS GIVEN BELOW		
	The AVR shall generally conform to all provisions of IS 9815-1981 amended up to date.		
S.NO	ITEM	AIR SPECIFICATIONS	TENDERER'S OFFER WITH EXCACT VALUE WHEREEVER REQUIRED
1.0	Capacity of AVR	80 KVA (continuous)	
1.1	Input Voltage	300 V to 460 V Three Phase, 50 Hz, 4 wire	
1.2	Output Voltage	415 V +/- 1% adjustable 5% for 3 phase	
1.3	Voltage regulation	plus/minus 1 % from no load to full load	
1.4	Frequency	47- 60 Hz	
1.5	Duty Cycle	Continuous	
1.6	Distortion	AVR should not introduce any output distortion (to be shown on dual trace CRO)	
1.7	AVR Type	Indoor, free floor standing, servo controlled or any other state of art technology (sensing and control details to be indicated) with individual phase sensing and control for regulating unbalance incoming voltage and suitable for unbalanced loads. The unbalance in load can be of the order of 50% of rated load. The output voltage stability with this unbalance (up to 50%) should be within +/- 5% of the Nominal voltage.	
1.8	No load current	Shall not exceed 5% of the rated output current.	
1.9	Overloading	Up to 20 % more rated current for 30 minutes	
1.10	Speed of correction	> 25 V / sec	
1.11	Efficiency	Better than 95 %	
1.12	Transformer Winding	Electrolytic prime grade copper of 99.9 % certificate to be provided during inspection	

1.13	Lamination of Transformer & Dimmer stat	M4 Grade - CRGO 0.27 mm thickness Watt loss/Kg 1.2W	
1.14	Insulation level	The power components of the AVR shall be capable of withstanding high voltage of 2.5 KV at the rated frequency for 1 minute applied between line parts and body.	
1.15	Insulation Class	As per IS amended up to date	
1.16	Mode of operation	Automatic and Manual mode selection	
1.17	Type of cooling	Air cooled	
1.18	Output protection with Audio Visual Alarms	Short circuit, single phase preventer, over current/over load protection with earth fault protection, high cut and low cut feature so that the unit gives minimum output in case of output feedback failure. Over load and short circuit protection should be through MCCB of suitable rating of reputed make. The unit should have auto restoration feature after time delay in case of tripping due to over voltage. Both audio and visual alarms to be provided.	
1.19	Operating Temperature	AVR shall work satisfactorily under ambient temperature of 0 - 50 deg and relative humidity of 95%	
1.20	Front panel Controls	Auto/Manual selection Switch, Voltage Buck-Boost Switch, Voltmeter input/output phase wise selector switch, Ammeter phase to phase & phase to neutral wise selector switch. The switches are of reputed make.	
1.21	Front panel displays	True RMS Voltmeter & Ammeter preferably digital, indicating lamps on each phase, over-load indicator, high cut-low cut indicator, phase reversal/failure indicator. The indicators should be of LED type.	
1.22	Rear panel terminals	Separate heavy duty terminal blocks for input and output connections.	
1.23	Time - Delay switching	An adjustable time delay device shall be provided so that the output is connected to load about 10 to 20 sec (adjustable) after the input is / switched on/restored after Power Supply failure or momentary interruption during which period the AVR output voltage will stabilize to the desired preset value.	
1.24	No Load Losses at 415 V & 50 Hz	1 % of the rated KVA	

1.25	Max loss at full load current	3% of rated KVA	
1.26	Designation Lables	Suitable designation labels for all control & indicating lamps etc shall be engraved on the panel and shall be distinctly visible.	
1.27	MECHANICAL CONSTRUCTION		
1.27.1	Enclosure	The body of AVR shall be made of MS sheet of minimum 16 SWG thickness capable to with stand transit hazards and to provide mechanical protection to the sensitive parts.	
1.27.2	Outer Finish	First quality paint after the initial primer coat shall be used to prevent rusting, corrosion etc.	
1.27.3	Facility for movement	The AVR has to be provided with sturdy wheels for ease of movement	
1.27.4	Life of roller carbon brush	Minimum 5 years. Roller carbon with minimum wear & tear. Angular Pressure roller carbon brush assembly which should protect the winding from vertical pressure deformation.	
1.28	Accessories	All the accessories like earthing terminals, lifting hook, terminal marking plate, diagram plate, rating plate etc are to be provided.	
1.29	Special Requirements	a) The AVR has to work in a strong VHF RF field laid by Broadcast Transmitter system. Therefore, it is necessary to provide fool-proof earthing for the control electronics including RF bypass arrangement for servo motor and other sensitive circuits of the AVR.	
		b) The AVR shall be free from hunting in auto mode operation on account line & switching surges as well as instantaneous variation in current due to broadcast transmitter.	

List of Consignee:

1. All India Radio , Chennai , (TN) - 2No.