Market Outreach Session

Supply and Installation of Mobile Weather Surveillance Radars with Power Backup System

Procurement Category	Procurement Process	Procurement Method and Document Type	Market Approach	Award Criteria
Goods	Single Stage - Two Envelope	Request for Bids	Open | International	Rated (40% + 60%) Most Advantageous Bid*

The Most Advantageous Bid is the Bid of the Bidder that meets the Qualification Criteria and whose Bid has been determined to be substantially responsive to the Bidding document and is the Bid with the highest combined technical and financial score.

Dated: Tuesday March 25, 2025

Section II – Bid Data Sheet (BDS)

	A. General
No. and Details of Lots	The number and identification of lots (contracts) comprising this RFB is: ***One/ Single Lot (3 No. Mobile Radars)***
	C. Preparation of Bids
Language	The language of the Bid is: ***English*** All correspondence exchange shall be in ***English*** language. Language for translation of supporting documents and printed literature is ***English.***
Price Adjustment	The prices quoted by the Bidder ***shall not*** be subject to adjustment during the performance of the Contract.
Bid Prices	Prices quoted for each lot (contract) shall correspond to at least 100 percent of the items specified for each lot (contract). Prices quoted for each item of a lot shall correspond at least to 100 percent of the quantities specified for this item of a lot.
Functioning Period of Goods	Period of time the Goods are expected to be functioning (for the purpose of spare parts): ***10 Years from the date of acceptance of Goods***

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Section II – Bid Data Sheet (BDS)

Manufacturer's Authorization	Manufacturer's authorization is *required*.
Sales Service	After sales service is: ***required.***
Final Destination	**Islamabad**
Bid Validity	The Bid shall be valid until: ***180 Days form the bid(s) submission date.***
Bid Securing Declaration	*A Bid-Securing* Declaration ***shall be*** required.
	G. Evaluation of Technical Parts of Bids
Technical Weightage/ Evaluation and Scoring Criteria	The technical factors and sub factors as applicable and the corresponding scores out of 100% are: ***Technical Part Scoring Methodology given at page 52 (Section III - Evaluation and Qualification Criteria)*** Weight in percentage: ***40% (.4X of 1.0)*** ***Features evaluation will contribute 100% to/ of the technical factor(s).*** ***Passing marks are at least 70% in technical evaluation. The bidder who scores at least 70% in technical evaluation would be considered for financial part opening/ evaluation.***

Dated: Tuesday March 25, 2025

Section II – Bid Data Sheet (BDS)

	I. Evaluation of Financial Part of Bids
Price Adjustment (Bid)	The adjustments shall be determined using the following criteria, from amongst those set out in Section III, Evaluation and Qualification Criteria: Deviation in Delivery schedule: ***No*** Deviation in payment schedule: ***No*** Life cycle costs: the costs during the life of the goods or equipment: ***No*** the performance and productivity of the equipment offered; ***No***
Bid Evaluation Currency	The currency that shall be used for Bid evaluation and comparison purposes to convert (at the selling exchange rate) all Bid prices expressed in various currencies into a single currency is ***Pak Rupees*** The source of exchange rate shall be: ***State Bank of Pakistan*** The date for the exchange rate shall be***: Selling Rate prevailing 14 days prior to the last date for submission of bids***
	J. Evaluation of Combined Technical and Financial Parts and Most Advantageous Bid
Financial Weightage and Combined Evaluation	The weight to be given for cost is: ***0.6X of 1.0***

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Maintenance and Support Plan

	Post Installation Support
Maintenance and Support Plan	The bidder shall provide a maintenance and support plan, including on-site training, remote troubleshooting, spare parts and software updates, for critical issues for a period of three (03) years.
Spare Parts	The supplier shall supply spare parts for a period of three (03) years; included in maintenance and support plan. Radar Spare Parts and Software Updates availability guaranteed for a period of not less than 15 years.

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Section III - Evaluation and Qualification Criteria

Technical Part

Qualification (Each Lot)

Qualification Criteria

The Purchaser shall assess each Bid against the following Qualification Criteria. Requirements not included in the text below shall not be used in the evaluation of the Bidder's qualifications.

(a) Financial Capability: The Bidder shall submit audited financial statements or, if not required by the law of the Bidder's country, other financial statements acceptable to the Purchaser, minimum for the last Three (03) years prior to bid submission deadline, demonstrating the current soundness of the Bidder's financial position. For a joint venture, this requirement shall be met by each member;

(b) Specific Experience: The Bidder shall demonstrate that it has successfully completed at least two (02) contracts within the last fifteen (15) years prior to bid submission deadline, each with a value of at least Two (02) Million USD deploying X-Band Weather Surveillance Radars at several locations under each contract that have been successfully and substantially completed and that are similar in nature and complexity to the Goods and Related Services (X-Band Weather Surveillance Radars consistent with the Technical Specifications and other such requirements given in this RFB). For a joint venture, this requirement may be met by all members combined.

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Section III - Evaluation and Qualification Criteria

Technical Part

(c) Documentary Evidence: The Bidder shall furnish documentary evidence (in English language) to demonstrate that the Goods it offers meet the following usage requirement:

All goods (to be delivered with services) shall fully comply with the Technical Specifications and are meant for the required working/ business environment vis-à-vis country's specific environmental and other such conditions.

(d) Manufacturing experience and Technical Capacity: For the items under the Contract that the bidder is a manufacturer, the Bidder shall furnish documentary evidence to demonstrate that:

(i) it has manufactured goods of similar nature and complexity for at least (15) fifteen years, prior to the bid submission deadline; and

(ii) its annual production capacity of goods of similar nature and complexity for each of the last (15) fifteen years prior to the bid submission deadline, is at least (10) ten times the quantities specified under the contract.

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Section III - Evaluation and Qualification Criteria

Technical Part

(e) Manufacturer's authorization: A Bidder who does not manufacture an item/s where a manufacturer authorization is required in accordance with BDS ITB 17.2 (a), the Bidder shall provide evidence of being duly authorized by a manufacturer (Manufacturer's Authorization Form, Section IV, Bidding Forms), meeting the criteria in (d) (i) and (ii) above, to supply the Goods;

At the time of Contract Award, the Bidder (including each subcontractor proposed by the Bidder) shall not be subject to disqualification by the Bank for non-compliance with SEA/ SH obligations.

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Section III - Evaluation and Qualification Criteria

Technical Part

Technical Evaluation

Mandatory Requirements:

Subject to meeting/ qualifying the following mandatory criteria only, the Purchaser's evaluation of responsive bids ***will consider*** scored technical factors.

A. **General Technical Requirements:** All weather radar(s) proposed by the bidder must strictly meet with the Technical Specifications of the Project.

B. **Maintenance and Reliability:** i) The radar should be designed to have a high Mean Time Between Failures (MTBF) and be easy to maintain. Regular maintenance should be possible with minimal downtime to ensure continuous weather monitoring; ii) The radar should be supported by an efficient maintenance plan, with easily available spare parts, technical support, and a low meantime to repair (MTTR).

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Section III - Evaluation and Qualification Criteria

C. **Data Processing and Integration:** i) The radar should have advanced data processing capabilities, including filtering and analyzing radar data in real-time. The radar system should be equipped with intuitive and user-friendly visualization software that allows meteorologists to easily interpret and analyze the data. Real-time processing and display of radar images, with color-coded displays for easy identification of weather patterns should be as per WMO standards; ii) The radar's data output should be adjustable to meet with the central meteorological data processing system for seamless integration and decision-making; iii) Data observed by the radar should be capable of integrating with other meteorological data, such as satellite data, weather stations data, and numerical weather prediction models existing radars to improve the overall quality of forecasts and understanding of complex weather system.

D. **Dual-Polarization Features:** i) The dual-polarization radar should have the ability to classify various types of precipitation (rain, snow, hail) to improve the accuracy of precipitation observation.

E. **Environmental Adaptability:** i) The radar system must be designed to operate under sever environmental conditions (e.g., extreme temperatures, strong winds, high humidity). It should be able to function in harsh weather conditions such as storms or heavy rain without degradation in performance, except for technical limitations imposed by the radio characteristics in each frequency band; ii) The radar should comply with international electromagnetic radiation standards and other local regulations, including frequency spectrum allocation. Compliance with the recommendations of the International Telecommunication Union (ITU) and other national and international standards is necessary to ensure safe and legal operation.

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Section III - Evaluation and Qualification Criteria

F. Safety and Scalability: i) The radar should meet safety standards for operators and the surrounding environment, including electromagnetic radiation safety, especially for personnel working near the radar; ii) The radar should be scalable to accommodate future expansions, such as enhancing data processing capabilities.

G. Upgradability and Customization: i) The radar should be capable of software and hardware upgrades to keep pace with technological advancements, such as improved signal processing, data analytics, or integration with other sensors and systems; ii) Customizing options of radar product display should be available to address the specific needs of the region, whether in terms of weather phenomena to monitor, operational environments, or regional forecast priorities.

H. Signal Quality and Accuracy: i) The bidder shall ensure that the radar is designed and optimized to minimize the effects of parallax error such as range accuracy, bearing accuracy, data processing (interpolation and extrapolation), senor fusion and user interface.

I. Documentation and Past Performance: i) Comprehensive technical documentation such as system manuals, installation guides, operational procedures and maintenance manuals with its summary for routine maintenance work must be provided by the bidder to ensure the system is easily deployed, operated and maintained; ii) The bidder must have at least two successful completions of past projects with customer references/recommendations which must be attached with the bidding documents.

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Section III - Evaluation and Qualification Criteria

J. **Data Integrity and Security:** Data Integrity and Quality: full support/compliance with Encryption (Data encryption in transit and at rest), Role-based Access Controls, Vulnerability Scanning/ Assessment and Firewall Protection (Network Security).

K. **Alerts and User-Friendliness: i)** System/Application Alerts: ability to customize thresholds for critical parameters and the system shall deliver alerts via email, SMS, and Push Notification on regular or need basis; b) User-friendliness: Intuitive Interface (Easy-to-navigate menus and controls) and Clear Data Presentation (Visualizations and reports).

L. **Remote Access and Monitoring:** Remote Access and Control: Web-based remote access and mobile app for monitoring and control with Web Services (APIs for data access) and Data Visualization.

M. **Data Visualization and Anomaly Detection:** Anomaly Detection: should be capable for identification and flagging of unusual or erroneous data.

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Common Mistakes in Bids Submission and How To Avoid Those

Common Mistakes and their Avoidance
Careful reading and understanding of Bidding Documents especially ‘Section I - Instruction to Bidders’ and ‘Section II – Bid Data Sheet’ before the preparation of Bids.
Compliance of ‘Documents Comprising the Bid’ as per ITB 11 of Section-I.
Compliance of ‘Evaluation and Qualification Criteria’ as per Section-III.
Preparation / submission of ‘Bidding Forms’ as given in Section-IV.
Compliance of the Product/ Solution as per Schedule of Requirement in Section-VII.
Careful study and understanding of ‘Section VIII – General Conditions of Contract’ and ‘Section IX – Special Conditions of Contract’ for Contract terms and Condition.
For payment terms and conditions, ‘Section IX – Special Conditions of Contract’ may be referred.

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Key Technical Specification

Radar	Oscillator type	Range	Polarization	Tx	Genset	Power Backup Unit
X Band	Solid State	130 km	Dual	>500 W	10 kVA	> 15 mins Lith-ion battery

Radar	Tuned Frequency GHz	BW MHz	Beam Angle (Deg)	Hybrid Solar System	Diagnostic System
X Band	9.300 to 9.500	5	1.5 or less	10 kVA	BITE TDME

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Environment & Social Management Requirements for Suppliers

- **Supplier's Environment and Social Management Plan (S-ESMP):**
  - Must be submitted for approval.
  - Should include agreed Management Strategies and Implementation Plans.
  - Implementation is required as per WB E&S standards.

- **Environment and Social Safeguard Management Unit:**
  - The Supplier must establish and maintain this unit with qualified Experts throughout the project duration.

- **Grievance Redress Mechanism (GRM):**
  - The Supplier must establish a GRM and report the status of complaints to the Purchaser.

- **Independent Monitoring:**
  - The Purchaser reserves the right to conduct independent environmental and social monitoring throughout project execution.

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i) Rated Criteria; and

ii) Technical Specifications For X-Band Dual Polarization Doppler Weather Radar

Attached

Technical Part Scoring Methodology

1. Weighted Table for Project Implementation Schedule

Factor	Sub-Factor	Description	Maximum Number	Respective Number	Condition
Project Implementation Schedule	Implementation Timeline	Estimated project duration	10	10	less than or equal to 18 months
				7	>18 months and ≤21 months
				3	>21months and ≤24 months
				0	≥24 months

2. Weighted Table for Environmental Hardiness with Certification of Radar Transmitter

Factor	Sub-Factor	Description	Maximum Number	Respective Number	Condition
Environmental Hardiness with Certification	Environmental Hardiness	Ability to withstand harsh environmental conditions	10	10	Harsh environmental conditions (-15 C to 55 C)
				5	Moderate environmental conditions (-5 C to 40 C)
				0	Inadequate environmental hardiness (0 C to 25 C)

3. Weighted Table for Maintenance and Support

Factor	Sub-Factor	Description	Maximum Number	Respective Number	Condition
Maintenance and Support	Maintenance and Support Services	Level of support provided	10	10	*Comprehensive maintenance and support services
				5	*Adequate/limited maintenance and support services
				0	*Insufficient maintenance and support services

*Note: For details, please refer to "*Comparison Table: RADAR Support Plans" given below.*

***Comparison Table: RADAR Paid Support Plans (including free support for three years after the completion)**

Feature	Comprehensive	Adequate/Limited	Insufficient
Availability	24/7/365	Business hours	Minimal or no availability
Scope	Covers all aspects of RADAR services	Limited to specific issues or components	Minimal or no coverage

Response Time	Priority response, often within minutes	Standard response times	Delayed or no response
Level of Assistance	Proactive monitoring, troubleshooting, and optimization	Self-service options, basic troubleshooting	Minimal or no assistance
Access to Technical Account Managers (TAMs)	Dedicated TAMs for personalized guidance	Limited access to TAMs	No access to TAMs

4. Weighted Table for Radar Transmitter Design

Factor	Sub-Factor	Description	Maximum Number	Respective Number	Condition
Radar Transmitter Design	Designed Mean Time between Failure (MTBF)	Predicted elapsed time between inherent failure	5	5	Over 25,000 hours
				3	Between 15,000 and 25,000 hours
				0	Less than 15,000 hours
	Designed Meantime to Repair (MTTR)	Average time taken to diagnose and rectify faulty equipment	5	5	Less than 1 hour
				3	Between 1- 6 hours
				0	More than 6 hours

5. Weighted Table for Free Software Update after the successful SAT without Hardware Binding

Factor	Sub-Factor	Description	Maximum Number	Respective Number	Condition
Radar Software	Radar Operation Software	Updates of Software for configuration and control of radar	5	5	Over 5 years
				3	Between 3 - 5 years
				0	Less than 3 years
	Radar Display Software	Updates of Software for generation and visualization of Radar products	5	5	Over 5 years
				3	Between 3 - 5 years
				0	Less than 3 years

6. Weighted Table for Radar Spare Parts Availability Guarantee (excluding PC and other computing peripherals)

Factor	Sub-Factor	Description	Maximum Number	Respective Number	Condition
Radar Spare Parts	Transmitter, Receiver and Signal Processor	Availability of Spare	10	10	Over 15 years
				5	Between 8 to 15 years
				0	Less than 8 years
			10	10	Over 15 years

	Antenna Controller and Assembly	Availability of Spare		5	Between 8 to 15 years
				0	Less than 8 years

7. Experience in large-scale, multi-sectoral projects (consistent with Specific Experience Criteria) with significant E&S risks and mitigation measures.

Factor	Sub-Factor	Description	Maximum Number	Respective Number	Condition
Experience in large-scale, multi-sectoral projects with significant E&S risks and mitigation measures.	Experience of firm in large-scale, multi-sectoral projects with significant E&S risks and mitigation measures.	Ability of the firm to perform project with E&S risks and mitigation measures	10	10	Two or more projects
				5	One Project
				0	No experience

8. Ability to use local workforce & capacity development

Factor	Sub-Factor	Description	Maximum Number	Respective Number	Condition
Ability to use local workforce and capacity development	% of labor cost from local market	Provision of labor from local market	10	10	(70% to 100%)
				05	(40% to 69%)
				0	(0% to 39%)
	Number of officers who will receive training during the project	Staff (Meteorological & Engineering) trained by the Bidder	10	10	Over 60 Officers
				5	31 to 59 Officers
				0	Less 30 Officers

Technical Specifications of X-band Dual Polarization Doppler Weather Radar (Solid-State)

Technical Specifications of Mobile X-band Pulse Compression Solid-state (SSPA) Dual Polarization Doppler Weather Radar

Radome	Quantity	: 1 set
	Type	: Sandwich panel
	Dimension	: Approx. 1.5m – 3m diameter
	Surface	: White colour, gel coat finish
	Survival wind speed	: 70m/sec. or more
	Suitable frequency	: Transmitting frequency
	Transmission loss	: 0.3dB or less on one way path in dry
	Relative humidity	: 0% - 100%
	Lightning protection	: Lightning rod with a pole beside of Radome (Protecting angles: 60 degrees)
Antenna	Quantity	: 1 set
	Type	: Parabolic antenna
	Reflector size	: Approx. 1.5m – 2.5m diameter
	Suitable frequency	: Transmitting frequency
	Beam width	: 1.5 degrees or less at -3dB point without Radome
	Antenna gain	: 37dB or more without Radome
	Polarization	: Simultaneous, dual polarization (horizontal and vertical)
	1st Side lobe level	: -20dB or less without Radome
	Angular positioning accuracy	: 0.1 degrees or less
	Driving range	: Azimuth 360 degrees, elevation -2 degrees – +90 degrees or wider
	Rotation speed	
	Azimuth	: 0 to 6rpm or higher, selectable
	Elevation	: 0 to 2rpm or higher, selectable
Transmitter	Quantity	: 1 set
	Transmitter type	: Solid-state power amplifier
	Transmitting frequency	: 9,300MHz – 9,700MHZ (±2.5MHz) [The specific available band/Tuneable frequency from FAB(Frequency Allocation Board Pakistan) will be communicated by Project Manager]
	Occupied frequency bandwidth: 5MHz or less	
	Transmitting power	: 100W peak or higher (each for horizontal and vertical at Tx output)
	Radiation blanking	: It shall be able to set both azimuth and elevation
	Pulse width	: from 1μs to 50μs
	*Short pulse and long pulse are combined for the observation period	
	Pulse repetition frequency (PRF): from 900Hz to 2,000Hz, selectable	
	Duty	: 10% Maximum

Digital Receiver & Signal Processor	Quantity : 1 set
	Receiver type : Coherent IF digitizer Noise figure of the high frequency circuit : 3.5dB or less at the input terminal of low noise amplifier (LNA) Sensitivity : -110dBm or better Maximum Range bin : 1000 or more Processing area : (Intensity mode) throughout 0 km to 80km or more in range and 0 to 360 degrees in azimuth (Doppler mode) throughout 0 km to 80km or more in range and 0 to 360 degrees in azimuth Intensity signal process: -Dynamic range : 90dB or more -Range correction: depending on radar equation -Air-attenuation correction: 0.01dB/km in Observation Range Velocity signal process: -Processing type: Pulse pair or FFT -Trigger control: Dual-PRF ratio (4:5) -De-aliasing of doppler velocity: Real-time processing by Dual-PRF -Maximum de-aliasing Doppler velocity: ±64m/s or more (Depends on PRF) Output data : Reflectivity (Z), Doppler velocity (V), Spectrum width (W), Differential reflectivity (ZDR), Differential phase shift (φDP), Polarimetric correlation coefficient (ρHV) Output data grid Azimuth : 1 degree or less Range : 100m or finer Output data resolution : 2 bytes (16 bits) or more Receiver Protector : Yes

Duplexer	Quantity : 1 set
	Type : Dual backup type TR limiter or circulator with diode limiter
Radar Controller	Quantity : 1 set
	Hardware CPU : Intel® Xeon or equivalent latest generation & Series or higher Main memory (RAM) : 64GB or more Hard disk : 1TB (SSD) x (RAID-5) LAN interface: : 10Base-T, 100Base-TX and 1000Base-T, two (2) port or more Monitor display : Color LCD type, 19 inches or more Input power : AC 230V, single phase, 50Hz Accessories : English keyboard, mouse, LAN arrester (RJ45)

	Software • Operating System platform independent • Up to 10 years Upgradable Software on Latest Operating System Version • Software without hardware binding [Radar control and monitoring] -Antenna scanning and radiation to control by pointing device -Monitoring of the result of the radar control -Fault monitoring including temperature alarm inside of the equipment -True north confirmation by sun tracking feature [Observation scheduling] -Antenna scanning mode (PPI, RHI, Volume Scan) -Elevation angle setting -Selection of Pulse width or set -Data elements (Reflectivity (Z), Doppler velocity (V), Spectrum width (W), Differential reflectivity (ZDR), Differential phase shift (φDP), Specific differential phase shift (KDP), Polarimetric correlation coefficient (ρhv)) -Selection of PRF [Radar echo display] -X-Y coordinates image in the form of PPI indication (Reflectivity (Z), Doppler velocity (V), Spectrum width (W), Differential reflectivity (ZDR), Differential phase shift (φDP), Specific differential phase shift (KDP), Polarimetric correlation coefficient (ρhv)) [Automatic shutdown] -Automatic graceful shutdown upon signal from the Power Backup Unit
Data & Protocol Converter	Quantity : 1 set
	Hardware CPU : Intel® Xeon or equivalent latest generation & Series or higher Main memory (RAM) : 64GB or more Hard disk : 1TB (SSD) x (RAID-5) LAN interface: : 10Base-T, 100Base-TX and 1000Base-T, two (2) port or more Monitor display : Color LCD type, 19 inches or more Input power : AC 230V, single phase, 50Hz Accessories : English keyboard, mouse, LAN arrester (RJ45) Software • Operating System platform independent • Up to 10 years Upgradable Software on Latest Operating

	System Version • Software without hardware binding [Data receiving, converting and transfer] -Collection of Ingested data -Compression processing of raw data -Dissemination of raw data over the network -FTP data transfer through live IP -GRIB-2, ASCII, NETCDF,GEOTIFF,PNG format etc. -The software shall include an interface for administrators and operators to create and schedule automatic export of products in various formats (e.g., GRIB2, ASCII, NetCDF, GeoTIFF, PNG) to external sources via FTP/SFTP/API or other compatible protocols. [Parameter setting] -Setting of dissemination schedule [Display processing] -Latest data display by the PPI style (selectable of Reflectivity (Z), Doppler velocity (V), Spectrum width (W), Differential reflectivity (ZDR), Differential phase shift (φDP), Specific differential phase shift (KDP), Polarimetric correlation coefficient (ρhv)) -Display of receiving status [Time adjustment] -Automatic adjustment by GPS NTP server (including GPS antenna) [Automatic shutdown] -Automatic graceful shutdown upon signal from the Power Backup Unit
Radar Data Display Unit	Quantity : 2 sets Hardware CPU : Intel® Xeon or equivalent latest generation & Series or higher Main memory (RAM) : 64GB or more Hard disk : 1TB (SSD) x (RAID-5) LAN interface: : 10Base-T, 100Base-TX and 1000Base-T, two (2) port or more Monitor display : 65 inches or more LED or video wall Input power : AC 230V, single phase, 50Hz Accessories : English keyboard, mouse, LAN arrester (RJ45) Software • Operating System platform independent

	• Up to 10 years Upgradable Software on Latest Operating System Version • Software without hardware binding [Basic data monitoring feature] -Display of X-Y coordinates image in the form of PPI indication (Reflectivity (Z), Doppler velocity (V), Spectrum width (W), Differential reflectivity (ZDR), Differential phase shift (φDP), Specific differential phase shift (KDP), Polarimetric correlation coefficient (ρhv)) [Weather product processing] - Base maps and overlays etc. should be dynamic as per the mobile RADAR location -PPI (plan position indicator) -RHI (range height indicator) -CAPPI (constant altitude PPI) -RTI (range time indicator) -Maximum value on X-Y axis -Rainfall near surface -VIL (vertically integrated liquid) -Warning output of heavy rainfall -Rainfall and strong wind warning output of specified district -Rain rate and rainfall near surface by DP (dual polarization) (Capable to set the combination of multiple polarization parameters and calculation algorithms) -Arbitrary N-hours rainfall accumulation by DP -Horizontal wind profile (wind direction and speed) -Time series wind profile of the upper layer -Wind shear detection -Multi window feature -Z-R and dual polarization parameter registration -Image file output as JPG file format [Map projection] -Conical projection or Mercator projection -Map data edit function [Product display & retrieval] -Automatic updating of the received product -Display of the necessary information Observed date and time Site code Name of product Product range information Legend (color code) -Data display area Map overlay feature Indication of information of a location pointed by pointing device

	(Location, radar echo value, distance of specified span) -Zooming display 2 or 4 times selectable for the desired area -Animation Animation displays of selected product Selectable items -Type of product -Retrieving period -Retrieving speed -Retrieving direction [Automatic shutdown] -Automatic graceful shutdown upon signal from the Power Backup Unit

Radar Power Maintenance Panel	Quantity	: 1 set
	Circuit breaker	: No-fuse-breaker type
	Main breaker	: No-fuse-breaker type or magnetic-breaker
	Power distribution	: No. of outputs as required including 2 spare
	Input power	: AC 230V, single phase two wire, 50Hz
	Output power	: AC 230V, single phase two wire, 50Hz
LAN Switch	Quantity	: 1 set
	LAN interface	: IEEE 802.3 Ethernet
	Connection port	: 100BASE-TX or more, eight (8) ports or more
	Input power	: AC 230V, single phase, 50Hz
	Each port and power supply shall be duplicated	
Router	Quantity	: 1 set
	LAN interface	: IEEE 802.3 Ethernet
	Connection port	: 100BASE-TX or more, three (2) ports or more
	Routing	: IP routing
	Input power	: AC 230V, single phase, 50Hz
	Each port and power supply shall be duplicated.	
Cellular Gateway	Quantity	: 1 set
	Cellular category	: 5G (with automatic fallback to 4G, 3G and 2G)
	Serial interface	: 1 port (RS232) or more
	LAN interface	: 1 port (Ethernet) or more
	Other interface	: Antenna port, SIM holder (Dual SIM compatible)
	Operating temperature	: -20 - +60ºC
	Input power	: AC 230V, single phase, 50Hz
	Accessories	: High gain antenna with connecting cable and mounting materials
Power Backup Unit	Quantity	: 1 set
	Capability	: 4kVA or more
	Input voltage	: AC 230V, single phase two wire, 50H
	Output voltage	: AC 230V, single phase two wire, 50H

	Back up time	: 20 minutes or longer for all the equipment indicated above
	Energy storage	: Lithium-ion battery
	Others	: Bypass function
Automatic Voltage Regulator (AVR)	Quantity	: 1 set
	Capacity	: 8kVA or more
	Input power	: AC 230V ±20%, single phase two wire, 50Hz
	Output power	: AC 230V ±5%, single phase two wire, 50Hz
Isolation Transformer	Quantity	: 1 set
	Capacity	: 8kVA or more
	Input power	: AC 230V selectable, single phase two wire, 50Hz
	Output power	: AC 230V, selectable, single phase two wire, 50Hz
	Insulation	: Class B
	Surge voltage	: 30kV or more
Grounding System	Quantity	: 1 set
	Mobile Grounding System	

Diesel Engine Generator for supporting all the Radar Equipment	Quantity	: 1 set
	Output	: 10kVA or more
	Voltage	: AC 230V, single phase two wire
	Frequency	: 50Hz
	Control unit	: Automatic transfer switch
	Fuel tank	: 200L
	Accessories	: Starting battery, fuel supply & lubricating systems, lubricating oil supply system, anchor bolts for generator and auxiliaries, spare parts for 3,000 hours and tools for maintenance.
Vehicle	A vehicle with radar equipment container required for installing and transporting the mobile solid state weather radar shall be included.	
Air Conditioner	Quantity	: 2 sets
	Type	: Air cooled
	Capacity	: 2kW – 3kW
	Automatic operation	: Thermostatic control
	Controller	: Remote type
	Temperature and wind speed setting	: Selectable

Spare Parts	Radar Signal processor	1 unit
	Receiver	1 unit
	Motor assembly for antenna (for azimuth drive)	2 sets
	Motor assembly for antenna (for elevation drive)	2 sets
	Solid-state power amplifier	5 sets
	Power supply unit(s) for radar equipment	1 set
	Fan unit(s) for radar equipment	2 sets

	Diode Limiter for digital receiver and signal processor 2 sets LAN arrester 1 set USB Back up of all Softwares for radar operation 2 set
External Storage (Network Access Storages(NAS) based)	Shall provide sufficient storage capacity (at least 100 TB) for saving the last 10 years of Radar data
Others	Equipment, devices, accessories, etc. necessary for operating the mobile solid state weather radar other than those specified above shall be included.

Circuit Breaker to be installed at a power distribution point	Capacity : As per load requirement of radar equipment Voltage : AC 230V, single phase two wire
TEST EQUIPMENT	Quantity: 1 set The following equipment should be provided as per radar testing requirement: -Spectrum Analyzer -Test Signal Generator -Power Meter -Power Sensor -Frequency Counter -Detector -Attenuator Set -Terminator for Detector -Digital Oscilloscope -Digital Multimeter -Clump Multi Meter -CW Converter -Portable Power Supply Unit -Earth Tester (Measures Earth resistance) Tool Kit :All necessary tools for radar maintenance for electrical/mechanical Step Ladder Type : As per requirement
Consumables	Grease with pump and oil with jug for antenna Slip ring carbon Brush
Calibration and Validation	Calibration: The radar system shall be calibrated in accordance with recognized meteorological standards (e.g., WMO or equivalent) to ensure accurate and consistent measurements of reflectivity, Doppler velocity, and other meteorological parameters. The calibration process shall include: • Internal calibration using built-in test equipment and reference signals. • External calibration using calibrated targets or reference radars. • Regular verification of system performance through routine

	maintenance and quality control procedures. Validation: The radar data shall be validated against independent measurements (e.g., rain gauges, disdrometers, radiosondes) to assess the accuracy and reliability of the radar-derived products. The validation process shall include: • Comparison of radar-estimated rainfall with ground-based rain gauge measurements. • Evaluation of radar-derived wind profiles against radiosonde observations. Assessment of the radar's ability to detect and characterize severe weather phenomena.
Maintenance and Support	The vendor shall provide a maintenance and support plan, including on-site training, remote troubleshooting, and software updates, for critical issues for a period of three (03) years. Radar Spare Parts Availability Guarantee (excluding PC and other computing peripherals) for period not less than 15 years.

Additional Software/hardware Features:

1) The Radar Control Processor (RCP) system should be having required menu driven software with GUI for Operating the Radar.
2) The antenna tracking sweep should be visible on all the visualization/ application software display systems.
3) The process of setup of various scan parameters should be easily accessible to operators using a workstation GUI.
4) Software should have storm tracking and nowcasting features.
5) Generation of storm vectors (SCITs).
6) Setup of display overlayed on map of Pakistan with political boundaries of international borders, provinces and district boundaries, river catchment etc. using shape files.
7) Provision to incorporate the Bias Values for correction
8) Monitoring the health of the Radar as well as logging of subsystem level information at fixed intervals while Radar in operation.
9) Interlock, status and analog parameters from sub systems should be available in Radar controller GUI display for monitoring and should be included in the Radar operation for the system and subsystem safety.
10) The system should be capable of detecting failures of subsystems and should provide indication remotely.
11) System should have the feature of blanking RF radiation for selective sector.
12) Real Time display of base products for the selected scan. Base Product display with zooming options, lat-long display, selectable parameter displays and colour coded. Simultaneous display of data having more than one parameter. Base product display with terrain map – GIS. Provision for recording and playback of data.
13) System should have provision for remote access for monitoring and control including equipment power supply.
14) The base data (output of Radar processor) shall be stored and accessible to the user. At least three-month past data shall be available on the local computer disk at a time. Data converter should be available on the system for automatic conversion of real-time Radar base data to other common formats such as NetCDF, HDF5, KML, KMZ, gridded binary and NEXRAD-Level II . Base data product images to be archived in

different image formats like GIF, JPEG, PNG.

15) The system should have concise interactive menus for monitoring and managing the process, which makes it easy to trace data all the way from the radar receiver to the end user.
16) Display applications for 3D rendering of data in a workstation and a web interface for accessing 2D data via a browser.
17) Should be a fully scalable system architecture and works just as well with a single radar as a network of radars.
18) Integration of Radar system in existing PMD RADARs network to enable central management, data archiving and generation of integrated products.
19) Supplier shall be responsible to provide tool and will perform calibration and optimize R-Z, values for radar rainfall estimation and authentication of all the products. Complete verification report of Radar Rainfall estimation shall be furnished with satisfactory performance scores.
20) Provision of radar software (Client / Server architecture).
21) Software should be fully licensed and supports installation /operation on any work station specification defined by the client.
22) The final composite view (web based) should look like a Satellite clouds image as a layer one, AWS data as layer two, Radar data as layer 3, LDN data as layer 4 and weather model products as layer 5
23) IQ data should be available for archival.
24) Generation of real time Mosaic view with existing radars of PMD.
25) Generation of movie loop and saving it in .mp4/.gif format. Comprehensive combination products such as Severe Weather Indicator (consisting of meso-cyclone detection, divergence and convergence detection and storm structure analysis).

TDME (Test Diagnostic Measurement Equipment)

1) ATE/ STTE : Automatic Test Equipment, Solid State Test Equipment for Simulation
2) Complete consumable / replaceable components list required during repairing / replacement, along with warranty of provision of such components for not less than 15 years.
3) List of single point failure component.
4) Software: packages to run TDME with firmware, O.S and procedure manuals

Inspections and Tests

The following inspections and tests shall be performed:
The following tests have to be performed before the system as a whole can be approved for operational services.

- Factory Acceptance Test (FAT)

A Factory Acceptance Test (FAT) for radars will include inspections, tests, and evaluations conducted at the manufacturer's facility before the radar system is shipped to the customer. The purpose will be to verify that the system meets contractual requirements, specifications, and operational performance criteria.

Key Aspects of Radar FAT:

1. Visual and Mechanical Inspection
Check physical integrity and build quality

Verify dimensions, connectors, and labeling
Inspect materials and components for compliance with standards

2. Power and Electrical Testing
Power-on self-test (POST)
Voltage, current, and grounding checks
EMI/EMC compliance tests (if applicable)

3. Functional Testing
Verify radar start-up and shutdown procedures
Test radar subsystems (transmitter, receiver, signal processor, display)
Check interface with external systems (e.g., networks, power sources)

4. Performance Testing
Measure range, resolution, and accuracy
Doppler and velocity measurement accuracy
Detection and tracking of test targets (if applicable)
Beam pattern and antenna performance tests

5. Software and Algorithm Verification
Verify radar signal processing algorithms
Check firmware and software stability
Test control interfaces and user interface functionality

6. Environmental and Stress Testing (if required)
Temperature and humidity tests
Vibration and shock tests
RF interference and noise immunity tests

7. Safety and Compliance Checks
Ensure compliance with safety standards (e.g., radiation exposure limits)
Confirm adherence to regulatory requirements (e.g., FCC, MIL-STD)

8. Documentation Review
Verify user manuals, schematics, and maintenance guides
Ensure test reports, calibration certificates, and compliance documents are complete

FAT Deliverables:
FAT Report with test results and observations
Compliance certificates
Approval sign-off from customer representatives

Once the radar system passes FAT, it is cleared for shipment and installation, followed by Site Acceptance Tests (SAT) at the deployment location.

- Site Acceptance Test (SAT)

A Site Acceptance Test (SAT) for radars is performed after installation at the operational site to verify that the system functions correctly in its actual environment and meets all contractual and performance requirements. SAT ensures the radar is fully operational before being handed over to the end user.

Key Aspects of Radar SAT:

1. Physical and Installation Verification

Verify correct placement and alignment of radar components (antenna, transmitter, receiver, processor, display units).
Check structural integrity (e.g., mounting, cabling, grounding).
Confirm environmental protections (e.g., waterproofing, ventilation, surge protection).

2. Power and Electrical Checks
Measure power supply voltage, current, and grounding.
Verify backup power functionality (UPS, generator, battery systems).
Check electromagnetic interference (EMI) and electromagnetic compatibility (EMC).

3. Communication and Network Integration
Test data transmission between radar and control centers.
Validate integration with existing networks (e.g., ATC systems, defense networks).
Ensure proper synchronization with GPS or timing systems if applicable.

4. System Boot-up and Functional Testing
Verify correct startup sequence and system initialization.
Test operator control interfaces, displays, and remote monitoring.
Validate system self-tests and diagnostics.

5. Performance Testing in Real-world Conditions
Range and Resolution Testing: Confirm radar detects targets at expected distances and resolutions.
Tracking and Detection Tests: Ensure radar can detect, track, and classify targets correctly.
Clutter Rejection Tests: Verify radar's ability to filter out unwanted signals (e.g., terrain, weather, sea clutter).
Beam Pattern and Coverage Verification: Test radar's azimuth, elevation, and coverage area.
Doppler and Velocity Measurements: Validate moving target detection and speed accuracy.

6. Environmental and Stress Testing
Check performance under different weather conditions (rain, fog, high/low temperatures).
Conduct vibration and wind resistance tests if required.
Test lightning and surge protection measures.

7. Safety and Compliance Verification
Confirm compliance with radiation exposure limits and safety protocols.
Verify regulatory compliance (e.g., ICAO, FAA, MIL-STD, ITU regulations).
Ensure safe operational procedures are documented and followed.

8. End-User Training and Documentation Review
Conduct training sessions for operators and maintenance personnel.
Review and hand over operational manuals, maintenance guides, and technical documentation.
Provide SAT test reports and certificates of compliance.

SAT Deliverables:
SAT Report: Summary of tests conducted, results, and observations.
Deficiency List (if any): Issues to be resolved before final acceptance.
Final Approval Sign-Off: Customer acknowledgment that radar meets operational requirements.