Broad Agency Announcement: WEATHER RADAR TECHNOLOGY EXPLORATION FOR THE NATIONAL WEATHER SERVICE

BAA_NWSRADARNEXT2024 AMENDMENT 0001

General Comments.

The due date for proposal submissions for Tier 1 has been extended to March 28, 2025.

The due date for white paper submissions for Tier 2 and 3 has been extended to April 30, 2025.

BAA_NWSRADARNEXT2024_Amendment 0001 has been posted. Any changes have been referenced in red.

AMS 2025 Town Hall presentation "NWS Identifying User Needs for the Future of Weather Radar: A Town Hall Discussion on Radar Next" have been posted.

1. Offerors are able to respond with multiple responses to any tier of the BAA. Responding to one tier does not preclude a submission to another. The Government may open additional rounds of proposal submissions. Additional requests, if applicable, will be posted on https://sam.gov as an amendment to this posting no later than May 1, 2027.

2. The Government is currently exploring the "Art of the Possible"; we have no preferred solution at this point. The responses to the BAAs will help inform the Government's Analysis of Alternatives, CONOPS, and Acquisition Strategy; therefore, the intent of the BAA is to understand the realm of possibility.

3. The intended solution must at a minimum maintain the continuity at an equal level of capability of the current NEXRAD system. Additional consideration will be given to improvements in coverage and capabilities. A recently completed availability study indicates NWS will be unable to maintain current availability by the mid-2030s. The Radar Next Program will be developing an approach to future technology insertion to balance the need for near term continuity while still allowing for promising technologies to be integrated once they are matured.

4. Offerors that have already provided information through the RFI process and wish to continue that exchange of information through that mechanism are able and encouraged to do so.

5. BAA awards will be dependent on the availability of funding.

Questions & Answers.

1. *Why are there two due dates?*

This is due to the priority and funding availability of the tiers. The Government is trying to move quickly on Tier 1, which is why there is only a one-step process. It is the priority. Tier 2 and 3 are following a more traditional BAA approach of a two-step process of the white paper being due first.

2. *How do you want us to respond?*

The Government is looking at what's available – increased performance, increased update rate, increased coverage, etc. The goal is that we want to provide the most cost-effective, most beneficial system for the nation following NEXRAD. The Government has posed a number of questions in each tier. The Offeror is able to respond to one or all of the questions in multiple tiers. Responding to the BAA for Tier 1 is similar to responding to an RFP. Tier 2 and 3 are white paper submissions, which the Government may come back at a later date requesting a proposal. Note there are page limitations, so it is at the Offeror's discretion how they choose to respond with one or multiple submissions. Please refer to the instructions beginning on page 11.

3. *What is the period of performance for these submissions? Timeline for deliverables? Is that up to us to figure out?*

The Government has been open to the timeline of the information from the first round of the BAAs to influence our analysis of alternatives, which we hope to complete by the end of the calendar year 2025; beginning of 2026. We are looking at 6 – 12 month type of activity, maybe a little longer within the first rounds of awards.

4. *We are not ready to respond with a proposal to items in Tier 1; however, we are interested in some of the topics. Are we able to submit a white paper to topics in tier 1?*

The Government can take it into consideration, but it is not currently how the BAA is set up. If it is something that you're not ready to respond to as a Tier 1 priority, the Government will have further opportunities as we go through this process to accept additional proposals for any of the tiers after we go through this initial response period.

5. *Can the Government please confirm that the posted NAICS Code as 541715 - Research and Development in the Physical, Engineering, and Life Sciences (except Nanotechnology and Biotechnology) is acceptable for Offerors to bid under?*

The .pdf has been updated to correct the NAICS code to 541715. It should be noted that the BAA is unrestricted. Therefore, the NAICS code does not limit responses based on size standards associated with the code.

6. *Can the Government please confirm if we are able to securely transmit our proposal(s) with proprietary data via a DoD SFE invite or another application?*

It is the responsibility of the offeror to ensure their proposal(s) is/are submitted in a way that is secure if there is any proprietary data incorporated into the proposal(s).

7. *Who controls ownership rights?*

The responsibility to restrict proprietary rights is on the Offeror. Please refer to page 13 number 4. Assertion of Data Rights.

8. *This NOAA/NWS Radar Functional Requirements document (ATT D) was last updated in 2015. Does NWS plan to incorporate any of research findings from NSSL, industry and academia and update this document to reflect results on phased array radar testing since 2015, most notably on the MPAR ATD?*

We are writing requirements for Radar Next in a multi-step process. The first is to determine the observation objectives that define the measurement objectives and products that the Radar Next program needs to provide. These objectives are implementation agnostic and address the question of "what is needed" rather than "how we meet the needs." These objectives also set the performance trade space for our Analysis of Alternatives from a threshold level of performance to an objective (or maximum effective) level of performance. After the alternative analysis, which will include all weather radar technologies that are likely to be available in the 2030s, and determination of the notional technical solution, we will write more detailed system and functional requirements - essentially an expansion upon and an update to the 2015 document.

9. *Can you please confirm whether a vendor can submit a Tier 1 proposal and support another vendor on their Tier 2 or 3 concept paper?*

Yes. The Government is not restricting any collaborative efforts.

10. *If a vendor wants to refer to papers in their Technical Proposal, can the list of references please be excluded from the page count?*

Only the cover page and table of contents are excluded from the page count in the Technical Proposal.

11. *If we include a list of acronyms, can that please be excluded from the page count?*

Only the cover page and table of contents are excluded from the page count in the Technical Proposal.

WEATHER RADAR TECHNOLOGY EXPLORATION FOR THE NATIONAL WEATHER SERVICE

Authority

This is a Broad Agency Announcement (BAA) issued on behalf of the National Weather Service (NWS), National Oceanic and Atmospheric Administration (NOAA) and public notice of a competitive opportunity used to obtain proposals to understand technological capabilities, methodologies, and innovative processes available in the marketplace as the NWS begins to develop a replacement weather program as described in Federal Acquisition Regulation (FAR) 35.016 and FAR 6.102(d)(2). Any resultant award negotiations will follow all pertinent laws and regulations, and any negotiations and/or awards for procurement contracts will use procedures under FAR 15.4, Contract Pricing, as specified in the BAA.

Offerors are advised that BAA amendments may be issued via the System for Award Management (https://sam.gov) and concept paper and/or proposal submissions shall comply with the most current amended BAA documents and/or attachments.

Background

Radars are a critical asset in achieving the NWS weather ready mission, providing atmospheric data and enabling forecasters to improve the lead times and accuracy of warnings for high-impact weather events for the protection of life and property. The Next Generation Weather Radar (NEXRAD) is the current weather radar program and one of the most impactful NOAA observational programs, supporting all weather mission service areas including severe, winter, aviation, and flood warnings. However, the current system has exceeded its original 20-year design life. A Service Life Extension Program (SLEP) was conducted to address the top failure rate components and major radar sub-components of current radars. SLEP was successful in extending the life of a few elements of the radar network; however, there are still more than 4,000 components that face obsolescence and supply chain challenges. As a result, NEXRAD is at an increasing risk of long or possible permanent failures across its network. Modernization of the next generation radars with technology that is available will do more than just maintain the capability that we have today. It will improve radar coverage, provide better data quality, and provide the ability for users and stakeholders to interact more with the radar than they do today. More importantly, modernization will have more impact on the people, especially the emergency managers, mayors, governors, and state representatives, in order to allow them to make the best decisions in severe weather and/or impactful events.

This BAA is seeking proposals for the development of the Radar Next program, which is intended to ensure the NWS can continue and improve upon delivering one of the most impactful observation systems in the nation. The Radar Next program plans to design and deploy the next generation network of weather radars that will:

- *Ensure continuity of radar data:* Prevent disruption in the continuity of the nation's weather radars due to aging infrastructure, which would severely impact the ability to predict and respond to weather-related emergencies.

- *Address current gaps in radar coverage:* Expand radar coverage, particularly at low levels, to better serve all communities, especially those that are vulnerable and underserved and meet NOAA's goals to provide the nation with timely and accurate weather forecasts and warnings to all communities.

- *Improve radar performance and capabilities:* Create a network of radars that are more flexible and scalable to adapt to changing needs and technological advancements, providing a mix of observations with higher temporal resolution for higher impact missions and supporting new business models and technology that, collectively, will result in improvements to radar capabilities and increased data accuracy.

Opportunity Description

The Government will make awards that represent the best value to the Government in accordance with the evaluation criteria, which is located in the proposal submission instructions.

1. **NAICS Code:** 541715 Research and Development in the Physical Engineering, and Life Sciences (except Nanotechnology and Biotechnology)

2. **Total Available Funding (All Awards):** Approximately $1,000,000.00 - $6,000,000.00 based on availability of funds.

3. **Anticipated Number of Awards:** Approximately 5-15 awards.

4. **Anticipated Funding (Per Award):** Awards under this BAA are estimated at $200,000.00 to $1,000,000.00 based on availability of funds.

5. **Contract Award Types:** The Government will award contracts on a firm-fixed price (FFP) basis.

6. **Eligible Offerors:** All responsible sources capable of satisfying the Government's needs, including both United States (U.S.) and non-U.S. sources, may submit concept papers for consideration. Eligibility includes:

    a. Accredited U.S. schools and universities
    b. Other accredited U.S. institutions of higher education and academic departments
    c. Private or public research institutes and centers
    d. For-profit and nonprofit scientific, consulting, and advisory organizations
    e. State or local government agencies within the U.S.
    f. Non-U.S. organizations may participate to the extent that such participants comply with any necessary nondisclosure agreements, security regulations, export control laws, and other governing statutes applicable under the circumstances.

Federally Funded Research and Development Centers (FFRDCs)

FFRDCs are subject to applicable direct competition limitations and cannot propose to this solicitation in any capacity unless they meet the following conditions. (1) FFRDCs must clearly demonstrate that the proposed work is not otherwise available from the private sector. (2) FFRDCs must provide a letter, on official letterhead from their sponsoring organization that (a) cites the specific authority establishing their eligibility to propose to Government solicitations and compete with industry, and (b) certified the FFRDC's compliance with the associated FFRDC sponsor agreement's terms and conditions. These conditions are a requirement for FFRDC's proposing to be awardees or subawardees.

Government Entities

Government Entities (e.g., Government/National laboratories, military educational institutions, etc.) are subject to applicable direct competition limitations. Government Entities must clearly demonstrate that the work is not otherwise available from the private sector and provide written documentation citing the specific statutory authority and contractual authority, if relevant, establishing their ability to propose to Government solicitations and compete with industry. This information is required for Government Entities proposing to be awardees or subawardees.

NOAA will consider FFRDC and Government Entity eligibility submissions on a case-by-case basis; however, the burden to prove eligibility for all team members rests solely with the proposer.

Historically Black Colleges and Universities (HBCUs), Minority Institutions (MI), Small Business concerns, Small Disadvantaged Business concerns, Women-Owned Small Business concerns, Veteran-Owned Small Business concerns, Service-Disabled Veteran-Owned Small Business concerns, 8(a) Business concerns, and HUBZone Small Business concerns are encouraged to submit responses to this BAA and to join other entities as team members in submitting responses. The Government reserves the right to implement a small business reserve as part of this BAA.

General Information and Process

Research interests outlined herein have been prioritized into three tiers. Tier 1 contains NOAA's highest priority interests with planned award(s) before Tiers 2 and 3. To expedite the process, Offerors shall **not** submit a concept paper if they are responding to a Tier 1 interest(s) only – no concept paper is necessary, nor will it be accepted if responding to a Tier 1 interest. Offerors shall submit only a full proposal if they are responding to a Tier 1 interest as per the instructions in this document (see *Tier 1 Instructions*).

For Tiers 2 and 3, Offerors shall first submit a concept paper for consideration. After evaluation of the concept paper, the Government may extend an invitation for a full proposal. This sequence allows for an early determination of the potential for interest based on technical merit, applicability to NOAA, and projected funding. This process is designed to limit Offeror and

Government expenditure of effort to prepare and review formal proposals for research that may have little chance of being funded.

One-on-one sessions will be available to give potential Offerors the opportunity to ask Government representatives questions that may reveal information that is sensitive in nature pertaining to their approach to the BAA. Sessions will be available between January 21 - 30, 2025 between 12:00 – 3:00 pm EST in 30-minute increments. It should be noted that if the Government feels that information has been afforded to a potential Offeror that provides an advantage or should be disclosed to a potential Offeror, that information will be included as part of an amendment posted to this BAA. To register, utilize the link provided in the Attachments/Links section of this BAA to access the registration form. You will be exiting the Government site to register. A meeting link will be provided via email once your registration has been confirmed.

Government Obligation

Offerors submitting concept papers and/or proposals in response to this BAA are advised that only the Contracting Officer (CO) may obligate the Government to any contract involving expenditure of Government funds. **The Government is under no obligation to pay for the cost of the development of concept papers or proposals. Furthermore, there is no commitment on behalf of the Government to fund any proposal.** Offerors are advised that concept papers and/or proposals are submitted strictly on a voluntary basis. This announcement is an expression of interest only. Any request for concept papers or submission of a full proposal does not guarantee an award. The Government reserves the right to cancel this requirement at any time and shall not be liable for any cost of proposal preparation or submission.

The Government reserves the right to reconsider unselected proposals evaluated for award up until May 1, 2027 without the opening of additional rounds of proposal submissions.

The Government reserves the right to open additional rounds of proposal submissions. Additional requests, if applicable, will be posted on https://sam.gov as an amendment to this posting no later than May 1, 2027.

This announcement is anticipated to result in awards of procurement contracts. Attachment G: General Terms and Conditions contain terms and conditions that will be incorporated into any resulting awards.

Research Interests

For this announcement, the Government requests concept papers and proposals that address the specific research interest areas described in detail below. Offerors are not required to respond to each interest area or every sub-interest within the tiers. Offerors are encouraged to respond to their areas of expertise and knowledge and will be evaluated on that area. In addition, the Government strongly encourages Offerors to propose solutions to **other weather radar technology issues that are responsive to the aims of this BAA**, which are to conduct

research and exploratory development of new technologies to improve the detection of severe weather hazards using weather radar.

For reference, four appendices are provided as follows: Appendix 1 contains the readiness level (RL) definitions recognized by NOAA, Appendix 2 contains the baseline radar architecture, Appendix 3 contains the operations and maintenance baseline, and Appendix 4 contains data products for WSR-88D performance. Also, for reference, seven attachments are provided as follows: Attachment A contains the WSR-88D System Specification, Attachment B provides the WSR-88D Radar Site List, Attachment C provides NEXRAD Coverage, Attachment D contains NOAA/National Weather Service Radar Functional Requirements, Attachment E Radar Next Market Research Overview, Attachment F SOW Template, and Attachment G General Terms and Conditions.

Research interests have been prioritized into three tiers. Tier 1 contains NOAA's highest priority interests with planned awards before Tiers 2 and 3. Tier 1 interests are proposal-only (i.e., no concept paper is necessary). A concept paper is the necessary first step for Tier 2 and 3 interests. Planned awards are subject to the availability of funds.

TIER 1 (Priority)

1. **Radar Network Concept Alternatives**
   A primary architecture objective is to maintain data continuity, improve coverage, and improve the performance of the nation's radar network. The reference architecture (based on NEXRAD) achieves this by placing state-of-the-art radars in appropriate locations to meet NWS mission needs. The purpose of this section is to potentially satisfy and even exceed the baseline capabilities of the WSR-88D (Attachment A). These architectures can include hardware and software improvements and will likely utilize recent advancements in radar technology to improve performance, reduce cost, and improve reliability.

   Offerors are encouraged to suggest alternatives to the reference radar network architecture in order to identify potential cost savings, performance enhancements, beneficial business arrangements, etc., including answering architecture trade questions as described below:

   a. The future radar solution may be a mix of radar types, frequency bands, and communication links. What does industry recommend as an overall approach (radar types, frequencies, locations, acquisition, etc.) to meeting the mission performance of the Baseline Radar Architecture (Appendix B)? What are any advantages, disadvantages, or risks? Are there variations on this approach the NWS should consider? (This could include traditional or non-traditional platform arrangements including S-Band, C-Band, X-Band, Phased Array, and mobile/portable platforms.)
      i. The NWS would like to consider continuing to use S-Band radars in its network to meet current user needs.
      ii. Additional capability (coverage, update rate, data quality, etc.) is anticipated to meet the future needs of the NWS and the US economy.
      iii. Improving coverage can include extending the low-level radar coverage for meteorologically high threat areas and vulnerable communities.

iv. Improving data quality can include improving scan rates, spatial resolution, and the ability to discern meteorological features from noise, interference, and non-meteorological targets.
v. The NWS would also like to understand the Reliability, Availability and Maintainability (RAM) of the proposed approach.
vi. Novel architecture approaches to acquiring radar data cost effectively. This could include technologies such as multi-static radar systems, satellite radar data, and other techniques.

2. Commercially Owned Radar Network Alternatives

The Government is interested in proposals for novel integration and operational concepts, including documenting proposed roles/responsibilities, ROM cost considerations, pros/cons of different approaches, and potential risks and associated mitigation strategies. Would industry have an interest in investing in or developing a completely commercially owned, operated, and maintained radar network (meaning the primary radar source that must have a minimum of 96% system availability, operate 24/7, and meet current WSR-88D specifications (Attachment A))? What could the role of industry be with respect to Radar Next in terms of integration, maintenance and operations, operational availability, and data quality? Is there any interest from industry in providing radar data as a service? If so, at what level of assurance?

3. Integration of Data from Various Sources

a. Investigate the potential for integrating data from various agencies and organizations (such as commercially available data, media, and state-owned radars) with NOAA weather surveillance asset data, including Terminal Doppler Weather Radar (TDWR) and air surveillance radars, to enhance weather detection. This includes data from radars with different wavelengths (specifically S-, C-, and X-bands) and different types of radar (to include reflector dish and phased array). Key areas of consideration should include scan rates, scan types and techniques, resolution, latency, challenges with mosaicking, data size, assimilation into models, and display capabilities.
b. Evaluate the integration of radar data with other weather observation data sets (such as imagery and lightning data from NOAA geostationary satellites and high-resolution, rapid-refresh model data) to augment weather surveillance and forecasting capabilities.

4. Use of Phased Array Radar (PAR) Systems

a. What is the level of effort required to mature PAR technology for weather applications (to RL7) and associated timelines? What is the associated effort/cost to mature existing PAR technology (to RL9)?
b. What would be the projected cost of future PAR production ready units once the technology is matured? Does it get cheaper at increased levels of production?
    i. What are the major cost drivers/components and related impacts to performance that need to be considered when estimating the cost of manufacturing/producing a future PAR production unit?
    ii. What are the major cost drivers/components and related impacts to performance that need to be considered when estimating the cost of installing a future PAR production unit?

iii. What are the major cost drivers/components and related impacts to performance that need to be considered when estimating the cost of operating and maintaining a future PAR production unit?

c. Investigate the functionality, cost-effectiveness, security, technical performance, and feasibility of PAR for a nationwide or supplemental, next-generation weather surveillance system.
d. Investigate operations and maintenance (O&M) and support areas such as power consumption, heating/cooling specifications, reliability, O&M costs, and other maintenance considerations such as sparing and calibration.

TIER 2

5. Frequency Bandwidth Implications For PAR

Given that the likely deployment of additional radars beyond the current number of WSR-88Ds and the integration of PAR will likely require significantly greater bandwidth in the upper 2 GHz band, the Radar Next program is interested in the following frequency management research topics:

a. What is the maximum number of S-band radars that could operate within CONUS to fit within the 2.7-3.0 GHz band without interference compromising data integrity? Is there a model to illustrate how frequency would be applied across a network of a) single-face rotating PARs and b) four-face PARs?
b. What are the impacts of a network of PARs in terms of managing frequency?
c. Is there an optimal number of radars in a network to minimize frequency interference within the network?
d. What engineering solutions are available to mitigate frequency interference within a network of single-face rotating PARs and four-face PARs?
e. How would a four-face PAR be implemented in terms of frequency? Would each panel operate at the same frequency?
f. If each panel operated at the same frequency, how would that affect the detection of storms? For example, if a strong storm detected by one panel causes a reflection on another panel receiving at the same frequency at the same time, how would the signal processor know which panel the signal was coming from?
g. How will single- and dual-pol calibration be maintained during the frequency-agile operation of a single radar? How significant will the impacts be on antenna construction and engineering measurements (gains, losses, phase control, etc.)?
h. What are potential impacts to deployment of Radar Next if PAR is included in the next generation system and there is a reallocation of the lower 3 GHz either adjacent or into the current band (2.7 - 3.0 GHz)?

6. Future Radar Architecture

a. Explore how these technologies can be employed to counteract the increase in man-made and natural obstructions (e.g., wind turbines, trees, buildings) that hinder NWS' ability to sample, detect, and interrogate data in the lowest atmospheric levels.
b. Identify strategies for deploying and maintaining radars in complex terrains (e.g., mountains) both within and outside the continental United States (OCONUS).

c. Investigate the potential advantages and disadvantages of X-band radars, such as accuracy, for precipitation estimates, especially during severe weather. Also include any challenges and mitigations.
d. Explore how space-based radar can be utilized to enhance NEXRAD radar coverage gaps, capabilities, and performance (e.g., aerial coverage, latency, resolution, sensitivity).

7. Use of PAR Systems

a. Analyze the performance of PAR technologies in weather surveillance against the objectives outlined in Attachment D. Criteria for evaluation should include, but not be limited to, dual polarization performance, the effect of calibrated beamwidth and shape when scanning electronically, calibration techniques, and the ability to perform rapid updates.
b. Evaluate the potential of various PAR architectures and designs to enhance weather detection capabilities.
c. Explore the application of PAR technology in weather detection and surveillance, including factors like spectrum usage, communication and bandwidth requirements, panel and antenna size, proprietary/intellectual property protections, and site security requirements.

8. Radar Networking and Infrastructure

a. Research and explore options for data storage, networking, hosting, analysis, and accessibility, including a cloud-based architecture, while ensuring data integrity, cost-effectiveness, access flexibility, and network resilience.
b. Assess how a cloud-based architecture can not only help with data storage, but how it can continue to enable product generation without latency issues.
c. Investigate the feasibility and advantages of commercial partnership opportunities and novel funding approaches to minimize operational costs.
d. Study innovative solutions to lower the cost of operations and maintenance, improve preventative maintenance and outage restoration, optimizing supply chain processes, and mitigating future technology obsolescence issues.

9. Radar Technology Advancements in Weather Detection

a. Investigate novel techniques, processes, or technologies that can enhance the probability of hydrometeor recognition, detection, and identification. This should also improve the identification of phenomena such as tornadoes, other severe storm impacts (e.g., hail and downburst winds), and fire behavior for use in predictive models.
b. Explore methods, radar system concepts, technologies, or processes that can boost the signal-to-noise ratio (SNR), dual polarization variables, and pattern recognition for phenomena detection and identification.
c. Areas for enhancement should also encompass quantitative precipitation estimates (QPEs), quantitative precipitation forecasts (QPFs), dwell time, scan time, precision in reflectivity and hydrometeor distribution.

10. Application of Artificial Intelligence (AI) in Radar Technology

a. Investigate how AI can be used to improve hazardous weather detection regarding weather radar capabilities, including seeking to understand where AI can have the greatest impact on weather radar techniques and solutions given the NWS' unique mission and needs.
b. Identify areas where AI is being used or developed in other systems for potential application to a Doppler radar-based next generation weather surveillance system. Areas of exploration should address but are not limited to the application of AI to improve lead time and accuracy of weather warnings and alerts, data analysis, data quality, image processing, noise, clutter, energy consumption, spectrum interference, and command and control applications for a network of radars.

11. Mobile Radar Technology and Operations

a. Investigate whether a mobile weather radar capability can and should be employed as part of the Radar Next solution set, including the conditions under which mobile radars should be employed and their general architecture.
b. Assess the ideal starting point for implementing a mobile radar capability concept of operations (CONOPS) (e.g., would it be just for emergencies/downtimes for maintenance or damage repairs, would/could it be used as strategic gap fillers in advance of predicted severe weather or potential flash flood events over post-wildfire burn scar regions?)
c. Assess the scalability of a mobile radar capability over time. How could /should it be scaled over time?
d. If a mobile radar capability were to be utilized as a strategic gap filler, what would be the recommended governance structure for making decisions on how/when/where to deploy units?

12. Other proposed research and exploratory development of new technologies to improve weather radar detection capabilities or to adapt other radar technologies for application in weather radar systems.

TIER 3

13. Weather Radar Technology Maturation

The NWS is interested in exploring the use of new technologies and techniques of current technologies in the next generation weather surveillance Doppler radar network. The current NEXRAD system incorporates S-Band radars with performance characteristics outlined in Appendix 4 (Data Products). All technology concepts must equal or exceed the performance of the current radar system (at S-Band) or demonstrate comparable performance at other frequencies. The goal of the maturation effort is to produce and demonstrate a technology concept that is consistent with Radar Next use at the indicated RL.

a. Offerors are invited to submit a concept of maturing an existing dual polarization Doppler weather radar to a RL6-9. Maturation may include improving the performance of the transmitter, receiver, antenna, signal processing, and other related components.

b. Offerors are invited to submit a concept of maturing an existing dual polarization Doppler weather phased array radar to a RL6-9.
c. Offerors are invited to submit a concept of maturing an existing phased array radar used for purposes other than weather surveillance to a dual polarization weather surveillance Doppler radar at a RL6-9.
d. Offerors are invited to submit a concept of maturing other types of radar technology to dual polarization weather surveillance Doppler radar capability at a RL6-9.

TIER 1 INSTRUCTIONS

SUBMISSION INSTRUCTIONS

Proposal Q&A period

Offerors are instructed to contact ONLY the Contracting Officer (CO) regarding any aspect of the requirement prior to contract award. Questions shall be submitted in writing to the Contract Specialist, Holly Ferguson at holly.ferguson@noaa.gov, and Contracting Officer, Kevin Buum at kevin.buum@noaa.gov, no later than 3:00 PM EDT, January 20, 2025.

Proposal Submission

Offerors shall submit proposals via email to the Contract Specialist, Holly Ferguson at holly.ferguson@noaa.gov, and Contracting Officer, Kevin Buum at kevin.buum@noaa.gov, by 11:59 pm EST on March 28, 2025 to be considered in the initial round of award(s).

The subject line for submission shall be formatted as follows:

"[Offeror Name] BAA Tier 1 Proposal Submission for WEATHER RADAR TECHNOLOGY EXPLORATION FOR THE NWS"

Only one round of awards is planned for Tier 1 at this time; however, proposals received after this date will still be considered for future awards pending available funding.

All proposal submissions must be unclassified and without restriction.

PROPOSAL FORMAT AND CONTEXT

Proposals shall adhere to the content/formatting requirements outlined below. The Government reserves the right to reject any proposal that does not include all requested information as non-responsive.

Proposal Volume	Volume Title	Page Limit	Format
Volume I	Technical Proposal	15 Pages (Cover Page and Table of Contents Excepted)	PDF
Volume II	Pricing Proposal	No Page Limit	PDF/Excel
Volume III	Administrative Proposal	No Page Limit	PDF/Excel

VOLUME I – TECHNICAL PROPOSAL

Technical proposals shall adhere to the following requirements and shall be no more than 15 pages in length, cover page and table of contents excepted. The Government reserves the right to reject any proposal that does not include all requested information as non-responsive.

Technical Proposal Formatting Requirements:

Offerors shall submit technical proposals in Adobe PDF format as follows:

1. Page Size: 8.5" x 11”
2. Margins: No less than 1” on all sides
3. Spacing: No less than 1.15 point
4. Font: Arial or Times New Roman, 12 point

Text within charts and tables may deviate from specified font and spacing guidelines, if necessary, but shall be clearly legible. Charts, tables, and figures are part of the 15-page proposal length limit.

Technical Proposal Content Requirements:

1. **Cover Page** (excepted from page limitation)**:** Offerors shall prepare a separate cover page labeled "TECHNICAL PROPOSAL" that includes the following information at a minimum:
    a. Offeror name;
    b. Offeror https://sam.gov Unique Entity Identifier (UEI);
    c. Solicitation number;
    d. Solicitation title;
    e. Proposal title;
    f. Offeror’s administrative and technical points of contact;
    g. Contact information for administrative and technical points of contact (telephone, mailing addresses, and email addresses);
    h. Total proposed price;
    i. Proposed period(s) of performance, inclusive of a base period and any proposed option period(s);
    j. Offeror representative name, title, and signature.

2. **Table of Contents** (excepted from page limitation)

3. **Statement of Work:** Offerors shall prepare a Statement of Work (SOW) in accordance with the information and instructions within Attachment F. The SOW shall be unclassified and shall not include any proprietary restrictions, as the SOW will be incorporated into any resultant award.

    DO NOT INCLUDE ANY PROPRIETARY OR RESTRICTED DATA IN THE SOW. If necessary to support the proposal, this data may be included in an Appendix

(not excepted from the SOW page limitation) as a supplement to the SOW, with each page containing proprietary drawings, information or data appropriately marked. The Government reserves the right to modify the proposed SOW based on clarification sessions with the Offeror prior to the contract award. Additionally, it is the Offeror's responsibility to perform their own determination of the export jurisdiction and classification of the products and technologies developed as it relates to technical data under the International Traffic in Arms Regulations (ITAR) in accordance with 22 CFR Chapter 1 Subchapter M, compliance with the DOC export control regulations, and other export control regulations.

4. **Assertion of Data Rights:** Include in this section a summary of any proprietary rights to preexisting results, prototypes, or systems supporting and/or necessary for the use of the research, results, and/or prototype. Any rights made in other parts of the proposal that would impact the rights in this section must be cross-referenced. If there are proprietary rights, the Offeror must explain how these affect its ability to deliver subsystems and toolkits for integration. Additionally, Offerors must explain how the program goals are achievable in light of these proprietary and/or restrictive limitations. If there are no claims of proprietary rights in preexisting data, this section shall consist of a statement to that effect.

5. **Contractor Qualifications:** A discussion of previous accomplishments and work in this, or closely related areas, and the qualifications of the investigators. Describe the organizational experience in the relevant subject area(s), existing intellectual property, and specialized facilities. Discuss any work in closely related research areas and previous accomplishments. Identify other Government solicitation(s) to which this concept has been proposed. If applicable, state whether funding or a positive funding decision has already been received and from which agency. Key personnel resumes shall be attached to the proposal and will not count toward the page limitations. All personnel necessary for the performance of the work shall be available and in place as soon as reasonably possible, but no later than within one (1) month of contract award.

6. **Management Approach:** A discussion of the overall approach to the management of this effort, including brief discussions of the total organization, use of personnel, project/function/subcontractor relationships, government research interfaces, and planning, scheduling and control practice. Identify which personnel, collaborators, and subcontractors (if any) will be involved. Include a description of the facilities that are required for the proposed effort with a description of any government furnished equipment, hardware, software, or information required, by version and/or configuration. Identify any planned collaborations with Industry partners, including the nature of the collaboration.

7. **Schedule and Milestones:** Provide a detailed schedule showing tasks (task name, duration, work breakdown structure element as applicable, performing organization), milestones, and the interrelationships among tasks. The task structure must be consistent with that in the SOW. Measurable milestones should be clearly articulated and defined in time relative to the start of the project.

VOLUME II - PRICING PROPOSAL

The Pricing Proposal shall be separate from the Technical Proposal and shall be provided in Microsoft Excel format. Submitted files shall contain all formulas, calculations, and worksheet/workbook links used to compute the proposed amounts. Formulas, calculations, and links shall not be hidden. Dollar values shall be submitted with no more than two decimal places.

If optional tasks or phases are proposed, the core/base proposal must be a standalone effort representing value to the Government even if optional tasks or phases are not exercised/funded. Optional phases or tasks, if proposed, shall be separately priced.

The Pricing Proposal shall be comprised of the elements listed below at a minimum:

1. **Direct Labor:** The Offeror shall provide anticipated labor categories, hourly rates, and levels of effort (hours) necessary to support the requirements of this BAA and the Offeror's quoted technical solution, and shall provide pricing totals for each line item in addition to a grand total for the entire contract period.

2. **Contractor Acquired Equipment:** Proposed contractor-acquired equipment, such as computer hardware, shall be specifically itemized. An explanation of any estimating factors, including their derivation and application, shall be provided. Please include a brief description of the offeror's procurement method.

3. **Supplies/Materials Pricing**: Materials shall be specifically itemized with estimated pricing. An explanation of any estimating factors, including their derivation and application, shall be provided.

It is the Government's intention that any FFP contracts resulting from this BAA will have three contract line item numbers (CLINs) for each project, with the associated percentages of the contract value payable upon completion of each task.

CLIN 0001: Kickoff meeting (25%)
CLIN 0002: Mid-term meeting (35%)
CLIN 0003: Final presentation and final report acceptance (40%)

If the Offeror suggests a different CLIN structure and payment schedule based on the proposed Schedule and Milestone in Volume I, this information shall be provided in the Price Proposal.

VOLUME III – ADMINISTRATIVE PROPOSAL SUBMISSIONS

The administrative proposal shall contain the following information:

1. **Accounting System Point of Contact:** The name and telephone number of the person to contact regarding your proposed accounting system.

2. **Existing Government Commitments:** Any current commitments with the Government relating to the work or services and whether these commitments will or will not interfere with the completion of work and services as contemplated under this BAA.

3. **Use of Current/Former NOAA Personnel:** Whether any current or former NOAA employee(s) will be utilized on this project. Provide the individual's name when employed by NOAA, where employed, and the capacity in which employed.

4. **Offeror Resources:** A confirmation that the Offeror has the necessary financial capacity, working capital, and other resources to perform the contract without assistance from any outside source. (If not, indicate the amount required and the anticipated source.)

5. **DCAA/DCMA Points of Contact:** Information for the Offeror's cognizant Defense Contract Audit Agency (DCAA) and Defense Contract Management Agency (DCMA) point of contact, address, phone, and email, if applicable.

6. **Environmental Considerations:** Discuss all applicable environmental and energy conservation objectives associated with the acquisition (see FAR Part 23), the applicability of an environmental assessment or environmental impact statement (see 40 Code of Federal Regulations (CFR) 1502), the proposed resolution of environmental issues, and any environmentally-related requirements to be included in the resultant contract.

7. **Representations, Certifications, and Other Statements of Offerors:** An affirmative statement that the Offeror's Representations and Certifications (Reps & Certs) are current at https://sam.gov. Each Offeror is required to complete the online Reps & Certs at https://sam.gov prior to submission of proposal and verification/validation is a prerequisite to award under this BAA.

8. **Additional Required Disclosure:** Each Offeror shall state specifically whether, as part of preparing a response to this BAA or performing work under any resulting contract, the Offeror has previously utilized, is currently utilizing, or intends to utilize any partners, subcontractors, and/or consultants. If so, Offerors shall provide the names and addresses of any and all individuals and/or companies acting in the capacity of partners, subcontractors, and/or consultants, and the specific nature of the engagement.

9. **FFRDC:** Each Offeror shall provide a letter on letterhead from their sponsoring organization citing the specific authority establishing their eligibility to propose to Government solicitations and compete with industry.

10. **Government Entities:** Each Offeror shall provide written documentation citing the specific statutory authority (as well as, where relevant, contractual authority) establishing their ability to propose to Government solicitations.

11. **Exception to Terms and Conditions:** Offeror shall provide any potential exceptions to terms and conditions incorporated into the award.

EVALUATION CRITERIA

Upon receipt of a proposal, the Government will perform a review of the proposal through a peer or scientific review process considering technical and importance to NOAA's programs. The Government will also determine if funds are expected to be available based on the proposed cost of the effort. Proposals not considered to have sufficient technical merit or importance to the NOAA mission programs or those in areas for which funds are not expected to be available may be declined without being subject to the detailed evaluation described below. Proposals need not be evaluated against each other.

Proposals will be evaluated considering technical and importance to NOAA's programs by utilizing the following criteria listed in descending order of importance: Technical Approach (based on the SOW), Management Approach, Schedule Realism, and Contractor Qualifications. Overall Technical Merit is considered more important than Price. All proposals will be assigned a rating of either **"Favorable"** or **"Unfavorable".**

1. **Overall Technical Merit:**

    a. Technical Approach: The proposed technical approach is innovative, feasible, achievable, and complete. The Government will determine if the approach is feasible by conducting an analysis, which will examine various aspects like technical viability, and financial costs. Task descriptions and associated technical elements provided are complete and in a logical sequence with all proposed deliverables clearly defined such that a final outcome that achieves the goal can be expected as a result of award. The proposal identifies major technical risks and planned mitigation efforts are clearly defined and feasible.
    b. Management Approach: The Offeror's management approach will be evaluated based on the clarity and feasibility of the proposed organizational structure, and its effectiveness in ensuring the efficient execution of the project. This includes the ability to manage personnel, subcontractors, and any collaborations with industry partners, as well as the coordination of government research interfaces.
    c. Schedule Realism: The proposed schedule aggressively pursues performance metrics in an efficient time frame that accurately accounts for the anticipated workload. The proposed schedule identifies and mitigates any potential schedule risk.
    d. Contractor Qualifications: The Offeror's prior experience in similar efforts clearly demonstrates an ability to deliver products that meet the proposed technical performance within the proposed budget and schedule. The proposed team has the expertise to manage the cost and schedule. Similar efforts completed/ongoing by the proposer in this area are fully described including identification of other Government sponsors.

2. Price:

a. The Government will evaluate the Offeror's price proposal in accordance with FAR 15.404, Proposal Analysis in order to determine that the price is fair and reasonable.

Discussions, Proposal Revisions, and Partial Award(s)

The Government reserves the right and intends to award without discussions. Each Offeror should submit its best proposal as the opportunity to submit a revised proposal is not assured. If, during the evaluation period, it is determined to be in the best interest of the Government to hold discussions with individual Offerors, these discussions may be held with individual Offerors or a limited number of Offerors at the discretion of the CO.

Normally, an entire proposed effort is funded. However, the Government may be interested in awarding only part(s) of a proposal or adding/removing optional phases, tasks, or option periods. If optional tasks or phases are proposed, the core/base proposal must be a standalone effort representing value to the Government even if optional tasks or phases are not exercised/funded. The Government reserves the right to award all or part of an Offeror's proposed effort and therefore requests that the proposed SOW clearly delineate proposed tasks/phases.

Basis of Award

Awards will be made for the proposal(s) determined to be the most advantageous and the best value to the Government as evaluated under the criteria described in this section. Each proposal will be evaluated based on the merit and relevance of the specific research proposed as it relates to the overall NOAA mission rather than against other proposals for research in the same general area.

TIER 2 and 3 INSTRUCTIONS

TIER 2 & 3 Process: The two-step process will be utilized for Tier 2 and Tier 3 submissions, which includes the submission of a concept paper that may lead to an invitation to submit a proposal, which would include a technical, pricing, and administrative volume. Potential offerors are invited to submit brief descriptive concept papers in lieu of full proposals. Concept papers will be reviewed for further consideration. Full proposals will be requested from those Offerors selected in the concept paper review process.

No proposals will be accepted for a Tier 2 or 3 research interest unless a concept paper has been submitted and evaluated beforehand. If an Offeror's concept is selected to move forward based on NOAA's evaluation of their concept paper, instructions for the full proposal will be emailed directly to the Offeror.

SUBMISSION INSTRUCTIONS

Concept Paper Q&A Period

Offerors are instructed to contact ONLY the CO regarding any aspect of the requirement prior to contract award. Questions shall be submitted in writing to the Contract Specialist, Holly Ferguson at holly.ferguson@noaa.gov, and Contracting Officer, Kevin Buum at kevin.buum@noaa.gov, no later than 3:00 PM EDT on February 20, 2025.

Concept Paper Submission

Offerors shall submit concept papers via email to the Contract Specialist, Holly Ferguson at holly.ferguson@noaa.gov, and Contracting Officer, Kevin Buum at kevin.buum@noaa.gov, by 11:59 pm EST on April 30, 2025 to be considered in the initial round of award(s). Concept papers received after this date will still be considered and evaluated for later award(s) pending available funding. Tier 3 concept papers will be considered after initial Tier 2 evaluations.

The subject line for concept paper submission shall be formatted as follows:

"[Offeror Name] BAA Concept Paper Tier 2 or 3 Submission for WEATHER RADAR TECHNOLOGY EXPLORATION FOR THE NWS"

CONCEPT PAPER FORMAT AND CONTENT

Concept Paper Format Requirements:

All concept paper submissions must be unclassified and without restriction. Concept papers do not require any special forms, but must be submitted in the following format:

> **Page Limit.** The submission is limited to one cover page, one, page quad chart, and the concept paper shall not to exceed seven pages. This results in a submission packet not to exceed nine pages. If submissions exceed these limitations, only those pages previously defined will be reviewed.

- Existing commercial documentation and product literature can also be submitted separately and **is not** subject to a page limitation.
- Contact information **does not** count against the page limit.
- Any supporting technical drawings/data may be included in an appendix and **does not** count against the page limit.
- Past performance summaries and references **do not** count against the page limit.
- Incorporated figures, charts, and images **do** count against the page limit.

General. For each distinct concept paper submission, combine all files and forms into a single searchable PDF file before submitting.

- Page size: 8 ½ x 11" with 1" margins
- Single Spacing
- Arial or Times New Roman font, size 12 point. Charts, tables, and graphics may use Arial or Times New Roman size 10 font.
- Text within charts and tables may deviate from specified font and spacing guidelines, if necessary, but shall be clearly legible.
- The file should not exceed 10 megabytes of storage space. Movie and sound file attachments, URL Links, or other additional files will not be accepted.

Concept Paper Content Requirements

Interested Offerors shall submit a concept paper proposing a distinct technology, architecture, and/or research concept as described in Tier 2 interests (5 – 12) and Tier 3 interest (13) . The concept paper shall describe the Offeror's concept's ability to address the needs and requirements detailed in the appropriate Tier interest. Merely restating the minimum Tier study objectives is not sufficient. The core components of the concept paper include a detailed explanation of the concepts being proposed, including definitions of how the Offeror plans to meet the requirements for that given concept, including but not limited to:

1. What concept are they proposing to study?
2. What do they plan to accomplish in the study timeframe?
3. What do they plan to deliver at the end of the study?
4. How does their concept contribute to the NWS' mission of protection of life and property and enhancement of the national economy through the issuance of timely and accurate weather forecasts and warnings?

For technology concepts, the Offeror must supply sufficient data to justify the RL maturity of the candidate technology. The price portion of the concept paper shall contain a high-level estimate on the work (Rough Order of Magnitude (ROM)) intended to be completed during the study. A detailed price proposal will be required if an Offeror moves to the next stage of the selection process. Offeror will receive an email with proposal submission instructions.

Offerors should indicate in their concept paper whether they believe the scope of the research is fundamental or not. While Offerors should clearly explain the intended results of their

research, the Government shall have sole discretion to determine whether the proposed research shall be considered fundamental. Appropriate language will be included in resultant awards for non-fundamental research to prescribe publication requirements, as appropriate.

Concept papers that are outside the scope of the BAA may be removed from consideration.

Content Details

1. **Cover Page**: Offerors shall prepare a separate cover page labeled "CONCEPT PAPER" that includes the following information at minimum:
   Offeror name:
   a. Offeror name;
   b. Offeror https://sam.gov Unique Entity Identifier (UEI);
   c. Solicitation number;
   d. Solicitation title;
   e. Proposal title;
   f. Offeror's administrative and technical points of contact;
   g. Contact information for administrative and technical points of contact (telephone, mailing addresses, and email addresses);
   h. ROM or high-level pricing estimate;
   i. Estimated period(s) of performance, inclusive of a base period and any proposed option period(s);
   j. Offeror representative name, title, and signature.

2. **Abbreviated Statement of Work:** The abbreviated SOW must clearly describe the objectives, general scope, and anticipated technical approach. The abbreviated SOW shall include the following sections:

   - **Title of Project:** Provide a descriptive title that reflects the proposed effort.

   - **Synopsis of the Technical Approach:** This section shall include the Problem Statement or Focus Area and identify specifically what issue or focus area the research or technology is attempting to address.

     a. **Background**: The background section should provide a clear and brief description of the relevance of the proposed effort and discuss the research or technology that will be proposed in general, non-technical terms.
     b. Describe each step of the technical approach and how it will be used to solve the issue designated in the problem statement.
     c. If technology is being proposed, define the state of readiness (RL, manufacturability, etc.) and what is needed to bring the technology to the level of development necessary to solve the designated problem. Also, identify any known or perceived barriers to the implementation of this technology due to the uniqueness of the weather radar environment or statutory regulations.

- **Objective:** A brief and succinct statement of what will be done relevant to the problem statement and the expected outcome.

- **Scope of Work:** The scope of work should provide a brief and clear description in non-technical terms as much as possible and should identify the major steps that will be undertaken to achieve the proposed outcome. The scope of work should address the following areas:

. Briefly describe the current state of the challenge, issue, or technology.
   b. Address the issues expressed in the background section and how the proposed research or technology will be developed to solve the problem.
   c. Briefly describe the specific tasks and phases of the work.
   d. Specify the period of performance for the total effort and each task or phase.
   e. Milestones, schedule, and decision points, including rough estimates of cost for each year, task and phase of the effort and total cost.

- **Deliverables:** Provide a summary of the deliverables including:
   a. Monthly or quarterly technical reports.
   b. Monthly or quarterly financial progress reports.
   c. Milestone reports.
   d. Draft Final and Final report. (Note: Time must be included in the schedule for the Government to review the Draft Final report and potentially ask questions, typically 30 days).

- **Key Personnel:** A summary of the key personnel including: a listing of key personnel with a short summary of qualifications.

3. **Price Portion:** The price portion of the concept paper shall include a ROM price estimate. No detailed price support information should be forwarded; only a time-phased bottom line figure should be provided.

4. **Schedule and Milestone:** Provide a notional schedule showing tasks (task name, duration, work breakdown structure element as applicable, performing organization), milestones, and the interrelationships among tasks. The task structure must be consistent with that in the SOW.

Quad Chart Guidelines

Offerors should provide a one-page quad chart (landscape view) that contains the following information. Any quad chart submitted that exceeds the one-page limit will not be read or evaluated.

a. **Heading:** Project title, BAA #, research interest, administrative/technical point of contact (name, email, phone number), company name and address. Note that the title of the project should be different from the research interest.

b. **Upper Left:** Objective: should be 2-3 sentences describing the objective and methodology. Description of effort: a few bullet points noting the primary concept/challenge.
c. **Lower Left:** Benefits of proposed technology or research.
d. **Upper Right:** Picture or graphic illustrating the research or the concept.
e. **Lower Right:** Milestones, period of performance, total ROM price estimate for the study.

CONCEPT PAPER EVALUATION

The Government will evaluate the Offeror's concepts as defined in their concept paper for their ability to meet the requirements as defined in this document. If the Offeror submits multiple concept papers, the Government will evaluate each study submission as independent studies and one (1) submission will not affect the evaluation of the other submission. The Government will evaluate the contents of the cover page, abbreviated statement of work, synopsis of technical approach, price portion, and schedule and milestones and assign a rating of either **"Favorable"** or **"Unfavorable".**

Offerors receiving a **"Favorable"** rating for their concept paper **may** receive a request to submit a formal proposal. Offerors receiving an **"Unfavorable"** rating for their concept paper **will not** receive a request to submit a formal proposal. Offerors that do not submit a concept paper may not submit a full proposal and will not be considered for award.

Upon completion of concept paper evaluations, Offerors will receive written notice regarding the favorability determinations for their concept paper submission(s). A **"Favorable"** rating of a concept paper does not constitute selection of the proposed effort for contract award and will not establish a binding commitment for the Government to fund the effort in whole or in part.

The Government **will not** offer debriefs to Offerors whose concept papers are rated unfavorable. The Government reserves the right to reconsider unselected concept papers evaluated for award up until May 1, 2027 without the opening of additional rounds of concept paper submissions.

If an Offeror's concept is selected to move forward based on the evaluation of their concept paper, instructions for the full proposal will be emailed directly to the Offeror and subject to FAR 52.232-18 -- Availability of Funds. The Government anticipates awarding multiple contracts, but reserves the right to award no contracts, or a combination of contracts or contract options based upon availability of funds.

BAA Solicitation Appendices, Attachments, and Forms

The following documents are provided for reference only and do not represent requirements for the next generation Doppler weather radar surveillance system.

Appendices

Appendix 1: Definitions of Readiness Levels
Appendix 2: Baseline Radar Architecture
Appendix 3: Operations and Maintenance Baseline
Appendix 4: Data Products

Attachments

Attachment A: WSR-88D System Specification
Attachment B: WSR-88D Radar Site List
Attachment C: NEXRAD Coverage
Attachment D: NOAA/National Weather Service Radar Functional Requirements
Attachment E: Market Research Overview
Attachment F: Statement of Work Template
Attachment G: General Terms and Conditions

Appendix 1 - Definitions of Readiness Levels

RL 1—Basic research, experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view. Basic research can be oriented or directed towards some broad fields of general interest, with the explicit goal of a range of future applications (OECD, 2015).

RL 2—Applied research, original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific, practical aim or objective. Applied research is undertaken either to determine possible uses for the findings of basic research or to determine new methods or ways of achieving specific and predetermined objectives (OECD, 2015).

RL 3—Proof-of-concept for system, process, product, service, or tool; this can be considered an early phase of experimental development; feasibility studies may be included.

RL 4—Successful evaluation of system, subsystem, process, product, service, or tool in a laboratory or other experimental environment; this can be considered an intermediate phase of development.

RL 5—Successful evaluation of system, subsystem process, product, service, or tool in relevant environment through testing and prototyping; this can be considered the final stage of development before demonstration begins.

RL 6—Demonstration of a prototype system, subsystem, process, product, service, or tool in relevant or test environment (potentially demonstrated).

RL 7—Prototype system, process, product, service or tool demonstrated in an operational or other relevant environment (functionality demonstrated in near-real world environment; subsystem components fully integrated into system).

RL 8—Finalized system, process, product, service or tool tested and shown to operate or function as expected within the user's environment; user training and documentation completed; operator or user approval given.

RL 9—System, process, product, service or tool deployed and used routinely.

Appendix 2 - Baseline Radar Architecture

For the purposes of this announcement, NOAA is providing a baseline radar architecture for the existing NEXRAD system. This reference network is for planning purposes within this announcement. It serves as the baseline case against which variations can be assessed but does not reflect future requirements that could affect radar coverage. The architecture consists of:

1. 143 S-Band Dual Polarization Doppler radars spaced across CONUS to cover major population centers, major airports and transportation infrastructure, major military installations, and other areas of critical infrastructure. All of these are rotating parabolic dishes.
2. 7 S-Band Dual Polarization Doppler radars spaced across Alaska to cover major population centers, major airports and transportation infrastructure, major military installations, and other areas of critical infrastructure. All of these are rotating parabolic dishes.
3. 4 S-Band Dual Polarization Doppler radars spaced across Hawaii to cover major population centers, major airports and transportation infrastructure, major military installations, and other areas of critical infrastructure. All of these are rotating parabolic dishes.
4. 1 S-Band Dual Polarization Doppler radar located in both Puerto Rico and Guam to cover major population centers, major airports and transportation infrastructure, major military installations, and other areas of critical infrastructure. These are both rotating parabolic dishes.

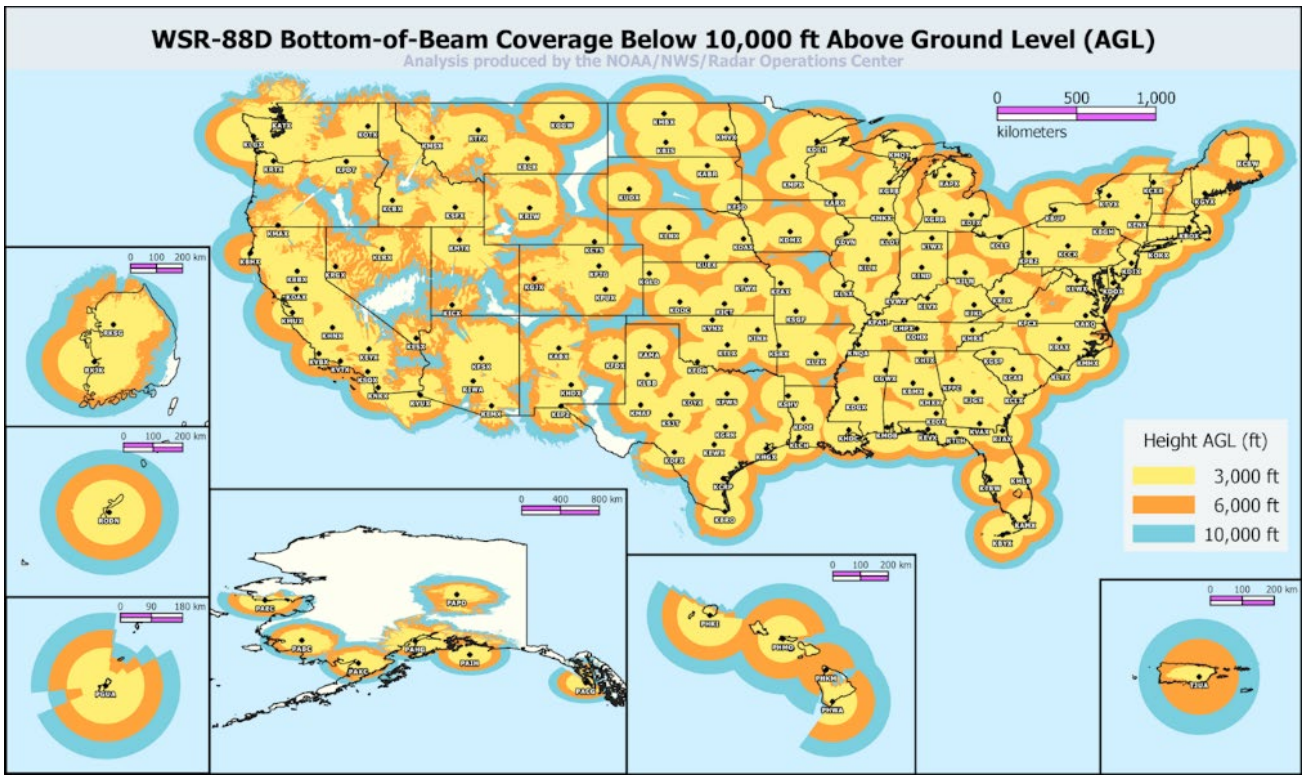

Figure 1: NEXRAD volume coverage below 10,000 ft. for CONUS and OCONUS.

The baseline radar network will generally represent the achieved operational capabilities of the WSR-88D with dual polarization. A description of these capabilities, including the data products and the measurement quality of these products is provided in Attachment D: NOAA/National Weather Service Radar Functional Requirements.

Appendix 3 - Operations and Maintenance Baseline

For the purposes of this announcement, the following overview of NEXRAD O&M activities is provided as a baseline. It serves as the baseline case against which concepts for improvement can be assessed but does not reflect future O&M requirements. NEXRAD currently uses radars that were designed and developed in the early 1990s and is currently under a SLEP since 2015 to extend the life of the radars.

- **Operations.** The NWS ROC located in Norman, Oklahoma, provides 24x7 Help Desk support for all NEXRAD technical and/or operational issues. A mobile team is on-call to support outage restoration and/or troubleshoot issues in the field.

- **Maintenance.** Routine maintenance of NEXRAD is performed by electronic technicians assigned to Weather Forecast Offices nationwide. Technicians are responsible for executing system modifications, replacing components, and diagnosing technical issues.

- **Repair**. Failed parts are sent for repair to the National Reconditioning Center (NRC) in Kansas City, Missouri. If unable to fix the part themselves, the NRC ships it to the Original Equipment Manufacturer.

Appendix 4 - Data Products

System bias

The radar hardware calibration must determine the measurement uncertainties related to the system hardware components as accurately as possible for all radar variables. Accurate system bias calculation ensures that observations accurately represent the returned signals for those variables.

WSR-88D capability, in the absence of clutter filtering:

- Reflectivity: 1 dBZ for target with true spectrum width of 4 m/s and SNR > 10 dB
- Velocity: 0.0 m/s for target with true spectrum width of 4 m/s and SNR > 8 dB
- Spectrum Width: 0.2 m/s for target with true spectrum width of 4 m/s and SNR > 10 dB
- Differential Reflectivity: 0.1 dB for target with true differential reflectivity (ZDR) of less than ±1 dB, true spectrum width of 2 m/s, Correlation Coefficient ≥ 0.99, dwell time of 50 ms and SNR ≥ 20 dB (for ZDR with a magnitude greater than 1 dB, bias should be less than 10% of the ZDR magnitude)
- Correlation Coefficient: 0.006 for target with true spectrum width of 2 m/s, Correlation Coefficient ≥ 0.99, dwell time of 50 ms and SNR ≥ 20 dB
- Differential Phase: 1 deg for target with true spectrum width of 2 m/s, Correlation Coefficient of ≥ 0.99, dwell time of 50 ms and SNR ≥ 20 dB

Standard Deviation of Estimates of Radar Variables

The radar variable values generated by signal processing of target return signals must be consistent from observation to observation for any given type of spatially homogeneous weather target to ensure reliability and dependability for subjective and objective applications of the data. Accurate estimations of system bias and low standard deviations of estimates of radar variables are critical components of the accuracy and representativeness of the radar variable estimates.

Performance of WSR-88D:

- Reflectivity: ≤ 1 dB for target with true spectrum width of 4 m/s and SNR ≥ 10 dB
- Velocity: ≤ 1 m/s for target with true spectrum width of 4 m/s and SNR > 8 dB
- Spectrum Width: ≤ 0.5 m/s for target with true spectrum width of 2 m/s and < 0.95 m/s for true spectrum width of 4 m/s and SNR > 10 dB
- Differential Reflectivity: < 0.4 dB for target with true spectrum width of 2 m/s, Correlation Coefficient ≥ 0.99, dwell time of 50 ms and SNR ≥ 20 dB
- Correlation Coefficient: < 0.006 for target with true spectrum width of 2 m/s, correlation coefficient ≥ 0.99, dwell time of 50 ms and SNR ≥ 20 dB
- Differential Phase: < 2.5 deg for target with true spectrum width of 2 m/s, correlation coefficient of ≥ 0.99, dwell time of 50 ms and SNR ≥ 20 dB

Quantization of Radar Variables

Radar variables must be provided to data processing systems with sufficient quantization to support data accuracy determinations and to provide the capability to reveal the small scale, often critical, variations of values within many weather targets (e.g., convective storms). Radar variable quantization is sometimes used interchangeably with precision of the variable estimates (e.g., the WSR-88D System Specification), even though such usage is not technically correct.

Performance of WSR-88D:

- Reflectivity: 0.5 dB
- Velocity: 0.5 m/s
- Spectrum Width: 0.5 m/s
- Differential Reflectivity: 0.0625 dB
- Correlation Coefficient: 0.00333
- Differential Phase: 0.35 deg