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Federal Weather Radar: In Brief

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SUMMARY

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Federal Weather Radar: In Brief

Extreme weather events, such as high winds, tornadoes, and heavy rainfall, impact communities across the United States each year. These extreme events can result in property damage, injuries, and lives lost. Multiple federal agencies have an interest in weather forecasting and warning. For example, Congress has directed the Secretary of Commerce to observe, forecast, and warn the public of weather and floods (15 U.S.C. §313), among other responsibilities. To do so, the Secretary has delegated responsibility for establishing and maintaining a series of weather radars across the country for observation and forecasting purposes to the National Oceanic and Atmospheric Administration (NOAA). NOAA works with the Federal Aviation Administration (FAA) and the U.S. Air Force—collectively known as the *tri-agencies*.

The tri-agencies operate 158 pulsed Doppler weather radars around the world, known as the Next Generation Weather Radar (NEXRAD) system. The radars scan the sky to assess atmospheric conditions at different heights above the ground. Forecasters use radar data to identify the different types (e.g., rain, hail, snow, ice, sleet) and intensity of precipitation, and to detect airborne tornado debris or conditions for possible tornado development. Forecasters analyze information from across the system to forecast and issue severe weather watches and warnings.

Members of Congress and other stakeholders have expressed a variety of concerns with NEXRAD. Concerns have generally centered on gaps in radar coverage, interference with radar, and the end of NEXRAD's design life in the early 2030s. Groups such as NOAA's Science Advisory Board and Environmental Information Services Working Group have recommended several immediate and future actions NOAA could take to address these issues. In 2019, NOAA found no "significant areas of warning service deficiency due to reduced radar coverage" and recommended an "all of the above" approach to improving hazardous weather detection. NOAA has responded to some stakeholder concerns and recommendations with various activities over time, such as the purchase of commercial radar data, changes in radar operations (in some cases), and the use of non-NOAA radar data. NOAA's Radar Next Program also continues to assess various radar technologies, including phased array radar, to determine the future weather radar system.

Congress continues to examine the strengths and weaknesses of NEXRAD, including stakeholder-identified issues of radar coverage and signal interference, as well as the configurations and costs of potential future radar systems as NEXRAD reaches the end of its design life. Congress might also consider how implemented and proposed changes to NOAA staffing could affect the federal weather radar system.

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Introduction

Extreme weather events, such as high winds, tornadoes, and heavy rainfall, impact communities across the United States each year. These extreme events can result in property damage, injuries, and lives lost.[1] Multiple federal agencies have an interest in weather forecasting and warning. For example, Congress has directed the Secretary of Commerce to observe, forecast, and warn the public of weather and floods (15 U.S.C. §313), among other responsibilities. To do so, the Secretary has delegated responsibility for establishing and maintaining a series of weather radars across the country for observation and forecasting purposes to the National Oceanic and Atmospheric Administration (NOAA). NOAA does so with the Federal Aviation Administration (FAA) and the U.S. Air Force, collectively known as the *tri-agencies*.[2] The current weather radar system, the Next Generation Weather Radar (NEXRAD), became operational in 1992. Congress continues to examine NEXRAD's strengths and weaknesses, including stakeholder-identified issues of radar coverage and signal interference, as well as the configurations and costs of potential future radar systems as NEXRAD reaches the end of its design life. Congress might also consider how implemented and proposed changes to NOAA staffing could affect the federal weather radar system.

Radars send out radio waves to determine the distance and velocity of the objects they hit. Weather radars use this technology to scan the sky to assess atmospheric conditions at different heights above the ground. Forecast0065rs analyze information from the radars and other sources to forecast and issue severe weather watches and warnings. The federal government began constructing the NEXRAD system of Weather Surveillance Radars-1988 Doppler (WSR-88D; **Figure 1**) in the early 1990s.[3] The tri-agencies selected radar locations to "provide extensive radar coverage," resulting in (1) overlapping radar coverage, where possible, east of the Rocky Mountains, and (2) increased coverage, in comparison to previous radar networks, west of the Rocky Mountains (**Figure 2**).[4] According to NOAA, NEXRAD is "the most important tool for short fuse, high impact warnings and without it the loss of life from severe weather would be extraordinarily higher."[5]

The tri-agencies operate 158 weather radars around the world, as of May 22, 2026.[6] Of the 158 weather radars, 142 are in the conterminous United States and 16 are in Alaska, Hawaii, U.S. territories, and U.S. military bases in other countries. NOAA states that the system was a $3.1

[1] National Oceanic and Atmospheric Administration (NOAA), National Centers for Environmental Information (NCEI), "Monthly Climate Reports, National Climate Report February 2026," https://www.ncei.noaa.gov/access/monitoring/monthly-report/national/202602.

[2] The parent departments of each agency, the Departments of Commerce, Transportation, and Defense, signed the most recent memorandum of agreement (MOA) in 2024 (*Memorandum of Agreement Among the Department of Commerce, Department of Defense, and Department of Transportation for Interagency Operation of the Weather Surveillance Radar-1988, Doppler (WSR-88D)*, January 2, 2024, https://www.roc.noaa.gov/public-documents/wsr88d/MOA.pdf (hereinafter *MOA for WSR-88D*).

[3] NOAA, "Doppler Radar," https://www.noaa.gov/jetstream/doppler (hereinafter NOAA, "Doppler Radar"); and National Weather Service (NWS), *NEXRAD Strategic Plan 2021-2025*, May 2021, p. 2, https://www.roc.noaa.gov/public-documents/wsr88d/NEXRAD_Strategic_Plan_2021-2025_May 2021_v5.pdf (hereinafter NWS, *NEXRAD Strategic Plan*).

[4] NOAA, *Report to Congress: Gaps in NEXRAD Radar Coverage*, 2020, p. 8, https://repository.library.noaa.gov/view/noaa/25628 (hereinafter NOAA, *Gaps in NEXRAD*).

[5] NOAA, *Gaps in NEXRAD*, p. 13.

[6] NOAA, NCEI, "NEXRAD Inventory: Select Site (WSR-88D and TDWR)," accessed May 22, 2026, https://www.ncei.noaa.gov/nexradinv/choosesite.jsp.

billion capital investment.[7] Under the tri-agency Memorandum of Agreement, each agency is responsible for managing its own NEXRAD sites, including logistics and supply costs, and for sharing collected radar data with the other agencies.[8] NOAA also has responsibility for the Radar Operations Center and for operational support of all deployed radars.[9]

Figure 1. WSR-88D in the NEXRAD System



Source: National Oceanic and Atmospheric Administration (NOAA), National Severe Storms Laboratory, "Tornado Intercept," https://inside.nssl.noaa.gov/nsslnews/2023/05/union-city/. Original image cropped.

Notes: Each WSR-88D includes a spherical radome atop a tower, as shown in the photo.

NOAA has been preparing for what comes after NEXRAD since at least 2003.[10] In 2012-2013, NOAA updated the radars to provide forecasters with additional information to help identify precipitation by type (e.g., rain, hail, snow, ice, sleet) and intensity, and to help detect airborne tornado debris or conditions for possible tornado development.[11] A 2025 study estimated that NEXRAD provides an annual benefit of between $5.2 billion and $11.2 billion in 2024 dollars in reduced injuries and fatalities from tornadoes, flash floods, and severe winds, as well as reduced or eliminated aviation-related costs.[12]

[7] NOAA, *Report to Congress: Weather Radar Follow-On Plan: Research and Risk Reduction to Inform Acquisition Decisions*, 2019, p. 9, https://repository.library.noaa.gov/view/noaa/56687 (hereinafter NOAA*, Weather Radar Follow-On Plan*).

[8] *MOA for WSR-88D*.

[9] *MOA for WSR-88D*, p. 8.

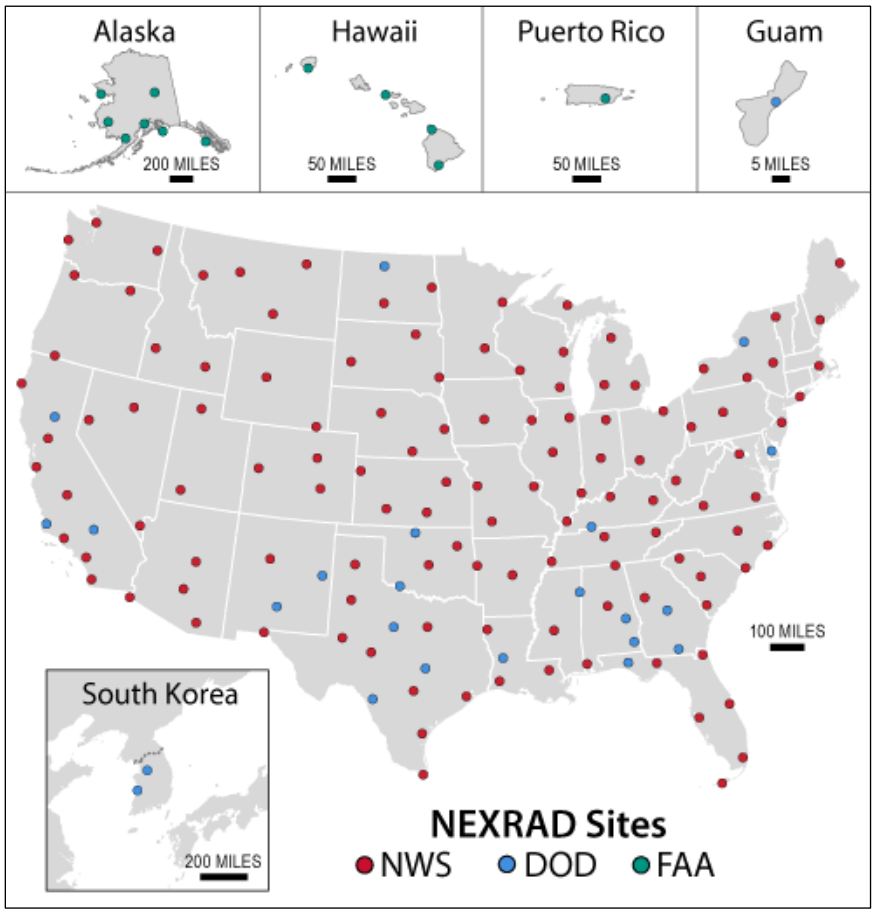
[10] NOAA*, Weather Radar Follow-On Plan*, p. 9.

[11] NOAA, "Doppler Radar"; and NOAA, National Severe Storms Laboratory (NSSL), "Research Tools: Dual Polarized Radar," https://www.nssl.noaa.gov/tools/radar/dualpol/.

[12] Sohini Mahapatra et al., *Next Generation Weather Radar (NEXRAD) Societal Benefit Study*, November 2025, MITRE Technical Report MTR250370, p. v, https://repository.library.noaa.gov/view/noaa/71986/noaa_71986_DS1.pdf.

Figure 2. NEXRAD Locations

(as of May 22, 2026)



Source: CRS, from NOAA, National Centers for Environmental Information (NCEI), "NEXRAD Inventory: Select Site (WSR-88D and TDWR)," accessed May 22, 2026, https://www.ncei.noaa.gov/nexradinv/choosesite.jsp, and NOAA, "cdo/nexrad (MapServer)," https://gis.ncdc.noaa.gov/arcgis/rest/services/cdo/nexrad/MapServer.

Notes: DOD = Department of Defense; FAA = Federal Aviation Administration; NWS = National Weather Service. The map shows active NEXRAD sites according to NOAA as of May 22, 2026.

Selected Stakeholder Concerns

The tri-agencies, some Members of Congress, and other stakeholders have expressed a variety of concerns with the NEXRAD system. Concerns have generally centered on gaps in radar coverage, interference to radar signals from multiple sources, and the anticipated end of NEXRAD's design life. Each has the potential to impact weather forecasting and the issuance of watches and warnings.

Gaps in Coverage: Several stakeholders, including NOAA advisory groups, have found limitations with current radar areal coverage. Congress directed NOAA's Science Advisory Board (SAB) to provide advice for prioritizing NOAA weather research initiatives in the Weather Research and Forecasting Innovation Act, known as the Weather Act (P.L. 115-25, §401). According to SAB's 2021 report, NOAA radar observations have "significant" limits in the lower

part of the atmosphere.[13] SAB stated that approximately 70% of the western United States below 1 kilometer altitude is unobserved, and some coverage gaps occur in the eastern United States.[14] Depending on the location of NEXRAD, the radar may not be able to scan the atmosphere below a certain altitude. For example, a radar sited on a mountainside may only be able to scan the atmosphere at altitudes at and above the site's elevation, with additional obstructions due to nearby mountains and other natural and manmade features. NEXRAD at these locations, therefore, may "miss" weather phenomena at lower altitudes, as they would be below the radar's scanning level. NOAA and other stakeholders have known of these gaps since NEXRAD's construction.[15]

The 2021 report recommended NOAA "integrate more fully data from existing radars operated by others," and begin deploying certain commercially available, low-cost radars into areas with the most significant gaps, with "at least thirty radars deployed within three years" (of 2021). In 2023, SAB recommended additional steps that NOAA could take to address the gaps:

- "Establish a gap-filling radar data strategy";
- "Use commercial radar data already in hand"; and
- "Act immediately to implement the gap-filling radar data strategy." [16]

Interference with Radar: According to NOAA, multiple types of interference may degrade radar data quality, including physical blockage and external source radio frequency.[17] Physical blockage of radar pulses may occur due to nearby natural features (e.g., trees) and man-made infrastructure (e.g., buildings, wind turbines). External sources of radio frequency interference may include local area telecommunication networks and surveillance cameras.[18]

End of Service Life: The NEXRAD system is nearing the end of its service life. NEXRAD was deployed across the country between 1992 and 1997 with an expected 20-year service life.[19] According to NOAA, NEXRAD is operating beyond its design lifetime, and some of the radars in the network are experiencing metal fatigue and/or have damaged components or obsolete parts.[20] In some cases, the agency has stated that the replacement parts are obsolescent or unavailable, or that damaged components would be cost prohibitive to repair.

[13] NOAA Science Advisory Board (SAB), *A Report on Priorities for Weather Research,* December 2021, p. 44, https://repository.library.noaa.gov/view/noaa/49573 (hereinafter SAB, *Priorities for Weather Research*).

[14] SAB did not define what it meant by western and eastern United States.

[15] For example, see National Research Council, *Assessment of NEXRAD Coverage and Associated Weather Services*, 1995, p. 8, https://www.nationalacademies.org/publications/9056.

[16] SAB, *Priorities for Weather Research*, and SAB, *NOAA Science Advisory Board Report on Data Gaps*, November 16, 2023, pp. 1-2, https://sab.noaa.gov/wp-content/uploads/SAB_Report_Nov2023_EISWG_Radar-Gaps.pdf (hereinafter SAB, *Data Gaps*).

[17] NOAA, NWS Radar Operations Center (ROC), "Hardware Engineering," https://www.roc.noaa.gov/branches/engineering-branch/hardware-engineering.php.

[18] For example, E. Saltikoff et al., "The Threat to Weather Radars by Wireless Technology," *Bulletin of the American Meteorological Society*, vol. 97 (2016), https://journals.ametsoc.org/view/journals/bams/97/7/bams-d-15-00048.1.xml.

[19] Federal Aviation Administration, "Next Generation Weather Radar (NEXRAD)," https://www.faa.gov/air_traffic/weather/nexrad.

[20] J. Schultz et al., "Introduction to Radar Next: The Future of a National Doppler Weather Radar Capability," May 1, 2024, NOAA NWS, powerpoint presentation, p. 7, https://fpaw.aero/sites/default/files/186/41-schultz-radar-next-fpaw-may-2024.pdf.

NOAA's Response to Concerns and Recommendations

NOAA has made some changes in response to stakeholder concerns and recommendations.

Gaps in Coverage

Congress directed NOAA to report on NEXRAD gaps and potential ways to address such gaps in the Weather Act (P.L. 115-25, §414) and H.Rept. 114-605.[21] The resulting 2019 study did not find "significant areas of warning service deficiency due to reduced radar coverage."[22]

The agency has responded to some stakeholder concerns and recommendations, including the following.

- With respect to integrating data from non-NOAA radars, NOAA stated that the agency continually updates its policy for the use of non-NOAA radar data, and that, as of 2022, it was assessing the potential benefits of using supplemental radar data in numerical weather models.[23] As of 2023, NOAA was also incorporating information from the FAA's 45 Terminal Doppler Weather Radars.[24]
- With respect to deploying low-cost radar, NOAA responded in 2024 that then-current funding levels were insufficient to change the national radar coverage beyond limited radar data purchases. As of 2026, NOAA has partnered with California and the University of California, San Diego, on a pilot project to combine data from an existing NEXRAD site with a new weather radar network and high-resolution models to improve prediction of precipitation, streamflow, and coastal flooding in San Francisco Bay.[25]
- With respect to establishing a gap-filling radar data strategy, in 2022, the agency noted that it is currently using nonradar observational platforms and advanced data integration to supplement radar coverage.[26] As of 2024, NOAA stated that it planned to define a "backbone" radar architecture that would best serve the nation, including ways to address gaps in radar coverage and the needs of vulnerable and underserved populations.[27]

[21] H.Rept. 114-605 was incorporated by reference into the explanatory statement accompanying P.L. 115-31.

[22] NOAA, *Gaps in NEXRAD*, p. 7.

[23] NOAA, *Response to PWR Report*, p. 8.

[24] SAB, *Data Gaps*, p. 8; and NOAA, NCEI, "Terminal Doppler Weather Radar (TDWR)," https://www.ncei.noaa.gov/products/radar/terminal-doppler-weather-radar.

[25] NOAA, Physical Sciences Lab (PSL), *AQPI Advanced Quantitative Precipitation Information,* https://psl.noaa.gov/outreach/resources/handouts/aqpi.pdf; and PSL, "AQPI Advanced Quantitative Precipitation Information," https://psl.noaa.gov/aqpi/.

[26] NOAA, *Response to the Science Advisory Board (SAB) Environmental Information Services Working Group (EISWG) Report on the Priorities for Weather Research (PWR)*, November 8, 2022, pp. 8-9, https://sab.noaa.gov/wp-content/uploads/NOAA-Response-to-SAB-PWR-Report_28Nov22_Final.pdf (hereinafter NOAA, *Response to PWR Report*).

[27] NOAA, *NOAA Response to the Science Advisory Board's Report Concerning Radar Gaps*, March 2024, p. 2, https://sab.noaa.gov/wp-content/uploads/SAB_Report_March2024_NOAA-Response_EISWG_Report_Radar_Gaps-1.pdf (hereinafter NOAA, *Response to Report on Radar Gaps*).

- With respect to using commercial radar data already available, in 2022, NOAA began evaluating private-sector radar data across the country to inform NOAA's future commercial radar data strategy.[28] As of 2024, NOAA was purchasing data from 20 radars from the National Mesonet Program for demonstration purposes.[29] The agency planned to purchase additional commercial radar data in FY2027.[30]

As of 2024, NOAA also had made other incremental improvements, such as changing NEXRAD radar angles to scan lower altitudes at 19 radars, and stating that it planned to lower elevation angles at an additional 8 radars.[31]

Interference with Radar

NOAA and other federal agencies have acknowledged radar interference issues from crowding of the frequency spectrum, wind turbines, trees, and other structures. As of 2024, NOAA planned to continue efforts to address those issues.[32] For instance, the agency stated that "interest in increasing spectrum utilization [by the private sector] will require NOAA to engage in formal processes to defend its S-band allocation and possibly accommodate new users while also limiting opportunity for a bigger NOAA footprint."[33]

In terms of physical interference, in 2024 the federal Wind Turbine Radar Interference Mitigation working group, which includes NOAA, FAA, and DOD, among other agencies, found that no mitigation technology it had assessed had been able to fully restore the technical performance of impacted radars.[34] It also noted that new techniques and federal government-private sector collaboration have allowed agencies to continue to perform their missions without significant impacts. As of 2024, NOAA had been participating and funding additional mitigation research.[35]

End of Design Life

NOAA has been preparing for what comes after NEXRAD since at least 2003.[36] NOAA began a service life extension program for NEXRAD—which consisted of replacing and refurbishing major components of each radar—in 2015 and completed it in 2024. With these investments and

[28] NOAA, *Response to Report on Radar Gaps*, p. 3.

[29] NOAA, *Response to Report on Radar Gaps*, p. 3.

[30] NOAA, *Budget Estimates Fiscal Year 2027, Congressional Justification,* 2026, https://www.commerce.gov/sites/default/files/2026-04/FY2027-NOAA-CJ-Submission.pdf, p. NWS-62 (hereinafter NOAA, *Budget Estimates FY2027*).

[31] NOAA, *Response to Report on Radar Gaps*, p. 3. CRS could not confirm whether NOAA changed the altitude of the additional eight radars.

[32] NWS, *NEXRAD Strategic Plan*, p. 8. Wind turbines can cause interference with weather radars by creating unwanted return signals ("clutter"), scattering return signals, or obscuring the target phenomena, among other ways (U.S. Department of Energy [DOE], *Update on the Efforts of the Wind Turbine Radar Interference Mitigation Working Group, Report to Congress*, February 2024, p. 3, https://www.energy.gov/sites/default/files/2024-02/EXEC-2022-004484%20-%20Report%20to%20Congress%20as%20of%20December%2014%202023%20%282%29.pdf (hereinafter DOE, *Wind Turbine Radar Interference*). For more information on U.S. offshore wind energy development see CRS Report R46970, *U.S. Offshore Wind Energy Development: Overview and Issues for the 118th Congress*, by Laura B. Comay and Corrie E. Clark.

[33] NOAA, *Weather Radar Follow-On Plan*, p. 17. The S-band is used for NEXRAD and "is viewed as an essential basis for the success of the NEXRAD observations."

[34] DOE, *Wind Turbine Radar Interference*, p. 3.

[35] DOE, *Wind Turbine Radar Interference*, p. 29.

[36] NOAA, *Weather Radar Follow-On Plan*, p. 9.

continued maintenance, NOAA expects NEXRAD to continue to be "upgradable, reliable, and maintainable beyond 2035 or until a suitable replacement for the WSR-88D is deployed."[37]

Regarding replacement, recent NOAA activities have focused on research and development (R&D) of *phased array radar* (PAR).[38] NOAA conducts its PAR R&D primarily through the Office of Oceanic and Atmospheric Research's (OAR's) National Severe Storms Laboratory (NSSL) and its Advanced Technology Demonstrator (ATD).[39] The NSSL is considered the "de facto Radar Laboratory" and the ATD "one of NSSL's major severe weather research tools for the next decade."[40]

Since 2021, NOAA's radar acquisition has coalesced under the newly created NWS *Radar Next* program and focused on "acquisition, integration, and implementation of a follow-on radar capability to provide continuity and meet emerging requirements for NOAA's most important observational system."[41] The Radar Next program estimates the following time frames for various acquisition stages: initiation and planning stage through 2028; design and development stage through 2032; manufacturing and installation stage through 2040; and the operations and maintenance stage to begin in 2035.[42]

NOAA has assessed and continues to assess alternative replacement configurations and mechanisms. In May 2025, NOAA requested information from the private sector regarding the sector's ability to provide radar-as-a-service (RaaS) that could meet or exceed the capabilities and coverage of the current NEXRAD system.[43] As of March 2026, the agency was working on an *Analysis of Alternatives*, including an examination of technologies and possible radar system architectures, to replace NEXRAD.[44] The analysis aims to compare the costs and benefits of another service life extension program for WSR-88D versus replacing WSR-88D with either an updated version of the WSR-88D or PAR technology (with multiple configurations possible).[45]

[37] NOAA NWS Radar Operations Center (ROC), "Service Life Extension Program (SLEP)," https://www.roc.noaa.gov/branches/program-branch/slep/service-line-extension-program.php.

[38] Forecasters must rotate and tilt the WSR-88D's radar dish to scan the sky. Conversely, the phased array radar has a flat panel antenna that remains stationary. The panel is made of multiple antenna that can be steered electronically and each transmit and receive a signal. This allows forecasters to direct beams only where storms are detected, allowing for a greater frequency of observations (NOAA NSSL, "Research Tools: Phased Array Radar," https://www.nssl.noaa.gov/tools/radar/par/).

[39] NOAA NSSL, "Research Tools: Radar," https://www.nssl.noaa.gov/tools/radar/; and NOAA NSSL, "Research Tools: Advanced Technology Demonstrator," https://www.nssl.noaa.gov/tools/radar/atd/.

[40] NOAA, *PAR R&D Future Plans*, pp. 2 and 14.

[41] NOAA, *Budget Estimates Fiscal Year 2026, Congressional Submission*, June 2025, pp. NOAA-14 and NWS-26, https://www.noaa.gov/sites/default/files/2025-06/NOAA%20FY26%20Congressional%20Justification.pdf (hereinafter NOAA, *Budget Estimates FY2026*).

[42] NOAA, *Radar Next,* p. 2, https://www.noaa.gov/sites/default/files/2025-02/NOAA_Radar%20Next_%20One%20Pager_%20Revised_Final%20pdf.pdf.

[43] SAM.gov, "RFI: Radar-as-a-Service," https://sam.gov/opp/39ed0000ee294649a585a4df68a97f48/view. In particular, see RFI_RADAR-AS-A-SERVICE.pdf, p. 2.

[44] NOAA, *Written Testimony of Taylor Jordan, Assistant Secretary of Commerce for Environmental Observation and Prediction*, March 25, 2026, Oversight Hearing on the National Weather Service Before the Subcommittee on Commerce, Justice, Science, and Related Agencies, House Committee on Appropriations, p. 3, https://docs.house.gov/meetings/AP/AP19/20260325/119094/HHRG-119-AP19-Wstate-JordanT-20260325.pdf.

[45] Kurt Hondl, NSSL Deputy Director and PAR R&D Manager, NOAA, *Observations and Understanding: Phased Array Radar R&D Future Plans,* November 2021, powerpoint presentation, p. 41, https://www.nssl.noaa.gov/about/events/review2021/presentations/NSSL2021LabReviewPAR.pdf (hereinafter NOAA, *PAR R&D Future Plans*).

Congressional Considerations

Congress may consider a range of issues related to NOAA's weather radars, including concerns about coverage, interference, and end of service life; costs of potential future radar systems; and impacts of implemented and proposed changes to NOAA staffing.

Addressing NEXRAD Concerns

The 119th Congress has shown continued interest in addressing concerns with the NEXRAD system. For instance, Congress provided NWS with up to $12.6 million in FY2026 to purchase commercial weather radar data in areas that lack "adequate" radar coverage, and directed NWS to establish a Radar Program Office to develop a plan for the "impending recapitalization" of the weather radar system.[46] The Radar Program Office's plan is to contain "an analysis of technologies, as well as alternative architectures, including purchasing radar data as a commercial service" or RaaS, as noted above.[47]

Some Members of the 119th Congress also have introduced legislation focused on the future of NOAA's weather radar. For instance, H.R. 2646 and S. 3795 would codify the Radar Next program at NOAA, would require the development of a plan to replace NEXRAD, and would allow for the purchase of RaaS, among other activities. Another bill, H.R. 1115, also includes similar provisions regarding a NEXRAD replacement plan and RaaS. Proposed Weather Act reauthorization bills (e.g., H.R. 3816, H.R. 5089, S. 3923) would incorporate directives from H.R. 1115, H.R. 2646, and S. 3795, and also would authorize appropriations for continued next generation radar research. Other bills (H.R. 2295, H.R. 3816, and H.R. 5089) would direct NOAA to establish a research, development, test, and evaluation program regarding radar line of sight interferences.

Costs of Current and Future Systems

A long-standing issue for Congress is considering the costs of maintaining existing observation platforms, like NEXRAD, in comparison to the potential costs of acquiring and maintaining future observational platforms. According to a 2019 NOAA report, NOAA's annual base appropriated funds for NEXRAD operations and maintenance were approximately $73.0 million, and the FAA and Air Force's combined annual contribution to NOAA's Radar Operations Center was approximately $10.0 million.[48] The NOAA report also estimated that recapitalizing NEXRAD (i.e., replacing the existing infrastructure with new technology) in the 2035-2040 time frame would cost approximately $6.0 billion in 2019 dollars, based on the acquisition cost of the

[46] U.S. Congress, House Appropriations Committee, *Commerce, Justice, Science, and Related Agencies Appropriations Bill, 2026*, report together with dissenting views to accompany H.R. 5342., 119th Cong., 1st sess., September 12, 2025, H.Rept. 119-272, p. 31, and U.S. Congress, Senate Appropriations Committee, *Departments of Commerce and Justice, Science, and Related Agencies Appropriations Bill, 2026*, report to accompany S. 2354, 119th Cong., 1st sess., July 17, 2025, S.Rept. 119-44, p. 62. H.Rept. 119-272 and S.Rept. 119-44 were incorporated by reference into "Explanatory Statement Submitted by Mr. Cole, Chair of the House Committee on Appropriations, Regarding H.R. 6938, Commerce, Justice, Science; Energy and Water Development; and Interior and Environment Appropriations Act, 2026," *Congressional Record*, vol. 172 (January 8, 2026) (hereinafter "Explanatory Statement Accompanying FY2026 Appropriations Law").

[47] S.Rept. 119-44, p. 62.

[48] NOAA, *Weather Radar Follow-On Plan*, p. 19. CRS did not identify a more up-to-date funding amount.

original NEXRAD system, adjusted for inflation.[49] (For context, Congress provided NOAA a total of $6.2 billion in FY2026.[50])

As noted above, Congress and NOAA have explicitly appropriated and requested, respectively, funding for research, development, and acquisition of a future weather radar system. Radar research activities may have also occurred under other broader budget line items. According to the 2019 report, NOAA had invested approximately $133.0 million in PAR research and development since 2003.[51] Congress has provided additional funding specifically for radar research since 2019, most recently in FY2026, when it directed $74.6 million for the procurement of a PAR test article (i.e., a prototype radar) and additional funding for the radar demonstration project in the San Francisco, CA, region (discussed above in "Gaps in Coverage").[52] For FY2027, NOAA's budget request does not provide a specific budget line request for radar research, but rather incorporates it into a new broader budget line item activity (i.e., "Science and Technology Integration").[53]

Regarding development and acquisition, NOAA's FY2027 budget request includes a budget line item for the Radar Next program, noting that the program requested $20.5 million in FY2026 and $21.2 million in FY2027. It is unclear to CRS how much funding Congress provided to the program, if any, in FY2026, and how the program fits within the newly created Radar Program Office.[54] The agency stated that FY2027 funding would support the development of "detailed requirements, program cost estimate," and "numerous acquisition plans required to achieve DOC Milestone 2 project approval in 2028."[55] NOAA planned to include a variety of radar-related activities in its acquisition plans, including radar system design, development, and deployment requirements; purchase and integration of commercial data; machine learning/artificial intelligence; cloud computing; and technology advancement and improvements.[56]

DOC Milestone 2 is part of the multistage DOC Acquisition Framework, with a total of six steps (Milestones 0-5). Congress has typically provided funding for each stage of the acquisition process and then operations and maintenance over multiple years, rather than in one lump sum. For example, Congress has provided billions of dollars to NOAA for its satellite programs over time, for research, acquisition, and operations and maintenance.[57] As part of oversight, Congress also has required the agency to provide five-year estimates of procurement, acquisition, and construction budgetary requirements for projects over $5 million; quarterly briefings to appropriations committees on all NOAA satellite programs, among other activities; and an annual

[49] NOAA, *Weather Radar Follow-On Plan*, p. 19.

[50] "Explanatory Statement Accompanying FY2026 Appropriations Law," p. H313.

[51] NOAA, *Weather Radar Follow-On Plan*, p. 19.

[52] H.Rept. 119-272, p. 35 and S.Rept. 119-44, p. 57.

[53] NOAA combined the Phased Array Radar activity with other activities, such as Weather-Ready Nation and the U.S. Weather Research Program, into the Science and Technology Integration activity. NOAA, *Budget Estimates Fiscal Year 2027, Congressional Justification,* 2026, https://www.commerce.gov/sites/default/files/2026-04/FY2027-NOAA-CJ-Submission.pdf, p. NWS-54 (hereinafter NOAA, *Budget Estimates FY2027*).

[54] NOAA, *Budget Estimates FY2027*, p. NWS-63. NOAA stated that the Radar Next program received $9.9 million in FY2024 and FY2025 in funding from P.L. 117-169, commonly referred to as the Inflation Reduction Act of 2022.

[55] NOAA, *Budget Estimates FY2027*, p. NWS-61.

[56] NOAA, *Budget Estimates FY2027*, p. NWS-61.

[57] For example, see NOAA, *Report to Congress: Major Program Annual Report on National Oceanic and Atmospheric Administration Satellite to Accompany the FY2025 Budget Request*, September 2024, https://www.nesdis.noaa.gov/s3/2024-09/24-PL-861-NOAA-NESDIS-FY25_Major_Annual_Satellite_Report.pdf.

major satellite expenditures report to Congress.[58] Congress may consider directing the agency to abide by the acquisition and appropriations process established for major satellite programs for oversight of radar development, acquisition, and procurement, or it may create a new process to facilitate oversight of these activities.

Changes in NOAA Organization and Staffing

The Trump Administration proposed to eliminate OAR, including NSSL, in FY2026 and FY2027 and transfer some OAR activities to NWS "to streamline program management and focus on NOAA's weather mission."[59] For FY2026, Congress retained OAR and approved the transfer of a subset of the Administration's requested activities, including the Tornado Severe Storm Research/Phased Array Radar program, to NWS.[60] It is not clear to CRS whether or how NSSL's PAR research may change with the laboratory and the research program operating within different line offices (OAR and NWS, respectively). Congress may choose to evaluate whether splitting PAR research across two line offices is detrimental or beneficial to weather research, and may choose to consider legislation to address the issue or allow the agency discretion to implement the programs under current authorizations. Congress previously directed NOAA to assess whether research- and operations-focused programs should be kept separate or combined; a NOAA advisory group recommended retaining OAR as a research-focused line office.[61] Congress may choose to request that the group or another entity again review NOAA's organizational structure, including the placement of research- and operations-focused programs, and make recommendations on the most effective configurations.[62] Alternatively, Congress could direct the agency to restructure in certain ways or continue to approve the agency's ability to do so.

In 2025, the Administration reduced NOAA staffing through various means as part of efforts to increase government efficiency and reduce federal spending. For FY2026 and FY2027, NOAA requested to reduce staffing levels. For FY2026, Congress expressed concern that "staffing losses [would] affect the agency's ability to fulfill its statutory responsibilities" and encouraged NOAA to address mission-critical vacancies.[63] Congress also directed NWS to "maintain staffing levels" to protect life and property to the maximum extent possible.[64] It is unclear to CRS what staff positions related to NEXRAD and Radar Next might be considered "mission-critical"; NOAA has

[58] For example, P.L. 119-74, Division A, title I; "Explanatory Statement Accompanying FY2026 Appropriations Law," 2026, p. H257; and 33 U.S.C. §878a.

[59] NOAA, *Budget Estimates FY2026*, pp. OAR-1, OAR-10, and OAR-13, and NOAA, *Budget Estimates FY2027*, p. OAR-1.

[60] "Explanatory Statement Accompanying FY2026 Appropriations Law." According to NOAA, the Tornado Severe Storm Research/Phased Array Radar program includes developing PAR, among other activities (NOAA, *Budget Estimates FY2027*, p. NWS-54).

[61] In 2003, Congress directed NOAA to report on the "costs and benefits of breaking OAR [research] up into its constituent parts and distributing those parts as desirable to the other line offices." NOAA charged its Science Advisory Board to take up the assessment—the SAB recommended retaining and strengthening OAR, arguing that long-term, high-risk research and its potential beneficial impacts may disappear under the "pressure of near-term operational requirements" if research programs become a part of an operation-focused line office, such as NWS (U.S. Congress, Senate Appropriations Committee, *Departments of Commerce, Justice, and State, the Judiciary, and Related Agencies Appropriation Bill, 2004*, report to accompany S. 1585, 108th Cong., 1st sess., September 5, 2003, S.Rept. 108-144, p. 101; and NOAA Science Advisory Board, Research Review Team, *Review of the Organization and Management of Research in NOAA*, August 6, 2004, p. 17, https://sab.noaa.gov/wp-content/uploads/2021/08/RRT_Report-080604.pdf).

[62] For more information about NOAA and its structure as a whole, see CRS Report R47636, *National Oceanic and Atmospheric Administration (NOAA): Organization Overview and Issues for Congress*, by Eva Lipiec.

[63] S.Rept. 119-44, p. 37.

[64] P.L. 119-74, §114.

again requested to eliminate OAR and add positions to NWS for FY2027.[65] Congress may choose to seek clarification from NOAA regarding which staff positions related to NEXRAD and Radar Next it considers essential. Congress may also consider whether NOAA's reduced workforce is able to maintain the current radar network and develop a new network, and if not, how the agency should proceed with obtaining weather radar observations, if such observations are of federal and congressional interest.

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[65] NOAA, *Budget Estimates FY2027*, p. Control Table-8.