

**ADVANCING EARTH SYSTEM SCIENCE  
AND STEWARDSHIP AT NOAA**

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**HEARING**  
BEFORE THE  
SUBCOMMITTEE ON ENVIRONMENT  
OF THE  
COMMITTEE ON SCIENCE, SPACE,  
AND TECHNOLOGY  
HOUSE OF REPRESENTATIVES  
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**ADVANCING EARTH SYSTEM  
SCIENCE AND STEWARDSHIP AT NOAA**

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**THURSDAY, SEPTEMBER 23, 2021**

HOUSE OF REPRESENTATIVES,  
SUBCOMMITTEE ON ENVIRONMENT,  
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,  
*Washington, D.C.*

The Subcommittee met, pursuant to notice, at 10:01 a.m., via Zoom, Hon. Mikie Sherrill [Chairwoman of the Subcommittee] presiding.

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY  
U.S. HOUSE OF REPRESENTATIVES  
SUBCOMMITTEE ON ENVIRONMENT

HEARING CHARTER

*Advancing Earth System Science and Stewardship at NOAA*

Thursday, September 23, 2021  
10:00 a.m. ET  
Online Via Zoom

**PURPOSE**

The purpose of this hearing is to discuss the Administration's priorities for the National Oceanic and Atmospheric Administration (NOAA) as they relate to climate science and services; scientific integrity; the scientific workforce; weather, water, and climate research and forecasting; and other issues within the Science Committee's jurisdiction. This hearing will be an opportunity for Members to discuss their priorities related to the agency's mission.

**WITNESS**

- **The Honorable Richard W. Spinrad, Ph.D.**, Under Secretary of Commerce for Oceans and Atmosphere and Administrator, National Oceanic and Atmospheric Administration

**OVERARCHING QUESTIONS**

- What are the Administration's priorities for advancing weather, water, and climate research and forecasting at NOAA to improve our understanding of the Earth system and the delivery of timely, accurate forecasts?
- How is NOAA working to enhance climate resilience and adaptation and the equitable delivery of actionable climate information, tools, and services to support decision-making in communities across the nation?
- What is the Administrator doing to ensure scientific integrity is applied and enforced in all of the agency's science and research activities?
- How is NOAA working to address staffing issues to build a more diverse and equitable workforce?
- What additional resources and policy changes does NOAA need to advance its Earth system science and stewardship mission?

**BACKGROUND**

The National Oceanic and Atmospheric Administration (NOAA) is a federal science agency that is responsible for weather forecasts and warnings, climate monitoring, fisheries management, coastal restoration, and more. Its stated mission is "to understand and predict changes in climate,

weather, oceans and coasts; to share that knowledge and information with others; and to conserve and manage coastal and marine ecosystems and resources.”<sup>1</sup>

NOAA was established in 1970 within the Department of Commerce (DOC).<sup>2</sup> NOAA’s operations are divided into six Line Offices: National Weather Service (NWS), Office of Oceanic and Atmospheric Research (OAR), National Environmental Satellite, Data, and Information Service (NESDIS), National Ocean Service (NOS), Office of Marine and Aviation Operations (OMAO), and National Marine Fisheries Service (NMFS). The Science Committee has jurisdiction over weather, ocean, and climate research and forecasting, satellites, space weather, and more, spanning work at the NWS, NESDIS, OAR, NOS, and OMAO (described in more detail below). The Committee does not have jurisdiction over marine fisheries (NMFS) or other living marine resources.

Dr. Richard Spinrad, who served previous roles at the agency, including as former Chief Scientist (2014-2016), began his tenure as NOAA Administrator in June of 2021 with three overarching priorities:<sup>3</sup>

- The development of an environmental products and services portfolio, in coordination with NOAA’s public and private partners, that reflects the urgency of climate change and increases accessibility for underserved communities.
- The advancement of programs and policies that enhance sustainability and environmental stewardship while also fostering economic development.
- The creation of a more equitable and inclusive workforce in the environmental, ecological, and related STEM field through the education and training of emerging professionals.

*National Weather Service:* The NWS’s mission is to “provide weather, water, and climate data, forecasts and warnings for the protection of life and property and enhancement of the national economy.”<sup>4</sup> They achieve this by collecting, analyzing, and disseminating weather and climate data to provide the authoritative information needed by Americans. NWS also conducts research to remain on the cutting edge of Earth system sciences.

The National Centers for Environmental Prediction (NCEP) is at the heart of all forecasts and warnings for the nation. It includes the Aviation Weather Center, Climate Prediction Center, National Hurricane Center, Storm Prediction Center, Space Weather Prediction Center, Ocean Prediction Center, Environmental Modeling Center, and NCEP Central Operations. 122 Weather Forecast Offices across the country issue warnings, advisories, and short-term forecasts for their respective local areas. NWS collects environmental observations and other meteorological data from across NOAA Line Offices including data from radars, satellites, aircraft, weather balloons, coastal and offshore buoys, and more to inform the development of weather forecasts. NWS also engages with external scientific partners to collect additional weather observations and data.

NWS is working to advance its Impact-Based Decision Support Services (IDSS) to better enable emergency personnel and public safety officials to make decisions to preserve life and property.

<sup>1</sup> <https://www.noaa.gov/our-mission-and-vision>

<sup>2</sup> <https://www.noaa.gov/our-history>

<sup>3</sup> <https://www.noaa.gov/news-release/richard-w-spinrad-sworn-in-as-noaa-administrator>

<sup>4</sup> <https://www.weather.gov/about/>

NWS continues to build trusted relationships with partners at the local, state, and national levels and provides them with actionable, timely, and reliable information. NWS provides on-site support at emergency operations centers or at incidents. For example, NWS deploys Incident Meteorologists (IMETs) to help crews on the ground fighting wildfires, providing crucial weather information that will help determine the best strategy to contain the fire and to protect lives and property.<sup>5</sup>

Congress authorized NOAA's Earth Prediction Innovation Center (EPIC) to improve U.S. numerical weather prediction and forecasting through building a community-based model that involves NOAA internal and external partners.<sup>6</sup> The Science Committee conducted extensive bipartisan oversight<sup>7,8</sup> of the EPIC program. In April 2021, NOAA announced that Raytheon Intelligence and Space was chosen to design and develop the Center.<sup>9</sup>

In addition to forecasting meteorological events, NWS also provides tsunami warnings. From two tsunami warning centers, NOAA staff monitor for earthquakes that may cause tsunamis, forecast potentially resulting tsunamis and their impacts, and issue tsunami warnings. As part of the National Tsunami Hazard Mitigation Program, NWS also works to educate the public on tsunami response and helps with community response planning and hazard mitigation.<sup>10</sup>

*Office of Oceanic and Atmospheric Research:* OAR's stated mission is to "conduct research to understand and predict the Earth system; develop technology to improve NOAA science, service, and stewardship; and transition the results so they are useful to society."<sup>11</sup> OAR, also called "NOAA Research," is the primary research and development organization within NOAA.

OAR provides the research foundation for understanding the complex systems that support our planet. OAR enables better forecasts, earlier warnings for natural disasters, and a greater understanding of the Earth, to better manage the environment, nationally, and globally.<sup>12</sup> OAR administers collaborative long-term partnerships between NOAA and participating universities and other non-profit institutions, including 16 Cooperative Research Institutes, 33 Sea Grant Programs, and the NOAA Climate Program Office, which manages the Regional Integrated Sciences and Assessments (RISA) program. The primary program components of the OAR network are the National Sea Grant Program, Office of Ocean Exploration and Research, Climate Program Office, Weather Program Office, Uncrewed Systems Research, Ocean Acidification Program, Global Ocean Monitoring and Observing Program, and Research Laboratories.<sup>13</sup>

<sup>5</sup> [https://www.weather.gov/git/PeakToValleyWin15V2\\_IMET](https://www.weather.gov/git/PeakToValleyWin15V2_IMET)

<sup>6</sup> Section 4, National Integrated Drought Information System Reauthorization Act of 2018, P.L. 115-423

<sup>7</sup> <https://science.house.gov/letter-to-acting-administrator-jacobs-regarding-upcoming-release-of-the-request-for-proposals-for-epic>

<sup>8</sup> <https://science.house.gov/hearings/a-task-of-epic-proportions-reclaiming-us-leadership-in-weather-modeling-and-prediction>

<sup>9</sup> <https://noaa.gov/media-release/raytheon-intelligence-and-space-to-lead-new-center-dedicated-to-advancing-us-weather>

<sup>10</sup> <https://nws.weather.gov/nthmp/>

<sup>11</sup> <https://research.noaa.gov/About-Us>

<sup>12</sup> <https://research.noaa.gov/>

<sup>13</sup> <https://research.noaa.gov/Labs-Programs/oar-programs>



*National Environmental Satellite, Data, and Information Service:* NESDIS's mission is to "provide[s] secure and timely access to global environmental data and information from satellites and other sources to promote and protect the nation's security, environment, economy, and quality of life."<sup>14</sup>

NESDIS operates a constellation of weather and environmental satellites broken into three portfolios to provide on-orbit environmental observations: low Earth orbit (LEO) satellites, geostationary orbit (GEO) satellites, and space weather observations (SWO). The current polar-orbiting Joint Polar Satellite System (JPSS) mission includes three operational LEO satellites that provide observations and data that inform both short- and long-term forecasts.<sup>15</sup> The current Geostationary Operational Environmental Satellites (GOES-R) series includes two operational GEO satellites, along with one spare, that provide advanced imagery and atmospheric measurements of the Western Hemisphere, real-time mapping of lightning activity, and improved monitoring of solar activity and space weather.<sup>16</sup> The SWO portfolio includes observations from the GOES-R series, and from the Deep Space Climate Observatory (DSOVR) satellite which monitors solar wind and space weather events from Lagrange Point 1, between the Sun and the Earth. The data from SWO are used by the Space Weather Prediction Center to issue warnings up to an hour before a space weather event (which can disrupt a wide variety of space-based and ground-based technologies) reaches the Earth.

Additionally, NOAA benefits from its international partnerships and utilizes data from partner countries' satellites to enhance environmental observations. NOAA is currently developing the next generation of satellites, including the Geostationary Extended Observations (GeoXO) mission<sup>17</sup> and the Space Weather Follow-On (SWFO) program.<sup>18</sup> NESDIS's Office of Satellite Ground Services facilitates its ability to operate NOAA's satellite constellation efficiently and effectively by sustaining a set of common ground services.<sup>19</sup>

NESDIS houses the National Centers for Environmental Information (NCEI), the largest publicly accessible archive of environmental data on Earth that inform decision-makers within government, academia, and the private sector.<sup>20</sup> These data are integral to the creation of products and services, such as those described in the Climate Services section of this charter.

*National Ocean Service:* NOS's mission is to "provide science-based solutions through collaborative partnerships to address evolving economic, environmental, and social pressures on our ocean and coasts."<sup>21</sup> They accomplish this through providing data, tools, and services that support coastal economies, primarily for the purposes of safe and efficient transportation and commerce, preparedness and risk reduction, and stewardship.

<sup>14</sup> <https://www.nesdis.noaa.gov/about/our-mission>

<sup>15</sup> <https://www.nesdis.noaa.gov/current-satellite-missions/currently-flying/joint-polar-satellite-system>

<sup>16</sup> <https://www.nesdis.noaa.gov/current-satellite-missions/currently-flying/geostationary-satellites>

<sup>17</sup> <https://www.nesdis.noaa.gov/next-generation-satellites/geostationary-extended-observations-geoxo>

<sup>18</sup> <https://www.nesdis.noaa.gov/next-generation-satellites/space-weather>

<sup>19</sup> <https://www.nesdis.noaa.gov/about/our-offices/office-of-satellite-ground-services>

<sup>20</sup> <https://www.ncei.noaa.gov/about>

<sup>21</sup> <https://oceanservice.noaa.gov/about/>

Within NOS, the National Centers for Coastal Ocean Science (NCCOS) conduct an array of coastal and Great Lakes research, including on harmful algal blooms (HABs) and hypoxia. NCCOS works to advance the scientific understanding and ability to detect, monitor, assess, and predict HAB and hypoxia events, including issuing short-term and seasonal HAB forecasts.<sup>22</sup> NCCOS also conducts social science across its Marine Spatial Ecology, Stressor Impacts and Mitigation, and Coastal Change portfolios.

NOS's Office of Coastal Management works collaboratively with the private sector, nonprofits, scientific community, and government to deliver coastal data and tools to make communities more resilient. NOS's Center for Operational Oceanographic Products and Services (CO-OPS) maintains the nation's network of coastal tide and water level sensors to provide real-time data that supports accurate weather forecasts, coastal storm and flood predictions, and tsunami warnings. NOS is also solely responsible for maintaining the nation's accurate coordinate system to help inform mapping, charting, and transportation activities and infrastructure, through the National Geodetic Survey.

*Office of Marine and Aviation Operations:* OMAO's stated mission is to "optimize NOAA's observational platforms and unique workforce capabilities to meet NOAA's science, service, and stewardship missions."<sup>23</sup> OMAO manages and operates NOAA's fleet of 15 research and survey ships and nine aircraft that gather oceanic, atmospheric, hydrographic, and fisheries data to support the agency's mission. OMAO also manages the NOAA Diving Program, NOAA Small Boat Program, and NOAA Aviation Safety Program. The staff is composed of civilians and officers of the NOAA Commissioned Officer Corps.

NOAA's fleet is the largest federal research ship fleet in the nation and ranges from large oceanographic research vessels for deep ocean exploration to smaller ships for charting shallow coastal waters. The fleet supports a wide range of research activities across the Line Offices, including nautical charting and ocean and climate studies.

OMAO also operates and maintains a fleet of civilian Hurricane Hunters, which include two P-3 Orion aircraft and one Gulfstream IV (G-IV). The P-3 aircraft fly directly into the storm to collect measurements of storm structure and intensity, as well as ocean temperature and storm surge. Outside of hurricane season, the aircraft support other national and international atmospheric research programs. The G-IV aircraft flies above and around storms to understand the conditions influencing hurricane movement, in addition to supporting missions related to studying winter storms and atmospheric rivers.

#### **NOAA CROSS-CUTTING ISSUES**

*Scientific Integrity:* Scientific integrity (SI) is at the core of NOAA's work and is critical for ensuring public trust in the agency's lifesaving weather forecasts and other public data, information, products, and services that Americans rely on. The policy and procedures guiding the SI of the agency's work and the conduct of its scientists are laid out in a NOAA Administrative

<sup>22</sup> <https://coastalscience.noaa.gov/research/stressor-impacts-mitigation/>

<sup>23</sup> <https://www.oma.noaa.gov/learn/about-oma/mission-statutory-authority>

Order (NAO).<sup>24</sup> The SI NAO was revised in 2011 in response to a memo from the Office of Science and Technology Policy on SI and was most recently revised and approved on January 19, 2021. On January 27, 2021, President Biden issued a Memorandum on Restoring Trust in Government Through Scientific Integrity and Evidence-Based Policymaking.<sup>25</sup> According to NOAA, its updated SI policy is “substantially compliant” with the Presidential Memorandum, and they will update this policy as appropriate.<sup>26</sup> NOAA has a Scientific Integrity Officer, whose role is to implement the procedures in the SI Policy.

A June 2020 report by the National Academy of Public Administration (NAPA) made a series of recommendations to NOAA to improve its SI policy, upon finding that the policy was violated in the events surrounding the release of an unsigned statement by NOAA during Hurricane Dorian in 2019 (the “Sharpiegate” incident).<sup>27</sup> The Science Committee conducted a series of oversight activities investigating the incident.<sup>28</sup> The NAPA report made recommendations that would strengthen NOAA’s SI policy of consulting its scientists in developing communications materials involving their expertise. It also called for the DOC Office of Inspector General or other agencies to investigate alleged violations of SI policies when they involve senior NOAA and DOC political leadership.

*Workforce – Diversity, Equity, and Inclusion:* The Science Committee released a Majority staff report in March 2021 entitled *Scientific Brain Drain: Quantifying the Decline of the Federal Scientific Workforce*.<sup>29</sup> The report highlighted that from fiscal year (FY) 2009-2020, NOAA’s overall workforce declined by 8.6 percent, and its STEM workforce declined by 1.6 percent. The report also highlighted NOAA’s challenge with a gender employment gap, noting that at the end of FY 2020, NOAA employed roughly 8.5 male engineers for every 1 female engineer. Additionally, while there was a 13.6 percent increase in STEM employment among minority groups, the Black/African American STEM workforce only increased by 0.4 percent from FY 2016 to FY 2020. NOAA has developed Diversity and Inclusion Strategic Plans, most recently for 2020-2024, to increase the diversity of its workforce and embrace an inclusive work environment concept as part of its organizational culture.<sup>30</sup>

*Climate Services and NOAA Climate Council:* Decisionmakers and communities across the U.S. increasingly rely on access to authoritative climate risk information and climate services to inform critical decisions about adaptation and mitigation. NOAA works across the agency to translate its premier climate science and data into accessible information, tools, products, and services to aid

<sup>24</sup> NAO 202-735D-2: *Scientific Integrity* (2021) <https://www.noaa.gov/organization/administration/nao-202-735d-2-scientific-integrity>

<sup>25</sup> <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/memorandum-on-restoring-trust-in-government-through-scientific-integrity-and-evidence-based-policy-making/>

<sup>26</sup> <https://sciencecouncil.noaa.gov/Scientific-Integrity-Commons/SIC-Integrity-Policy>

<sup>27</sup> <https://www.washingtonpost.com/weather/2020/06/15/noaa-investigation-sharpiegate/>

<sup>28</sup> For example: <https://science.house.gov/letter-to-president-trump-on-white-house-video-of-altered-hurricane-forecast-map>

<sup>29</sup> <https://science.house.gov/imo/media/doc/2021-3%20EMBARGOED%20Scientific%20Brain%20Drain%20Majority%20STAFF%20REPORT%20w%20cover%20page.pdf>

<sup>30</sup> <https://www.noaa.gov/organization/inclusion-and-civil-rights/diversity-and-inclusion>



decisionmakers. For example, NOAA's six Regional Climate Centers<sup>31</sup> support the development and delivery of a wide range of place-based climate science and information products and services to help people make informed decisions. NOAA's RISA program supports ten research teams across the country who work hand-in-hand with stakeholders and decisionmakers to build capacity to prepare for and adapt to climate variability and change.

The recently established NOAA Climate Council aims to implement a holistic government response to the changing climate by the fast integration of research and government action in tackling the fundamental causes of increasing emissions, while also assisting vulnerable populations adapt to the inevitable effects.<sup>32</sup> A main priority of the Climate Council is to strengthen NOAA's climate goods and services and ensure they reach all communities equitably.<sup>33</sup>

*High Performance Computing (HPC):* NOAA requires robust HPC capabilities to support both its research and operational activities, and to stay at the forefront of Earth Systems science. HPC enables NOAA scientists to run advanced Earth system models to improve the accuracy of forecasts and predictions. NOAA's Research and Development HPC System (RDHPCS) supports advances in research and modeling to better understand Earth systems. NOAA's Weather and Climate Operational Supercomputing System (WCOS) provides HPC capabilities to run real-time numerical models for weather and climate forecasting. NOAA requires additional HPC resources to support advances in modeling and forecasting, as well as data management and storage capacity. Insufficient computing capacity is the most limiting factor for NOAA's ability to advance understanding of Earth systems and to provide products and services to the nation.<sup>34</sup>

*The Fifth National Climate Assessment:* The National Climate Assessment (NCA), developed by the U.S. Global Change Research Program (USGCRP), are the Nation's comprehensive, authoritative quadrennial reports on the effects of climate change on the U.S. and projections of future conditions, designed to inform climate decisions. The Fifth National Climate Assessment (NCA5) is currently in development and anticipated to be completed in 2023.<sup>35</sup> NOAA plays a key role as the administrative agency for NCA5 and through providing data, tools, and information to help people understand and prepare for climate variability and change.

*NOAA's FY 2022 Budget:* The President's Budget Request for FY 2022 represents a historic proposed increase in NOAA's budget to \$6.98 billion, which is 29 percent above the FY 2021 enacted level of \$5.44 billion.<sup>36</sup> On July 19, the House Appropriations Committee reported out the Commerce, Justice, Science and Related Agencies Appropriations bill with a top line number for NOAA of \$6.46 billion, but the bill has yet to pass the House.<sup>37</sup>

<sup>31</sup> Through the National Centers for Environmental Information at the National Environmental Satellite, Data, and Information Service.

<sup>32</sup> <https://oceanfdn.org/what-noaas-new-climate-council-means-for-our-ocean/>

<sup>33</sup> <https://www.noaa.gov/new-noaa-climate-council-to-enhance-delivery-of-climate-science-and-services>

<sup>34</sup> [NOAA Blue Book 2022 final.pdf](#)

<sup>35</sup> <https://www.globalchange.gov/nca5>

<sup>36</sup> NOAA's FY22 Blue Book and Congressional Justification can be found at <https://www.noaa.gov/organization/budget-finance-performance/budget-and-reports>

<sup>37</sup> <https://www.congress.gov/117/crpt/hrpt97/CRPT-117hrpt97.pdf>

### **APPENDIX – Relevant HSST Hearings**

#### *Relevant Hearings<sup>38</sup> – 117<sup>th</sup> Congress*

- July 21, 2021 – Silent Killer: The Rising Problem of Extreme Heat in the U.S.
- July 20, 2021 – Spectrum Needs for Observations in Earth and Space Sciences
- June 29, 2021 – The State of Federal Wildland Fire Science: Examining Opportunities for Further Research & Coordination
- June 7, 2021 – Defining a National ‘Oceanshot’: Accelerating Ocean and Great Lakes Science and Technology
- April 21, 2021 – Working Towards Climate Equity: The Case for a Federal Climate Service
- March 17, 2021 – Brain Drain: Rebuilding the Federal Scientific Workforce
- March 12, 2021 – The Science Behind Impacts of the Climate Crisis

#### *Relevant Hearings – 116<sup>th</sup> Congress*

- September 30, 2020 – Coping with Compound Crises: Extreme Weather, Social Injustice, and a Global Pandemic
- July 14, 2020 – Sweltering in Place: COVID-19, Extreme Heat, and Environmental Justice
- February 27, 2020 – An Examination of Federal Flood Maps in a Changing Climate
- January 15, 2020 – An Update on the Climate Crisis: From Science to Solutions
- November 20, 2019 – A Task of EPIC Proportions: Reclaiming U.S. Leadership in Weather Modeling and Prediction
- October 23, 2019 – Space Weather: Advancing Research, Monitoring, and Forecasting Capabilities
- September 26, 2019 – Understanding, Forecasting, and Communicating Extreme Weather in a Changing Climate
- July 22, 2019 – Field Hearing: Weathering the Storm: Improving Hurricane Resiliency Through Research
- July 11, 2019 – Earth's Thermometers: Glacial and Ice Sheet Melt in a Changing Climate
- June 5, 2019 – Ocean Exploration: Diving to New Depths and Discoveries
- June 4, 2019 – Nature in Crisis: Biodiversity Loss and its Causes
- May 16, 2019 – The Future of Forecasting: Building a Stronger U.S. Weather Enterprise
- April 30, 2019 – A Review of the NOAA Fiscal Year 2020 Budget Request
- February 27, 2019 – Sea Change: Impacts of Climate Change on Our Oceans and Coasts
- February 13, 2019 – The State of Climate Science and Why It Matters

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<sup>38</sup> <https://science.house.gov/hearings>

Chairwoman SHERRILL. The hearing will come to order. Without objection, the Chair is authorized to declare recess at any time. Pursuant to *House Resolution 8*, today the Committee is meeting virtually. I want to announce a couple reminders to the Members about the conduct of this remote hearing. First, Members should keep their video feed on as long as they are present in the hearing. Members are responsible for their own microphones. Please also keep your microphones muted, unless you are speaking. Finally, if Members have documents they wish to submit for the record, please e-mail them to the Committee Clerk, whose e-mail address was circulated prior to the hearing.

Good morning. Welcome to today's Environment Subcommittee hearing to discuss the National Oceanic and Atmospheric Administration's (NOAA's) Earth System Science and Stewardship policies. I'd like to thank Ranking Member Bice for her bipartisan partnership at this hearing, as well as on recent legislation we've partnered together on, including the *NOAA Weather Radio Modernization Act*, which would expand and modernize a key tool in providing warnings on impending weather emergencies, as well as the *VET RENT Act*, which we'll be introducing soon, to ensure veterans who were housed in barracks-style housing have parity when competing for rental housing as civilians. I'd like to welcome NOAA Administrator Dr. Richard Spinrad to the Committee, and thank him for being here to testify about the vital work of this agency.

The climate crisis, and its very real impacts that we're facing today, underscores the importance of NOAA's mission to "understand and predict changes in climate, weather, and oceans, and coasts, to share that knowledge and information with others, and to conserve and manage coastal and marine ecosystems and resources." Extreme weather events and billion-dollar disasters are on the rise, and NOAA's environmental research, services, and stewardship activities are critical to saving lives and safeguarding our economy.

Earlier this month, Hurricane Ida, which made landfall over 1,000 miles away, caused historic and deadly levels of rainfall and flooding across my district and region in New Jersey. New Jerseyans are unfortunately no strangers to flooding, but an event of this magnitude shows us why we need to invest in resilience, and not just recovery. Climate change is causing storms like Ida to rapidly intensify and suck up more moisture, increasing flood risk. Supporting the work of NOAA's dedicated researchers and forecasters will help improve lead times for extreme weather and evacuation alerts, and to better understand how climate change impacts extreme events like Ida.

Many Americans utilize NOAA's data, products, and services on a daily basis, often without even realizing it. The most obvious examples are the weather apps on our phones. In addition, brave firefighters rely on meteorological data to predict where the latest catastrophic inferno would—will spread. Farmers across the country use products like the U.S. Drought Monitor to be strategic about their irrigation and crop decisions. Local officials utilize NOAA's real-time ocean data to know when to issue a harmful algal bloom (HAB) warning and close beaches. NOAA's Regional Integrated Sciences and Assessments Program provides crucial climate prod-

ucts and tools for officials to make informed infrastructure planning decisions that will withstand a changing climate, and so much more.

NOAA's only able to provide this, and many more types of useful information, because of its extensive network of Earth systems observations. These observational systems collect data from ships, aircraft, satellites, radar, and more. NOAA's scientists then process and analyze the data to provide forecasts and predictions in an accessible manner for all of us to benefit from. That is why my colleagues and I on the Science Committee must continue to support NOAA's work. That means understanding what the Agency needs to expand their current science and stewardship activities for future needs. It means providing the necessary high performance computing capabilities to both conduct research and run Earth systems models. It also means supporting NOAA's work force by increasing both hiring and diversity. And last, but most certainly not least, it means upholding scientific integrity.

NOAA and the scientific enterprise overall took a beating over the last several years when it came to upholding scientific integrity. We must work collectively to restore America's faith in science and our invaluable Federal scientists. I am pleased that the Biden Administration and Congress have taken steps to provide major investments for NOAA in Fiscal Year 2022 and beyond. Passing these investments into law will be critical to advancing the agency's life-saving work, and help Americans across the country. I'm looking forward to hearing Administrator Spinrad's vision for advancing cutting edge science, and how we in Congress can support the Agency's mission in tackling the challenges we face today, and will face in the future.

[The prepared statement of Chairwoman Sherrill follows:]

Good morning, and welcome to today's Environment Subcommittee hearing to discuss the National Oceanic and Atmospheric Administration's (NOAA) Earth System Science and Stewardship priorities.

I'd like to thank Ranking Member Bice for her bipartisan partnership at this hearing as well as on recent legislation we've partnered together on, including the *NOAA Weather Radio Modernization Act*, which would expand and modernize a key tool in providing warnings on impending weather emergencies, as well as the *VEET RENT Act*, which I'll be introducing soon, to ensure veterans who were housed in barracks-style housing have parity when competing for rental housing as civilians.

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And last, but most certainly not least, it means upholding scientific integrity. NOAA and the scientific enterprise overall took a beating over the last several years when it came to upholding scientific integrity. We must work collectively to restore America's faith in science and our invaluable federal scientists.

I am pleased that the Biden Administration and Congress have taken steps to provide major investments for NOAA in fiscal year 2022 and beyond. Passing these investments into law will be critical to advancing the agency's life-saving work and help Americans across the country.

I am looking forward to hearing Administrator Spinrad's vision for advancing cutting edge science and how we, in Congress, can support the agency's mission in tackling the grand challenges we face today and will face in the future.

Chairwoman SHERRILL. The Chair now recognizes Ranking Member Bice for an opening statement.

Mrs. BICE. Thank you, Chairwoman Sherrill, for holding this hearing today. I also want to welcome Administrator Spinrad, and thank him for his time today. Although we've had some great acting NOAA Administrators, it's been a few years since we had a confirmed administrator, so I want to congratulate you, Dr. Spinrad, and I look forward to working together.

Last year there were 22 weather, water, and climate disasters in the United States that exceeded \$1 billion in losses. Communities around the country have struggled through the effects of extreme events, including hurricanes, floods, droughts, wildfires, and the collapse of fisheries, and no one knows the lasting consequences of severe weather better than my constituents in Oklahoma, the very heart of Tornado Alley. Violent tornadoes, as well as hailstorms and large thunderstorms, can pop up quickly, leaving just minutes for people to find safety.

While natural disasters can be devastating and life altering, the data, tools, and services NOAA provides can equip all Americans with better access to more timely warnings and support. The never-ending goal is to protect all lives and property. While weather forecasting and observations might be the most widely known outfit, NOAA has a wide-ranging mission, from fishery management to atmospheric observation. These products and services have a tremendous economic impact, and affect more than 1/3 of America's gross domestic product. The President's Fiscal Year 2022 budget request for NOAA was 6.98 billion, a 22 percent increase from last year's enacted funding. With such a large increase proposed, I look forward to hearing from Administrator Spinrad on what his priorities are for the agency.



While I am certainly not opposed to investing in NOAA's life-saving products, we must ensure that the administration is adequately preparing—prepared to handle an increased budget. This includes expedited hiring, upgrading infrastructure, ramping up new research projects, and a variety of other issues. A lump sum of money with no strings attached can be a curse before it is a blessing. Therefore, priorities must be set, and decisions must be made.

When it comes to the specifics of the budget request, I was disappointed to see it did not include any details regarding the Earth Prediction Innovation Center, or EPIC. This Committee has had multiple hearings on EPIC, and its timely implementation has been a priority for Members on both sides of the aisle. It's a project that is absolutely critical to reclaiming and maintaining international leadership in numerical weather prediction.

However, I was pleased to see NOAA's focus on increasing their higher-performance computing capabilities. Last year one of NOAA's systems, Hera, was ranked number 88 on the top 500 list of fastest supercomputers in the world. A continued emphasis on computing will accelerate the development of weather modeling across NOAA and the National Weather Service. This, in turn, will improve the prediction of high impact weather events, and evaluate the potential future directions for models and data assimilation.

I hope to hear more on how NOAA can collaborate with other agencies, including the Department of Energy, which houses three of the top five fastest supercomputers in the world. Cross-agency collaboration, especially with an agency that is the clear subject matter expert, is the most efficient use of taxpayer money, and we should encourage it as much as possible.

Lastly, I look forward to discussing how NOAA will leverage existing centers, and scientific expertise, to inspire and support the next generation of STEM (science, technology, engineering, and mathematics) students. Oklahoma is proud to house a key component of NOAA's infrastructure, the National Weather Center. The work conducted in this center provides property and life-saving services for the entire country. But in order to attract and keep the next generation of talent filling that center, we must ensure that our buildings, instruments, and the entire infrastructure are world-class. The meteorologists, oceanographers, biologists, and other researchers shouldn't have to settle for outdated buildings, or cramped laboratories. Every Member of this Committee has priorities for their district, and I'm sure Administrator Spinrad has priorities of his own. I am excited to hear how NOAA plans to balance these, and how we in Congress can help maximize our return on investment. And, again, I want to thank Administrator Spinrad for testifying before the Committee today, and I look forward to engage—the engaging discussion. Madam Chair, I yield back the balance of my time.

[The prepared statement of Mrs. Bice follows:]

Thank you, Chairwoman Sherrill, for holding this hearing today. I also want to welcome Administrator Spinrad and thank him for his time today. Although we've had some great Acting Administrators at NOAA, it's been a few years since we've had a confirmed Administrator. So I want to congratulate you, Dr. Spinrad, and I look forward to working together.

Last year, there were twenty-two weather, water, and climatic disasters in the United States that exceeded \$1 billion in losses. Communities around the country

have struggled through the effects of extreme events, including hurricanes, floods, droughts, and wildfires.

And no one knows the lasting consequences of severe weather better than my constituents in Oklahoma, the very heart of Tornado Alley. Violent tornados, as well as hailstorms and large thunderstorms, can pop up quickly, leaving just minutes for people to find safety. While natural disasters can be devastating and life altering, the data, tools, and services NOAA provides can equip all Americans with better access to more timely warnings and support. The never-ending goal is to protect all lives and property.

While weather forecasting and observations might be the most widely known output, NOAA has a wide-ranging mission, from fisheries management to atmospheric observation. These products and services have a tremendous economic impact and affect more than one-third of America's gross domestic product. The President's Fiscal Year 2022 budget request for NOAA was \$6.98 billion, a 28 percent increase from last year's enacted funding. With such a large increase proposed, I look forward to hearing from Administrator Spinrad on what his priorities are for the agency.

While I'm certainly not opposed to investing in NOAA's life-saving products, we must ensure that the Administration is adequately prepared to handle an increased budget. This includes expedited hiring, upgrading infrastructure, ramping up new research projects, and a variety of other issue. A lump sum of money with no strings attached can be a curse before it is a blessing. Therefore, priorities must be set, and decisions must be made.

Chairwoman SHERRILL. Thank you. And we're pleased to have the Full Committee Chairwoman, Ms. Johnson, with us today. The Chair now recognizes the Chairwoman for an opening statement.

Chairwoman JOHNSON. Thank you very much, and good morning. I'd like to give a warm welcome to our witness, NOAA Administrator Dr. Richard Spinrad. He is testifying before the Committee for the first time since he officially took the helm of the agency. The National Oceanic and Atmospheric Administration plays a critical role in protecting American lives, property, and economic prosperity. NOAA is a unique agency that performs cutting edge science, but also provides critical environmental service and stewardship. By looking at the Earth as a system, we are better able to understand how the weather, ocean, climate, and atmosphere interact. Based on that understanding, NOAA provides essential services and products that serve us all.

Recently Americans have experienced an unprecedented string of natural disasters made worse by climate change. We've seen extreme heat and drought conditions out West that set the stage for this record-breaking wildfire season, and last month, Hurricane Ida rapidly intensified in the Gulf of Mexico before making landfall due to warmer water temperatures. In addition, warmer atmospheric conditions brought heavy precipitation leading to extraordinary flooding along the Gulf Coast, and all the way up to New England. This one devastating storm killed dozens and left countless others with property destroyed. Each year seems to have more multi-billion-dollar weather and climate disasters than the previous.

NOAA's scientific observations, predictions, and warnings have always been vital to Americans across the country, but they're becoming increasingly important for helping Americans prepare for extreme events exacerbated by climate change. This Committee is steadfast in supporting NOAA as the authoritative source for weather and climate information, so I am glad that Chairwoman Sherrill spoke to the importance of this in her remarks. This Committee has worked in a bipartisan fashion to authorize R&D (research and development) activities that help reduce our emissions

and mitigate climate change. NOAA's weather and climate programs also play an important role in addressing the climate crisis. NOAA data can be used to inform adaptation and resilience decisions at a community level. NOAA's scientists contribute to major climate reports that influence policy around the world, including the National Climate Assessments and the IPCC (Intergovernmental Panel on Climate Change) assessment reports.

It is reassuring to see that the President has elevated the importance of NOAA within his administration. We have the first Senate-confirmed Administrator in over four years, who is also eminently qualified. The Administration has significantly increased its budget request for NOAA. NOAA also has a seat on multiple White House-level interagency working groups tackling our most pressing climate issues. I look forward to this hearing from my administrator about his goals to advance NOAA's mission of science, service, and stewardship. NOAA has an important role to play in addressing the climate crisis, and we are fortunate to have an experienced leader like this administrator to guide the agency.

In closing, I again want to welcome you, Administrator, and this will be our first—many positive interactions we have with this Committee. With that, I yield back.

[The prepared statement of Chairwoman Johnson follows:]

Good morning. I would like to give a warm welcome to our witness, NOAA Administrator Dr. Richard Spinrad. He is testifying before the Committee for the first time since he officially took the helm of the agency.

The National Oceanic and Atmospheric Administration plays a critical role in protecting American lives, property, and economic prosperity. NOAA is a unique agency that performs cutting edge science, but also provides critical environmental service and stewardship. By looking at the Earth as a system, we are better able to understand how the weather, ocean, climate, and atmosphere interact. Based on that understanding, NOAA provides essential services and products that serve us all.

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I look forward to hearing from Administrator Spinrad today about his goals to advance NOAA's mission of science, service, and stewardship. NOAA has an important

role to play in addressing the climate crisis, and we are fortunate to have an experienced leader like Administrator Spinrad to guide the agency.

In closing, I again want to welcome you to the Committee, Administrator Spinrad. I hope this will be the first of many positive interactions you have with this Committee. With that, I yield back the balance of my time.

Chairwoman SHERRILL. Thank you, Madam Chairwoman. We're also pleased to have the Full Committee Ranking Member, Mr. Lucas, with us today, so the Chair now recognizes Ranking Member Lucas for an opening statement.

Mr. LUCAS. Thank you, Chairwoman Sherrill, and I echo my colleagues, welcome to Administrator Spinrad. It's great to have you here today. NOAA has a broad array of responsibilities, ranging from weather forecasting and climate prediction to ocean and atmospheric observation. NOAA's work benefits America's farmers and ranchers. Coastal communities, disaster personnel, land use planners, weather forecasters, and everyday citizens rely on NOAA's daily work. NOAA's in-house research is groundbreaking, and the publicly available environmental data they collect has an immense economic impact. That's why I'm eager to hear from Administrator Dr. Rick Spinrad today.

As NOAA's former Chief Scientist, and head of the Office of Oceanic and Atmospheric Research (OAR), I know that the administrator is very familiar with this Committee, and the work we do. In fact, to give you a sense of how intertwined our paths have been, Administrator Spinrad was present in his official OAR capacity at the 2006 dedication of the National Weather Center in Norman, Oklahoma. There's a great picture of him right next to Jim Cantore that I'll have to share someday with everyone. All of this is to say I believe the administrator speaks the Science Committee's language.

While we might not agree on the exact way to do certain things, I think we can engage in a meaningful discussion where both sides are heard and valued. At the end of the day, weather is non-partisan. Severe events don't travel along party lines. That's why I will remind my colleagues, just I have done in years past when Republicans were in control, the administration's top priority should be aligned with NOAA's core priority, protecting life and property. So today I look forward to hearing from the administrator on how he envisions advancing NOAA's mission, and improving its ability to save lives.

One issue I'd like to address today is commercial data supply. NOAA provides tools, data, and operations that are capable to—literally—applicable to literally every single district in the country. Whether it's a rancher in Oklahoma, fishing captain in Florida, a firefighter in Oregon, they all depend on information NOAA provides. But as more private sector companies enter the picture, with the ability to gather their own environmental and weather data, NOAA must seek to balance its capacities with supplemental commercial data. Simply put, NOAA's no longer the only provider in the market, and oftentimes NOAA's collection of data costs more than that acquired of the same quantity of data from a private sector company.

I can't assume—I literally say that we can't assume an endless increasing budget. At some point the balloon will pop. Believe me, I want NOAA to be successful across its mission areas. We can best

ensure that by prioritizing funding, and standing up programs to acquire data that private industry cannot collect, while preparing for a commercially competitive future. Again, I want to thank Administrator Spinrad for being here today, Chairman Sherrill for having this hearing, and I yield back the balance of my time.

[The prepared statement of Mr. Lucas follows:]

Thank you, Chairwoman Sherrill. And I echo my colleagues' welcome to Administrator Spinrad. It's great to have you here today.

NOAA has a broad array of responsibilities ranging from weather forecasting and climate prediction, to ocean and atmospheric observation. NOAA's work benefits America's farmers and ranchers, coastal communities, and disaster personnel. Land use planners, weather forecasters, and everyday citizens rely on NOAA's work daily. NOAA's in-house research is groundbreaking and the publicly available environmental data they collect has an immense economic impact.

That is why I am eager to hear from NOAA Administrator Dr. Rick Spinrad today. As NOAA's former Chief Scientist and head of the Office of Oceanic and Atmospheric Research (OAR), I know that the Administrator is very familiar with this Committee and the work we do. In fact, to give you a sense of how intertwined our paths have been, Administrator Spinrad was present in his official OAR capacity at the 2006 dedication of the National Weather Center in Norman, Oklahoma. There's a great picture of him right next to Jim Cantore that I'll have to share with everyone some time.

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We can't assume an endlessly increasing budget. At some point, the balloon will pop. Believe me, I want NOAA to be successful across its mission areas. We can best ensure that by prioritizing funding and standing up programs to acquire data that private industry cannot yet collect while preparing for a commercially competitive future.

Again, I want to thank Administrator Spinrad for being here today and Chairwoman Sherrill for having this hearing. I yield back the balance of my time.

Chairwoman SHERRILL. Thank you, Ranking Member Lucas. At this time I'd like to give the opportunity for Representative Bonamici to introduce her fellow Oregonian, and I yield to Ms. Bonamici.

Ms. BONAMICI. Thank you Chairwomen and Ranking Members. It is really a pleasure to introduce Dr. Richard Spinrad, the current Administrator of the National Oceanic and Atmospheric Administration, and a fellow Oregonian. Dr. Spinrad is an internationally renowned scientist and leader, with more than 35 years' experience. In 2014 then-President Obama nominated Dr. Spinrad as NOAA's Chief Scientist. From 2003 until 2010 he served as the head of NOAA's Office of Oceanic and Atmospheric Research and the National Ocean Service. Dr. Spinrad has also held leadership positions at the U.S. Office of Naval Research and Oceanographer

of the Navy, and was awarded Distinguished Civilian Service Award, the Navy's highest award for civilians.

Throughout his career Dr. Spinrad has held multiple faculty positions, including most recently as a Professor of Oceanography at Oregon State University. Earlier this year I had the honor of introducing Dr. Spinrad at his confirmation hearing in front of the Senate Commerce, Science, and Transportation Committee. Dr. Spinrad's successful confirmation makes him the 11th NOAA Administrator, the first Senate-confirmed leader, as Ranking Member Bice mentioned, since January of 2017, and the third from Oregon State. Now, as Members of this Committee, especially Representative Gonzalez, know, my alma mater is the University of Oregon, and yet I am extremely proud of Oregon State University here.

Since assuming the position of NOAA Administrator in June, Dr. Spinrad has been a force, preserving and strengthening NOAA's core mission of science, service, and stewardship. In July NOAA established a climate council, which will be comprised of senior leaders across the agency and entrusted with coordinating climate work across NOAA. The council is also tasked with advancing equitable delivery of NOAA's science to all communities, and especially those most severely affected by climate change. Additionally, last week NOAA announced \$41 million in grants for Coastal, Oceanic, and Great Lakes Observation Program, and that's going to help the scientific community and others better stand—better understand our invaluable coasts and respond to climate change.

I want to thank Dr. Spinrad for spending time with this Committee this morning. I look forward to hearing more about the important work NOAA is—as our Nation's premier climate science agency. Thank you again, Chair Sherrill, and I yield back the balance of my time.

Chairwoman SHERRILL. Thank you. As our witness should know, you will have five minutes for your spoken testimony. Your written testimony will be included in the record for the hearing. When you've completed your spoken testimony, we will begin with questions. Each Member will have five minutes to question the witness. With that, I'm pleased to turn it over to Administrator Spinrad.

**TESTIMONY OF THE HONORABLE RICHARD W. SPINRAD,  
PH.D., UNDER SECRETARY OF COMMERCE  
FOR OCEANS AND ATMOSPHERE, AND ADMINISTRATOR,  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION**

Dr. SPINRAD. Chair Sherrill, Ranking Member Bice, Members of the Subcommittee, as well as Chair Johnson and Ranking Member Lucas, thank you for the opportunity to testify today regarding my priorities for the National Oceanic and Atmospheric Administration. Special thanks also to Representative Bonamici for that very kind introduction. Thank you.

One week from today marks my 100th day as Administrator of NOAA. This is my third tour of duty at NOAA. Previously I served as Chief Scientist during the Obama Administration, and before that I led our Office of Oceanic and Atmospheric Research in the National Ocean Service. The urgency with which NOAA's working to address our Nation's most pressing challenges is like never before. From combatting the climate crisis, and bolstering the equi-

table delivery of climate science and services, reinforcing scientific integrity, and rebuilding our scientific work force, ensuring our agency is diverse, equitable, inclusive, and accessible, to promoting economic development, while maintaining environmental stewardship, the NOAA work force has been firing on all cylinders to meet the increasing demands of our Nation.

That mission is science, service, and stewardship, to understand and predict changes in climate, weather, oceans, and coasts, to share that knowledge with others, and to conserve and manage coastal and marine ecosystems and resources. As NOAA Administrator, I'd like to share with you my main priorities in pursuit of this mission, and in alignment with the goals of the Biden/Harris Administration.

The first pillar of that mission, our science, is at the core of our agency, and is the foundation for smart policy and decisionmaking. From the depths of the ocean to the surface of the Sun, we are observing and collecting data, and turning those data into Earth system models, information, tools, and forecasts. NOAA's trusted data are the basis for your weekend weather forecasts, provide our constituents with harmful algal bloom warnings, and feed into our models that predict wildlife and wildfire smoke movement in real time. It is essential that NOAA's data and information adhere to the principles of scientific integrity to maintain our trusted status, and issue life-saving weather forecasts and warnings, as well as our climate predictions and projections. The Biden/Harris Administration has made upholding scientific integrity a main priority, and I've already taken steps to ensure NOAA not only meets but exceeds those expectations, including by requiring all NOAA political appointees to complete scientific integrity training.

The second pillar of our mission is service, and I have made it one of my top priorities to expand NOAA's role as the primary authoritative provider of Federal climate products and services that can be applied to a diverse range of missions. Just as NOAA is the authoritative provider of weather forecasts, navigational charts, and fishery stock assessments, we play a unique role in that not only do we collect data and conduct research, but we are mandated to make it operational.

This means we must provide the public and our Federal, State, tribal, and industry partners with actionable environmental information to make decisions in the face of climate change. These decisions can range from municipalities looking to ensure new construction will be resilient to sea level rise, flooding, and heavy precipitation, large insurance companies seeking to incorporate climate risk into their insurance policies, or a resident of New Orleans wondering if they should rebuild or relocate after the latest hurricane. My vision is that, no matter the need, people will know they can turn to NOAA for reliable, easy to use climate information. We are seeing increasing demands for this kind of information. As demonstrated by the record-setting summer of extreme heat, drought, wildfires, floods, hurricanes, and other extreme events, the climate crisis is upon us, and requires a whole of government response.

The third pillar of our mission is stewardship. Stewardship means that we conserve our lands, waters, and natural resources,

protecting people and the environment now, and for generations to come. As an agency under the Department of Commerce, NOAA is dedicated to promoting economic development, while maintaining environmental stewardship. The two can go hand in hand. We create opportunities for sustainable economic growth across the country, including by providing training for the next generation of climate-ready workers. This aligns with another of my top priorities, to advance the new blue economy, which means looking to the ocean for data and information that can be applied to sustainable business development in new and traditional ocean-based sectors. The new blue economy offers opportunities for climate-smart innovation and economic growth.

To fully realize NOAA's mission, I've made equity a central focus to ensure that equity is not something that we do, but rather everything we do. This will better position NOAA to help tackle the climate crisis, produce better science, deliver better services, be better stewards of the environment and the economy, and build a more inclusive work force. Thank you all for again inviting me here today, and I look forward to answering any questions you may have.

[The prepared statement of Dr. Spinrad follows:]



**WRITTEN STATEMENT OF  
DR. RICHARD W. SPINRAD  
UNDER SECRETARY OF COMMERCE FOR OCEANS AND ATMOSPHERE AND  
NOAA ADMINISTRATOR**

**ON THE  
ADVANCING EARTH SYSTEM SCIENCE AND STEWARDSHIP AT NOAA**

**BEFORE THE  
HOUSE COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY  
SUBCOMMITTEE ON ENVIRONMENT**

**September 23, 2021**

Chairwoman Sherrill, Ranking Member Bice, and Members of the Subcommittee, thank you for the opportunity to testify today regarding my priorities for the National Oceanic and Atmospheric Administration (NOAA).

One week from today marks my 100th day as Administrator of NOAA. This happens to be my third tour of duty at NOAA - previously, I served as Chief Scientist during the Obama Administration, and a few years before that, I led our Office of Oceanic and Atmospheric Research and the National Ocean Service. In my first 100 days as Administrator, I can tell you that the urgency with which NOAA is working to address our Nation's most pressing challenges is like never before. From combatting the climate crisis and bolstering the equitable development and delivery of climate science and services; reinforcing scientific integrity and rebuilding our scientific workforce; ensuring our agency is diverse, equitable, inclusive, and accessible; to promoting economic development while maintaining environmental stewardship - the NOAA workforce has been firing on all cylinders to meet the increasing demands of our mission.

That mission is science, service, and stewardship -- to understand and predict changes in climate, weather, oceans, and coasts; to share that knowledge and information with others; and to conserve and manage coastal and marine ecosystems and resources. As NOAA Administrator, I would like to share with you my main priorities in pursuit of this mission, and in alignment with the goals of the Biden-Harris Administration.

The first pillar of that mission - our science - is at the core of our agency and serves as the foundation for smart policy and decision-making. From the depths of the ocean to the surface of the sun, we are observing, measuring, monitoring, and collecting data, and turning those publicly-available data into earth system models, information, tools, and forecasts for public use. NOAA's trusted data are the basis for your weekend weather forecast that you can access on your phone with a press of a button; they provide your constituents with forecasts and warnings for harmful algal blooms; feed into our models that predict the movement of wildfire smoke in real-time; and identify impacts of climate change on fisheries and living marine resources to improve management. It is essential that NOAA's data and information adhere to

the principles of scientific integrity in order to maintain our trusted status and issue our life-saving weather forecasts and warnings as well as our climate predictions and projections. The Biden-Harris Administration has made upholding scientific integrity as a main priority, and I have already taken steps to ensure NOAA not only meets, but exceeds, those expectations, including by requiring all NOAA political appointees to complete scientific integrity training.

The second pillar of our mission is service, and as Administrator, I have made it one of my top priorities to expand upon NOAA's authoritative climate products and services that can be applied to a diverse range of missions. We play a unique role in that not only do we collect data and conduct research, but we are mandated to make it operational - research to operations, applications, and commercialization, or R2X as it is known in the scientific community. The operations part means that we must provide the public and our Federal, state, tribal, and private sector partners with actionable environmental information in order to make decisions in the face of climate change. These decisions can range from businesses planning where to locate their next offices; municipalities looking to ensure their plans for construction of new housing developments will be resilient to increasing sea level rise, flooding, and heavy precipitation; large insurance companies seeking to incorporate climate risk into their insurance policies; or a resident of New Orleans wondering if they should rebuild or relocate after the latest hurricane. My vision is that people will know they can turn to NOAA for reliable, accurate, accessible, relevant, easy-to-use climate information for planning, adaptation, and resilience decisions and actions. And we are seeing increasing demands for this kind of information. As demonstrated by the record-setting summer of extreme heat, exceptional drought, raging wildfires, unprecedented floods, disastrous hurricanes, and other extreme weather events, the climate crisis is upon us and requires a whole-of-government response. At NOAA, we are responding to the Administration's call to action to work across the Federal government to prepare for, adapt to, and build resilience against this crisis in myriad ways, working collaboratively with our sister agencies.

The third pillar of our mission is stewardship. Stewardship means that we conserve our lands, waters, and natural resources, protecting people and the environment now and for generations to come. NOAA sits within the Department of Commerce, and therefore, it is our responsibility to promote economic development without sacrificing environmental stewardship. The two are not mutually exclusive; in fact, they can go hand in hand. Through our stewardship, we create jobs and opportunities for sustainable economic growth and innovation. For example, each national marine sanctuary is a significant driver of eco-tourism and local recreation; the new Civilian Climate Corps will provide training and well-paying, quality jobs for the next generation of climate-ready workers; the National Coastal Resilience Fund provides funding for projects that enhance fish and wildlife habitats and increase protection for coastal communities, which leads to job creation in communities across the country and protection of critical infrastructure. This aligns well with another of my top priorities to advance what is now called the new blue economy, which I define as the knowledge-based ocean economy - looking to the ocean for data, information, and knowledge that can be applied to new, sustainable business development, products, and services that support offshore wind, transportation, shipping, exploration, recreation, fisheries, aquaculture, tourism, and other new and traditional ocean-based sectors. The new blue economy offers opportunities for sustainable, climate-smart innovation and economic growth based on sound science.

Essential to fully realizing NOAA's mission, is integrating equity into everything we do at NOAA, from development of new products to delivery to all - including the most vulnerable - communities. I have made equity a central focus to ensure that equity is not *something* we do, but rather embedded in *everything* we do. Doing so will better position NOAA to help tackle the climate crisis, produce better science, deliver better services, be better stewards of the environment and the economy, and build a more inclusive workforce.

Making my vision for NOAA a reality requires significant investment in our critical infrastructure. To conduct more cutting edge research and transition into operations, expand our delivery of authoritative climate information and services, mitigate and adapt to the climate crisis, strengthen ecosystem and community resilience, meet the Administration's offshore wind goals, improve upon our world-class weather and climate models - we must scale up our core systems that are the backbone of this crucial work. Investments in research and R2X, observational infrastructure such as the NOAA fleet and satellites, high performance computing, ocean observations, laboratories, aircraft, and uncrewed systems, are essential to meeting our mission and this moment. NOAA's FY2022 budget request includes these important investments that will enable us to better serve *all* Americans through our science, service, and stewardship.

#### **Scientific integrity**

As mentioned, a major priority of the Biden-Harris Administration as well as NOAA is Scientific Integrity. When I served as NOAA's Chief Scientist, I co-authored the agency's first Scientific Integrity policy. At the time and to this day, our policy is viewed as a model for the Federal Government. But as we've learned, even with a model policy in place, scientific integrity can still be threatened. We must stay vigilant to ensure its principles - to promote a continuing culture of scientific excellence and integrity, and ensure that management and policy decisions are based on sound, transparent, and reliable scientific activities - are upheld. And there must be consequences if policies are violated. This Administration has made it clear that we must affirm and reinforce the value of science and scientific integrity, and to that end, I directed my political staff to undertake the Department of Commerce's Scientific Integrity training, to which they complied in August 2021.

#### **Scientific workforce**

Integral to maintaining a high standard for our science is our scientific workforce. As this Committee found in the March 2021 staff report titled, "Brain Drain: Quantifying the Decline of the Federal Scientific Workforce," over the past decade, while some Federal science agencies have greatly increased staffing, there has been an alarming decline in employment at others.<sup>1</sup> At NOAA, our workforce declined by 8.6% from FY 2009-2020, and our STEM workforce in particular was 1.6 % smaller in 2020 than it was at the end of the previous decade.<sup>2</sup> The report also found that racial, ethnic, and gender gaps in our STEM workforce are pervasive and pernicious. This is unacceptable to me and I am committed to reversing these alarming trends. I know that in order to maintain, and grow, our status as a preeminent science agency and global leader in climate science and services, the agency must attract and retain a

<sup>1</sup> House Committee on Science, Space, and Technology, Majority Staff, [\*Scientific Brain Drain: Quantifying the Decline of the Federal Science Workforce\*](#), Mar. 2021.

<sup>2</sup> Ibid.

diverse STEM and overall workforce. To be the leader in providing mission-agnostic climate products and services, NOAA must look like the communities we seek to serve and reflect the great diversity of the American public.

To recruit and retain the workforce necessary to achieving our mission and fulfilling this Administration's priorities, we must ensure that NOAA's culture is inclusive. Employees must feel a sense of belonging or we risk further "brain drain." To that end, we are working hard to create a culture of diversity, equity, inclusion, and accessibility (DEIA). In July, we held the inaugural We Are NOAA Week, a week that examined the challenges, progress, and opportunities for advancing DEIA at NOAA. During this week, I participated in a conversation with our twelve Employee Resource Groups and NOAA leadership, where I heard feedback and ideas from employees on how to advance DEIA at NOAA and made a commitment to incorporate their recommendations and engage more regularly with the workforce.

In accordance with EO 13985 on Advancing Racial Equity and Support for Underserved Communities Through the Federal Government, earlier this summer we completed Service Equity Assessments to better understand barriers to access for underserved communities to some of our programs, and are working to incorporate the findings made in those reports.<sup>3</sup> We are currently undertaking a self-assessment on the status of DEIA within the agency's workforce as directed by EO 14035 on Diversity, Equity, Inclusion, and Accessibility in the Federal Workforce.<sup>4</sup> In addition, we have been holding a series of Climate and Equity Roundtables in various regions across the country, where we hear from local stakeholders in underserved communities that are vulnerable to climate change about how NOAA can better serve their needs. These are just a few examples of the ongoing efforts to better integrate equity at NOAA, both internally within our workforce, and externally in the work we do to serve communities. My goal is that these efforts will improve NOAA's culture and enable us to foster a more diverse and inclusive STEM and overall workforce that will continue to grow into the next decade.

#### **Climate science and services**

**One of my top priorities is to expand upon NOAA's authoritative climate products and services that can be applied to a diverse range of missions.** For this reason, I announced on July 21 the creation of a new NOAA Climate Council (NCC), which will leverage and coordinate our resources and expertise to strengthen the delivery of NOAA's climate products and services. The NCC is already working to ensure that our critical climate information and services are delivered effectively and equitably. These information and services are needed more than ever before, as communities across the country are increasingly grappling with the impacts of climate change as evidenced by a summer of record extremes. July 2021 was the world's hottest month ever recorded, and 2021 is likely to be among the world's 10 warmest years on record, according to NOAA's National Centers for Environmental Information (NCEI).<sup>5</sup> The 2020 State of the Climate report, led by NCEI and published by the American Meteorological Society in August 2021, found that greenhouse gas levels and global

<sup>3</sup> [E.O. 13985](#), Jan 20, 2021.

<sup>4</sup> [E.O. 14035](#), Jun 25, 2021.

<sup>5</sup> <https://www.ncei.noaa.gov/news/global-climate-202107>



temperatures reached record highs in 2020; the number of tropical cyclones was well above average; ocean heat content was record-setting; and other alarming indicators of climate change are already underway, consistent with an increasingly warmer earth.<sup>6</sup> NOAA reported that in 2020, the U.S. experienced an unprecedented 22 separate billion-dollar disasters that killed at least 262 people - wildfires, drought and heatwave events, tornado outbreaks, hurricanes, hail storms, and more.<sup>7</sup> And so far, we are on track for another record-setting year of costly disasters.

Every Federal agency looking to understand the impacts of climate change on their mission, starts first with NOAA's authoritative data. Beyond just providing data, NOAA convenes and works directly with other Federal science agencies to produce climate science and to support the agencies who need to use our science within their missions. Under the Congressionally-mandated U.S. Global Change Research Program (USGCRP), NOAA works with the other twelve USGCRP member agencies and co-leads multiple interagency working groups focused on global climate change and climate science, adaptation and resilience, international collaboration, climate and human health, sustained assessments, and the social sciences of climate and global change.

NOAA's science has made it clear: climate change is already devastating our communities, and we must prepare ourselves for the unavoidable impacts to come. To enable communities to better prepare for, respond to, and recover from increasing extreme weather and climate events, NOAA has requested an additional \$855.1 million over enacted levels which will bolster climate research, expand our local and regional decision-support services, products, and tools, and help our most vulnerable communities build resilience. With more resources, we will be able to improve upon and increase the critical delivery of our trusted global-scale climate information to communities that need it to plan for the future. For example, NOAA's Regional Integrated Sciences and Assessments (RISA) program will expand to reach more communities across the country, especially the vulnerable, and work with them to create and implement climate resilience plans. We will engage with tribes and local indigenous groups to co-develop knowledge and co-manage resources. The National Sea Grant College Program will work with more coastal communities to help them better understand their climate risks and develop decision-support tools. These are just a few examples of my plans to expand the reach of our climate products and services and get them to the communities that need them the most. NOAA has the authoritative data, knowledge, expertise, and tools needed to adapt to, mitigate, and build resilience against climate change, and with additional resources, we can make them more accessible, more usable, and more widely available to help meet decision-making needs in communities.

#### *Research, observations, and forecasting*

Fundamental to my vision of expanding NOAA's authoritative climate products and services is our research, observations, and forecasting. Our research enables us to understand current and projected changes in our climate and is the foundation of our products and tools. In our budget request, we are asking for an increase of \$149.3 million to improve our understanding of climate change across timescales - weeks, years, decades, centuries - and use this information

<sup>6</sup> [State of the Climate in 2020](#), Aug. 2021.

<sup>7</sup> <https://www.noaa.gov/stories/record-number-of-billion-dollar-disasters-struck-us-in-2020>

to improve climate predictions and projections as well as our understanding of the impacts of climate change. We will research the interactions between ocean and climate in order to better understand and project sea level rise, coastal inundation, precipitation, sea ice, and other indicators. We will work across NOAA and with our academic partners to advance subseasonal-to-seasonal and seasonal-to-decadal forecasts using our Unified Forecast System (UFS). We will work with our agency partners, such as NASA and the National Science Foundation, to enhance our understanding of the coupled earth system which will in turn inform adaptation and management decisions. Our research also serves to inform other Federal agencies about their own climate risks.

Observations and forecasting are essential to measuring and predicting climate change, and there is an increasing demand for NOAA's actionable environmental data. A network of satellites, aircraft, radar, buoys, surface systems, atmospheric sampling stations, uncrewed systems, ships and more are continuously collecting data that we archive, integrate into models and tools, and provide to the public, other Federal agencies, and academic and private sector partners. To meet the growing need for our data, NOAA has proposed a \$368.2 million increase which will enable us to continue to invest in our observational network. We will continue to track weather, climate, and other environmental conditions and store this information in our publicly-available records. Our records serve as the baseline against which we measure climate and environmental changes. We will also continue to support and maintain our ocean and atmospheric observation systems, which feed into our essential operational weather, climate, and marine forecasts and services.

To improve our climate and weather forecasting and facilitate collaboration between NOAA and the academic and private sector weather forecasting community, we awarded a contract in April to design and build the Earth Prediction Innovation Center (EPIC). EPIC will help us accelerate improvements to our operational weather and climate forecasting, which will in turn strengthen our unified, Earth system models, weather and climate services, and improve our decision-support tools. The transition of our research, observations, and forecasts into operations continues to be a priority. For example, we recently transitioned two Harmful Algal Bloom (HAB) forecasts into operations, which will inform Florida and Texas coastal residents about where and when red tide might impact their beaches, and give Lake Erie residents an early outlook of a bloom's likely severity. The delivery of our HAB forecasts is an example of a key service we provide that enables local planners, the public, and other stakeholders to make informed decisions about, in this case, when to plan beach outings and other outdoor activities. We will continue to work to ensure that our weather and climate research, observations, and forecasts are transitioned into tools, products, and services that are disseminated to all communities, working with local partners to ensure information is equitably distributed and helps people make informed decisions.

#### *Climate adaptation and resilience*

As the ocean and climate experience unprecedented warming, the Nation continues to deal with increasingly frequent and severe extreme weather events. Coastal and inland communities alike need more tailored forecasts and products to make decisions, which rely on improving our understanding of the ocean-climate nexus. This improved understanding will lead to more opportunities for NOAA, our Federal partners, and the private sector to create new products that will enable communities and businesses to adapt to climate change.

Sea level rise, hurricanes, HABs, flooding, and other ocean-related climate risks threaten people and infrastructure. Many of the impacts of these threats can vary significantly depending on the geography and environmental conditions in a place, and therefore local planners need hyper-localized climate information specific to their community. The demand for this information is already creating new opportunities for innovation, both within NOAA, between NOAA and other Federal agencies, and in the private sector. For example, NOAA's Sea Level Rise Viewer is a web mapping tool that visualizes community impacts from sea level rise and coastal flooding, informing local planning decisions. The joint NOAA and BOEM OceanReports is a new web-based marine spatial planning tool that can analyze any U.S. ocean "neighborhood" and inform decision-making and planning for offshore energy, climate resilience, and conservation efforts. NOAA supports and coordinates with FEMA and other federal agencies, who use and provide flood data information products and services to support local decision-making; for example, FEMA's National Flood Hazard Layer enables communities to better understand their level of flood risk and type of flooding. First Street Foundation leverages NOAA's data to create property-level flood risk mapping tools to inform individuals and communities about the risks to their properties and livelihoods from rain, riverine, tidal events, and storm surge.<sup>8</sup> Tailored climate information products, based on ocean and climate data, are emerging as a major market within the new blue economy.

I recognize that communities that are most vulnerable to climate change and least well-resourced need additional support to prepare for and respond to sea level rise, hurricanes, flooding, and other extreme events. To ensure communities can access and utilize our climate risk tools and adequately prepare for increasing extreme weather events, NOAA has requested \$57.9 million in FY 2022 to better integrate equity and environmental justice into our activities and service delivery. These resources will enable us to better respond to the needs of vulnerable and historically underserved communities, including implementing recommendations from our Service Equity Assessments to remove barriers to access to our services, providing Spanish language translations of our Sea Level Rise Viewer and other decision-support tools, and increasing recruitment and hiring of a diverse workforce so we can reflect the communities we seek to serve. We will expand our work to ensure that the most vulnerable communities are included in our resilience efforts and can reap the benefits of the new blue economy.

#### **New blue economy**

Advancing the new blue economy is another main priority of mine. This means leveraging the data, information, and knowledge that we derive from the ocean, and applying it to sustainable economic development. The new blue economy is being centrally driven by data about the status and trends of the ocean environment, and NOAA is, and will continue, to play a leading role in the collection and provision of this data.

The new blue economy presents us with opportunities to create innovative new climate-smart

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<sup>8</sup> <https://www.floodfactor.com/about>

products, services, and businesses in traditional and novel blue economy sectors. To meet the moment and our mission, NOAA must continue to collect diverse sets of data, provide quality assurance and control, and ensure the data is accessible. The commercial sector will continue to utilize our open data, and make innovations that will lead to new products and services. As the climate and ocean continue to change, the demand for products and services that are adaptable to changing conditions will continue to grow. This demand underscores the need for improvements in technology for measuring, modeling, and predicting the ocean - our FY 2022 budget request will enable NOAA to address these challenges and make necessary improvements.

#### *Ocean exploration*

Understanding our ocean, its relationship to climate, and improving our dissemination of ocean data and information requires observations, measurements, and modeling. Underpinning our models, products, and services that predict changes in our whole Earth system is quality, reliable data on past and present ocean conditions. Our ocean is changing at an unprecedented rate and much of the ocean remains largely unexplored and not well-understood. To improve our weather and climate predictions, we must improve our understanding and knowledge of the ocean, which requires us to collect more data and information through ocean exploration, observation, and mapping. In fact, NOAA's participation in the UN Decade of Ocean Science for Sustainable Development (2021-2030) promotes cooperative research and data sharing to improve the global understanding of the ocean and its effects on our climate and on the global community. Ocean exploration, observation, and mapping data will enable us to provide better products and services, and to advance the new blue economy by providing needed information to industries such as transportation, aquaculture, tourism, energy, and others. Ocean science is a prerequisite for sustainable blue economy development, and improving our knowledge of the ocean by doing more exploration, data collection, and mapping will improve our climate products and services and create more opportunities for economic development and innovation.

#### *Offshore wind*

The Biden-Harris Administration has set the goal of deploying 30 gigawatts (GW) of offshore wind energy by 2030, and we are working to advance that goal. The proliferation of the offshore wind sector is a prime example of how the new blue economy offers opportunities for sustainable business development, and a place where NOAA can promote economic development while maintaining environmental stewardship. The installation and deployment of offshore wind requires data and information about the conditions of the ocean and how they will change over time. It also requires a scientific understanding of protected resources, fisheries, and habitats to minimize impacts from wind siting to our trust resources and the communities that rely upon them. NOAA's knowledge of the ocean and marine resources, our observations, and forecasts play an important role in achieving the Administration's offshore wind goal. In FY 2022, NOAA has requested \$20.4 million which will support interagency coordination, scientific assessments and guidance, environmental and marine resource assessments, and development of new fisheries survey methods, to achieve the goal of 30 GW by 2030. As the offshore wind energy industry continues to grow, and as the renewable energy market expands, NOAA will continue to leverage our scientific information while ensuring we continue to protect marine resources and fisheries. These activities are essential to facilitating offshore wind energy development as a climate change mitigation strategy while protecting communities, setting quotas for commercial and recreational fishermen, and monitoring and



assessing the recovery and conservation programs for protected species and essential fish habitat.

### **Space weather**

Space weather events pose a major risk to the economy, communications, and national security, and therefore must be observed and forecasted. The Promoting Research and Observations of Space Weather to Improve the Forecasting of Tomorrow Act (PROSWIFT) authorizes agencies to develop formal structures to transition space weather research to NOAA. The Space Weather Operations, Research, and Mitigation (SWORM) Interagency Working Group identified the need for space weather R2O2R (research-to-operations-to-research), and we are working to close the gap in our ability to improve space weather forecasting and warning services. NOAA has requested \$5 million in FY 2022 to accelerate our space weather predictions and ensure we are prepared for a future space weather event. Space weather is a critical component of our research, observations, and forecasting that enables us to meet our mission and provide critical information and services to the public.

### **Federal collaboration**

#### *Interagency Working Groups*

Through EO 14008 on Tackling the Climate Crisis at Home and Abroad, the President created the National Climate Task Force to coordinate the whole-of-government response to the climate crisis.<sup>9</sup> The Task Force recently announced the creation of five interagency working groups (IWG) to support communities in developing resilience strategies to address the risks of drought, wildfires, extreme heat, coastal hazards, and floods. NOAA is involved in each of these efforts and has a leadership role in two of them. CEQ Chair Mallory and I are co-chairs of the Coastal Resilience IWG, and EPA Administrator Regan and Health and Human Services Secretary Becerra and I are co-chairs of the Extreme Heat IWG. Through these IWGs, we are focusing on coordinating across the government and developing strategies to reduce the devastating impacts of these climate-related hazards on communities, particularly those most vulnerable and least well-resourced.

#### *Other Federal collaboration mechanisms*

EO 14008 also directed us to work with FEMA and the Office of Science and Technology (OSTP) policy to produce a report on “ways to expand and improve climate forecast capabilities and information products for the public.”<sup>10</sup> We are also involved in the development of a report on “the potential development of a consolidated Federal geographic mapping service that can facilitate public access to climate-related information that will assist Federal, State, local, and Tribal governments in climate planning and resilience activities.”<sup>11</sup> Both of these reports are underway and expected to be delivered to the Climate Task Force in short order. These efforts won’t end with the delivery of the reports; once complete, I have directed my staff to move towards implementing the findings and recommendations. I view this effort as one of many key steps in achieving my vision to expand NOAA’s authoritative, equitably-delivered climate products and services.

<sup>9</sup> [E.O. 14008](#), Jan 27, 2021.

<sup>10</sup> [E.O. 14008](#), Jan 27, 2021.

<sup>11</sup> *Ibid.*

NOAA collaborates with other Federal agencies on climate through mechanisms such as the USGCRP, where we co-lead the development of the National Climate Assessment. We also co-chair with OSTP the Interagency Council for Advancing Meteorological Services (ICAMS), which convenes Federal science and stakeholder agencies and departments - NASA, NSF, FEMA, others - to coordinate and advance Federal meteorological activities. ICAMS is a historic modernization of Federal coordination on meteorological activities to advance our services and ensure U.S. global leadership. Together with USGCRP - it presents a systemic, whole-of-government opportunity for strategic collaboration to ensure that all Americans have access to the information and services they need to prepare for, respond to, and adapt to climate change and increasing extreme weather events.

### **Conclusion**

In my first 100 days as NOAA Administrator, we have made great strides in implementing Administration priorities, including: working to expand NOAA's authoritative climate products and services, reinforcing scientific integrity and building a diverse and inclusive workforce, advancing the new blue economy, and ensuring equity is central to everything we do. We still have much work to do, and I am hopeful that through our FY 2022 budget request, we will be able to make substantial investments in NOAA's science, service, and stewardship and bolster our development and delivery of climate information and services. We are at a critical juncture in our fight against the climate crisis, and the need for actionable, authoritative weather and climate information, tools, and services is greater than ever before. NOAA is well-poised to help meet these needs, and support our communities as they prepare for, respond to, mitigate, and adapt to climate change.

Richard (Rick) W. Spinrad, Ph.D., was sworn in on June 22, 2021 as the Under Secretary of Commerce for Oceans and Atmosphere and the 11th NOAA Administrator. Dr. Spinrad is responsible for the strategic direction and oversight of the agency and its over 12,000 employees, including developing NOAA's portfolio of products and services to address the climate crisis, enhancing environmental sustainability and fostering economic development, and creating a more just, equitable, diverse, and inclusive NOAA workforce.

Most recently, Dr. Spinrad served as a Professor of Oceanography and Senior Adviser to the Vice President of Research at Oregon State University (OSU). He was also Vice President for Research at OSU from 2010-2014.

Dr. Spinrad served as NOAA's Chief Scientist under President Barack Obama from 2014 until 2016. He also led NOAA's Office of Oceanic and Atmospheric Research and National Ocean Service from 2003-2010. While at NOAA, Dr. Spinrad co-led the White House Committee that developed the nation's first set of ocean research priorities and oversaw the revamping of NOAA's research enterprise, including the development of the agency's Scientific Integrity policy.

Prior to initially joining NOAA, Dr. Spinrad held leadership positions at the U.S. Office of Naval Research and Oceanographer of the Navy, where he was awarded the Distinguished Civilian Service Award — the highest award given by the U.S. Navy to a civilian. He has held faculty appointments at OSU, the U.S. Naval Academy, and George Mason University; served as Executive Director at the Consortium for Oceanographic Research and Education; was President of Sea Tech, Inc.; and worked as a research scientist at OSU and the Bigelow Laboratory for Ocean Sciences. He also developed the National Ocean Sciences Bowl for high school students. In the international arena, Dr. Spinrad served as the U.S. permanent representative to the United Nations' Intergovernmental Oceanographic Commission from 2005-2009.

He is the recipient of Presidential Rank Awards from presidents George W. Bush and Barack H. Obama. Dr. Spinrad is past president of The

Oceanography Society (TOS) and the Marine Technology Society. He is a Fellow of the American Meteorological Society, Marine Technology Society, TOS, and the Institute of Marine Engineering, Science and Technology (IMarEST), and an IMarEST Chartered Marine Scientist.

Dr. Spinrad received his B.A. in Earth and Planetary Sciences from The Johns Hopkins University, and his M.S. and Ph.D. in Oceanography from Oregon State University.

Chairwoman SHERRILL. Well, thank you. At this point we will begin our first round of questions. The Chair recognizes herself for five minutes.

Dr. Spinrad, flooding is the most common and widespread of all weather-related natural disasters in the United States, and in North Jersey we've seen the devastating effects of repeat flooding events for business owners and community members. Earlier this month we saw devastating and deadly flooding brought by the remnants of Hurricane Ida. Unfortunately, our forecasts were not as accurate as they can be, and that's due in large part to outdated precipitation data. In fact, one woman in my district, whose house flooded, and who had to be rescued by boat, along with her young children during the storm, said to me, you know, at five o'clock I heard that we were going to be fine, that the storm was going to pass to the west. So that's why I introduced a package of bipartisan bills to address flooding called the *FLOODS Act* and the *PRECIP Act*. Dr. Spinrad, can you speak to the importance of having long term, accurate, and complete weather data and climate data? What's NOAA doing to ensure communities get the information they need to improve safety and resilience?

Dr. SPINRAD. Thank you, Chair Sherrill. And I concur completely with the premise that you've stated in your question with regard to the need for improved forecasts. You know, when we look at what happened in the northeast with both Hurricanes Henri and Ida, we saw, for example, in Central Park a 100 year old record for rain rate, rainfall rate, broken twice, one with Hurricane Henri, where we saw 1.3 inches per hour, and then just a few days later—a week—two weeks later we saw Hurricane Ida come through, where we got over 3 inches of rain in the New York/New Jersey area in an hour. So we certainly recognize that this is a critical area that we need to focus on.

We've made a lot of improvement in forecasts—overall forecasts for severe storms. With respect to floods specifically—and I should point out this is all based on our concept of impact-based decision support, so we want to make sure where we make the improvements in flood forecasts, for example, they are specific to where the impacts are greatest in lives and property. Part of this is going to be about increasing the resolution of forecasts.

So what we have recognized is that, especially with flooding, how fine a grid one has in the models that are used by forecasters to predict where flooding is going to occur is critical. Perhaps more critical than many other environmental phenomena. To do that means advanced capabilities in high performance computing, it means taking advantage of newer kinds of observations, more sophisticated radars, and doing research on high resolution processes. I'd also point out it means, especially in the case of flooding, probably upping our game, with respect to working with our sister agencies. Part of the flooding equation, if you will, is a really good understanding of the topography and the landscape, which makes close coordination with our colleagues and agencies like the U.S. Geological Survey.

And then the last piece, I think, to do this fine tuning, the higher resolution that's required, for example, to provide the accurate forecast for the constituent that you just described, is making sure that

the great research that we're doing in our laboratories, and with our colleagues in academia, is effectively transition. We can't afford to say, yes, 20 years from now we're going to have a great research product for you. And so I'm moving that aggressively to try to institute processes that allow us to test beds evaluations, get that product, if you will, out of the laboratory, into the weather forecast office much sooner than we might have done in the past.

Chairwoman SHERRILL. I applaud you for those efforts. They're incredibly necessary, certainly in Northern Jersey, and other areas across the country. So in April we held a hearing on the importance of working toward climate equity, and the need for improved climate services provided by the Federal Government. We heard from witnesses about the growing need for authoritative, actionable climate information delivered in an accessible manner. This is critical to helping communities across America make informed decisions, and you sort of, I think, alluded to this in your discussion about getting that information out.

So I have just a few seconds, and we can come back, depending on the length of the hearing, but I'd love to understand your vision for expanding NOAA's delivery of climate services to ensure that every American business and organization has equitable access to information, tools, services they need to adapt to the changing climate, and what additional mandates would NOAA need to achieve this vision? And I'll take my answer for the record at this point. I may come back to you after others have had time to ask a question. Thank you so much for your testimony.

Dr. SPINRAD. Thank you.

Chairwoman SHERRILL. Now I'd like to recognize our Ranking Member, Mrs. Bice.

Mrs. BICE. Thank you, Chairwoman. Dr. Spinrad, earlier this week I introduced legislation, co-sponsored by Congresswoman Sherrill, that focuses on the NOAA weather radio. Many people don't know this alert system exists, but in Oklahoma we are all too familiar with the life-saving capabilities these small radios have. Also, many of us are very familiar with the beeping it makes, maybe in the middle of the night, to make sure you're aware that there are thunderstorms headed your way. While maintaining the existing system is certainly a priority, I worry about the ever-digitized future, where a handheld radio is viewed as obsolete. Can you talk about the future of NOAA weather radio, and the potential for upgrades? Specifically, can you touch on transitioning to IP (Internet Protocol)-based communications, backup continuity options like satellites, and alternative options to reach the most remote areas of the country?

Dr. SPINRAD. Yes. Thank you, Ranking Member Bice. This is a critical capability that NOAA brought to the fore a couple of decades ago. And I would make one quick point with respect to NOAA weather radio, it had started as NOAA Weather Radio, that it was going to provide weather information. It has been such a success that, as I think you know, it's now expanded to a vast array of warning capabilities, including being used for Amber Alerts for lost children, for example. So the tool has proven its worth extraordinarily. It reaches 95 percent of the American population right now, which is terrific, but it's not good enough. And, in fact, that

last mile, and, if you will, to some extent, the digital gap that a lot of the population faces, is what we are trying to address.

You talked about the modernization, and brought up the—what I would say are two of the main components that we are working on right now. One is the incorporation through internet providers so that we do, in fact, expand the capability. We also are looking at the increased number of transmitters out there. It turns out we can get from 95 to 97 percent of the American population with somewhere between about 50 and 100 new transmitters out there. So we know there are certain things we can do with current technology. And then, finally, yes, absolutely, we are looking at the expanded capabilities for satellite-based backup for NOAA weather radio. This is where the commercial sector is going. It makes perfect sense. It's part of our current thinking about moving forward.

And I would simply close by adding that it's my expectation, as Administrator, that, just as we have seen NOAA weather radio going from, if you will, just weather forecasts to a broader array of capabilities, I foresee NOAA weather radio in the future to be, effectively, NOAA Environmental Radio, that it'll be providing all range of environmental forecasts and predictions for the full spectrum of hazards and other natural events that we have to be warning people about. So there is a lot of opportunity for expanded capability and modernization of NOAA weather radio.

Mrs. BICE. Perfect. Well, speaking of modernization, as both Ranking Member Lucas and myself mentioned in our opening statements, which should tell you about the importance of it, Oklahoma is the home to the National Weather Center. It houses NOAA's National Severe Storms Laboratory and the Storm Prediction Center. The work being done there is absolutely essential to predicting and alerting the public of severe weather, but also understanding the root causes of severe weather, and exploring innovative ways to use that knowledge to improve forecasts and warnings.

But as these extreme events become more common, the need for more equipment, more full-time employees, and more space to operate is becoming urgent. Do you believe the National Weather Center is in need of expansion and upgrades, and what would an investment in the Center do for training the next generation of meteorologists?

Dr. SPINRAD. Thank you for that question. And I would point out that, as Ranking Member Lucas brought up in his opening statement, I am very proud of the fact that my name is on that building. I was the head of the Office of Oceanic and Atmospheric Research when the building was put up, and have followed its progress ever since. I've been there many, many times. And in the spirit of your question, just this past week I had a long conversation with Dr. Berrien Moore, whom I think you probably know from the university. I've known Berrien for years and years, and he brought up the issue of potential expansion. I shared with him that I think the model that was originally invoked to establish the National Weather Center is just as valid now as it was then.

What I would like to do is undertake the effort to try to figure out what are the expansion requirements and opportunities for NOAA'S facilities. And NOAA has both research and operational

facilities at the Weather Center, so I am fully prepared to pursue that question in close conjunction with our colleagues at the university, and also, interestingly, with some of the private sector inhabitants, if you will, occupants of some of the facilities right near the Center. So I look forward to having that discussion, and I do think there is opportunity for consideration of expansion potential.

Mrs. BICE. Thank you, Dr. Spinrad, and Congresswoman Sherrill. I yield back.

Chairwoman SHERRILL. Thank you, Representative Bice. I now recognize the Chairwoman of the Full Committee, Ms. Johnson, for five minutes.

Chairwoman JOHNSON. Thank you very much. Doctor, a March report by this Committee's majority staff found that NOAA's overall work force declined by almost nine percent over the last decade. And, further, the report found that NOAA, particularly in its STEM work force, suffers from gender and racial minority staffing disparities. These findings are deeply concerning to me, and I'm committed to working with my colleagues to ensure that NOAA's work force, and the rest of the Federal science enterprise, reflects the diversity of America. Can you please discuss how NOAA is working to address the staffing declines and staff diversity issues identified in this report? And what is the Agency doing to attract and retain more minority scientists and staff, and in particular African-American scientists for staff, or how would you—how are you working to create a culture of inclusion? And is there anything Congress can do to help to move these efforts along?

Dr. SPINRAD. Thank you for that question, Chair Johnson. I share all of the concerns you have described. To state quite bluntly, too much of NOAA's work force looks like me. And in the past the answer has been, well, we'll fix that over the next several generations. No, that's not good enough. 80 percent of our work force is White, 67 percent is male. Those numbers are changing slightly, and there are specific things that we are doing.

With respect to the hiring process, I can tell you we have staffed more aggressively to bring in human capital experts to help move the process of hiring, accelerate it, if you will, and we've seen dramatic improvement, in terms of the time it takes to get somebody into the Federal Government. We're also looking aggressively at direct hire authorities. I would point out NOAA has one of the strongest educational programs with historically Black colleges and universities and minority serving institutions. We are not taking enough advantage of that direct connection, if you will. So, through education partnership programs, we're looking at how we can expand direct hire authority, give some of the graduates of some of these minority serving institutions opportunities to come on board more quickly.

I would also point out that we have dramatically enhanced the visibility and engagement with our employee resource groups. We now have a dozen of these for targeted areas of underrepresented communities within the work force. I've begun a dialog with them. We are working aggressively with our Office of Inclusion and Civil Rights to identify where the specific areas are that we can enhance the hiring activity. So there's a number of "programmatic", and systemic, and, if you will, policy areas where I'm moving to try to



make very clear that we cannot wait for a generational change. There are things that we need to do right now. The other part, of course, is ensuring that in the hiring process we make sure we have diverse selection panels, and that we make a specific emphasis on recruitment of under-represented populations within the work force.

Chairwoman JOHNSON. Thank you very much. Scientific integrity is at the heart of NOAA's work, and is vital to ensuring the public's trust in Federal science and scientists. However, some deficiencies in NOAA's scientific integrity policy were exposed in a June 2020 report by the National Academy of Public Administration (NAPA) following Hurricane Dorian and the Sharpiegate incident. I understand that NOAA's scientific integrity policy was updated in January, but it remains unclear what specific steps NOAA is taking to implement the recommendations from the NAPA report. Can you explain that briefly?

Dr. SPINRAD. Absolutely. I take scientific integrity very seriously. I was, in fact, the co-author of NOAA's original scientific integrity policy some 12 years ago, when we had serious concerns about political influence on the science. That policy was held up as one of the examples of one of the better policies among Federal agencies for many years. I was not with the government back when that policy was tested a few years ago, in the incident that you described, but I will share with you that I was an outside complainant, referencing that particular activity, and I saw where the scientific integrity policy had some flaws. And so, coming in as NOAA Administrator, I am making sure that we are actively participating in the effort being led by the President's science advisor, Eric Lander, to take best practices among all the Federal agency scientific integrity policies, establish them as the norm, and develop a government-wide approach to scientific integrity. So that's one thing, taking the best of class programs, if you will.

The other is one of the things we learned was that, within NOAA, and specifically the Department of Commerce, our parent department, we needed to see bolstering of department policies as well. So I have been in discussion with our Deputy Secretary Graves about how NOAA can work with the ensure the department's policies are strong and effective as well. The third thing I would bring up is that, from the day I arrived, I insisted that we make all political appointees at NOAA take the scientific integrity training, and demonstrate an awareness of, and familiarity of, and respect for NOAA's scientific integrity policy. And I can tell you that, as of today, every one of our appointees has taken that scientific integrity training, including myself.

Chairwoman JOHNSON. Thank you very much, and thank you, Ms. Sherrill. I yield.

Chairwoman SHERRILL. Thank you, Madam Chairwoman. I now recognize the Ranking Member of the Full Committee, Mr. Lucas, for five minutes.

Mr. LUCAS. Thank you. Administrator Spinrad, my bill, the *Weather Research and Forecasting Innovation Act of 2017*, is the birthplace of NOAA's Commercial Weather Data Program, so, as you might imagine, I'm quite invested in its success. So can you—as you can imagine, I was thrilled when NOAA ordered its third

delivery order in August, but I'm concerned that we could be leaving valuable data on the table. As I understand it, companies that were not in orbit at the time NOAA initiated its Commercial Data Buy Program are not eligible to participate until a new proposal is initiated, potentially a year from now. So, after successfully testing and verification by NOAA, what recourse does a commercial company have to immediately engage with NOAA to provide this life-saving data for weather forecasts?

Dr. SPINRAD. Thank you for that question, Ranking Member Lucas. I would point out that I do share your appreciation for and desire to see a more strong exploitation of commercial data. There's a cautionary note, of course, with regard to the use of commercial data, and that is we need to make sure that it meets the standards that are applied, and also that it's—it—sustainable. The—in the worst case scenario, we end up developing products and services that are critically dependent on the provision of commercial data, and then, for a variety of economic or business reasons, those data are not available downstream.

So part of the exercise, part of what we do in the evaluation process that we are now undertaking, with respect, for example, to the data you alluded to, which is actually data looking at something called radio occultation, how satellite data changes as it goes through the atmosphere, we're getting 3,000 profiles a day. It's really exciting to see how we're going to use that data, how it will improve the forecast. Once those assessments are made—and it will take a little bit of time for the research to be done, for the demonstration of the efficacy and impact of those data, we're going to want to make sure that we have established processes and mechanisms to ensure the data quality, the data accuracy, and the sustained availability of those data.

All of that is fully consistent with the *Weather Act*, and everything that you've built into the *Weather Act*. And I am eager, in the spirit of being in the Department of Commerce, to bolster economic development, to see that we can come to a place where there is a clear enterprise approach to acquiring commercial data, ensuring its accuracy, and its—ensuring its sustainability.

Mr. LUCAS. I appreciate that, and as long as it's an ongoing process, I—that—I think that's—on a similar note I want to talk about space weather data. This Committee passed the *PROSWIFT Act* last Congress, and I was keen to include an amendment allowing NOAA to enter into contracts to acquire commercial space weather data. In a meeting with my staff, NOAA informed us that space weather data capacities were included in the Commercial Weather Data Program's most recent request for information (RFI). A number of companies responded, but none met NOAA's mission need. The RFI was sent out in September, before the *PROSWIFT Act*, and it wasn't signed into the law until October. So, while NOAA may have been proactive, I don't believe their updated responsibilities for space weather-related research forecasting and capacity perhaps were fully considered in the RFI. So, Administrator, can you comment on—or can you commit to publish another RFI or request proposals that would be related to this space weather commercial data?

Dr. SPINRAD. So, Ranking Member Lucas, what I would like to do is get back to you on the specifics of how that played out, but you have my commitment to look into that and see what the appropriate next step would be.

Mr. LUCAS. That's all I can ask. Thank you, Mr. Administrator. Yield back, Madam Chair.

Chairwoman SHERRILL. Thank you, Ranking Member Lucas. And now I'm going to defer to Committee Counsel for the order of recognition.

STAFF. Ms. Bonamici is recognized.

Ms. BONAMICI. Thank you so much. Dr. Spinrad, I want to talk about hypoxia. For many years now hypoxic zones have been observed in the coastal waters off the Pacific Northwest. The location of these hypoxic zones changes on a yearly basis, so predicting them could be challenging. Ocean temperatures are warming, there could be a decrease in the water's ability to retain oxygen, and that makes it worse. So this year Oregon grappled with one of the most intense and prolonged hypoxic seasons to date. These episodes not only disrupt ecosystems by killing off marine species, they also disrupt, as you are well aware, the coastal economies. Escalating episodes of hypoxia are threatening Oregon's prized Dungeness crabs, for example. That—they—that industry has been responsible for an average of \$39-1/2 million in—of annual value over the past couple of decades.

So, Dr. Spinrad, what are some of the biggest challenges NOAA faces right now in monitoring, predicting, and preventing hypoxia, and what can Congress do? And in addition to providing sufficient appropriations in the Fiscal Year 2022 cycle, what can Congress do to address these challenges?

Dr. SPINRAD. Yes, thank you for that question, Congresswoman Bonamici. And I am very familiar with the issues, as I think many Oregonians are, and many folks in the U.S. are as well, because it affects seafood prices and availability.

Ms. BONAMICI. Right.

Dr. SPINRAD. The quick—or I shouldn't say quick, but the fundamental issue here is observational capability, that we are building out capabilities for measuring hypoxia. This is one of those phenomena for which the observational capability was needed many years ago, but it's now only currently really getting hardened and firmed up. And, in fact, we're working with fishing communities due to—you may be aware that some of the crabbers off the Oregon coast now include dissolved oxygen sensors on their crab pots—

Ms. BONAMICI. Right, right.

Mr. SPINRAD [continuing]. As a device for making these observations. So we're incorporating that within the Integrated Ocean Observing System, IOOS, as one of the many parameters that are being observed. Research investments into the predictability is the—one of the tough nuts to crack. It's one thing to say this is what happened yesterday in the ocean, and it's another thing to say, be prepared, this is going to happen next week. So we're doing extensive research through our cooperative institutes, with the fishery science centers, with the universities in the Pacific Northwest. And, I should point out, we also have the authority for devel-

oping the harmful algal blooms and hypoxia events of national significance—

Ms. BONAMICI. Right, right.

Mr. SPINRAD [continuing]. Strategy. And that—thank you for the support on that. We will be putting out the *Federal Register* notice on that draft policy very soon. And so I think, once we see what kind of comments we get back, and what kind of input we get back, and people understand what is NOAA's responsibility, what is EPA's (Environmental Protection Agency's) responsibility, I think we will have a better handle on specifically how we want to address this, both from a policy—

Ms. BONAMICI. Yes.

Mr. SPINRAD [continuing]. Appropriations, and programmatic—

Ms. BONAMICI. Thank you, Dr. Spinrad. That's really helpful. I want to ask you to—I really appreciate that NOAA's engaged in the extensive efforts to prepare, adapt to, and mitigate the worst effects of climate—the climate crisis, particularly on oceans, coasts, fisheries, estuaries. So I want to ask you about the Climate Council. The council reflects, of course, as you mentioned, the Biden Administration's whole of government approach. So I want to ask, how are things going, is the council fully formed and operating, and what are its priorities?

Dr. SPINRAD. Yes, thank you for that. So the NOAA Climate Council is the only council that reports directly to me. We have a lot of councils for facilities, for human resources, for many things. This council was set up shortly after I arrived as administrator, and it is the leader career folks from the agency, the people in charge of the weather service, the ocean service, the satellites, the assistant administrators. Already we have used this council to establish priorities as we formulate our Fiscal Year '23 budget form—and has helped build the equity framework for climate products and services. So I now have in front of me, if you will, a guidance document that this council has developed.

We're also using this council to engage the rest of government. So we invited the Special Envoy for Climate, John Kerry, his office, to come talk with our—

Ms. BONAMICI. Great.

Mr. SPINRAD [continuing]. NOAA Climate Council as well, and we're doing the same thing within the Department of Commerce. So it serves as a two-way communication mechanism, and a strategic body to define policies and priorities for the agency.

Ms. BONAMICI. That's very encouraging. And in my remaining time, I want to follow up on Chairwoman Johnson's question. We had many conversations in this—in the Subcommittee, but also in the Full Committee, over the years on diversifying the work force in the sciences, and one of the things in particular is—that I've been aware of is the lack of women in jobs, particularly at NOAA, and of getting women in the field, but also keeping them there. So I want to ask you, Dr. Spinrad, will you commit to carrying on the policies and practices that Dr. Sullivan, when she was NOAA Administrator, put in place to help address sexual harassment, which has been a problem particularly on research vessels?

Dr. SPINRAD. Absolutely, is my short answer. I'll go one further than my good colleague, and mentor in many respects, Kathy Sul-

livan. We've already set up a SASH, Sexual Assault/Sexual Harassment, Council. We have built in many processes, especially with the NOAA corps and our ships, to make sure that we have prevented that. We have established an office for workplace violence prevention and response, so we have done—we've taken a lot of actions in setting up facilities and mechanisms. I am going to make a very strong message—have made a very strong message in that regard.

And I've got to point out that for, I'm pretty sure it's the first time in NOAA history, half of assistant administrators are women right now, and we will have an opportunity shortly, because the head of the National Weather Service, Lou Uccellini, a national icon in weather, has announced his retirement. We may have an—

Ms. BONAMICI. Wow.

Mr. SPINRAD [continuing]. Opportunity to have a woman in that position as well. So we are moving on aggressively, and doing things, and setting policy—

Ms. BONAMICI. Thank you for that commitment. And my time has expired. I yield back. Thank you.

STAFF. Mr. Feenstra is recognized.

Mr. FEENSTRA. Thank you, Chair Sherrill, and Ranking Member Bice. Mr. Spinrad, thank you for taking the time to speak with us today. My office has had the pleasure of working with your staff at NOAA on ideas for potential legislation, and are excited to continue these conversations with you. Administrator Spinrad, I've been working on legislation to establish research and testing programs to mitigate the impact of radar obstructions on detection and prediction capabilities. These obstructions were addressed in a fall 2019 joint study on the impact of wind farms on weather radar. As you know, radar forecasting and detection can be affected by nearby buildings, terrain, and wind turbines. That said, it is crucial that we do not restrict the growth of clean wind energy by putting excessive red tape on wind farm construction.

Administrator Spinrad, my potential legislation would focus on researching and testing options, like new processing algorithms, phased array radar, commercial data, and other technologies. It would involve consultation with private industry, academia, NOAA, the FAA (Federal Aviation Administration), and the DOD (Department of Defense), among other groups. Has NOAA or other national weather services conducted research on specific technology-based options to reduce obstruction issues when developing NEXRAD (Next-Generation Radar), or other systems?

Dr. SPINRAD. Yes. Thank you for that question, and I especially appreciate your invoking the issues with our colleagues at DOD and FAA, who share similar concerns. And, as a consequence, we have a wind turbine radar interference working group that is addressing those issues that's chaired by the Department of Energy. I would say that there are a couple of potential approaches. You alluded to one, that is beam-forming using the current NEXRAD systems in slightly different manners. We are researching that. I would also point out, as a bit of an aside, I worked for Navy many years, and I became fascinated with the use of phased array radar by the Navy as a potential weather radar for many years. Going

on 20 years now I've been a strong advocate of the potential application of phased array radar as a potential replacement for NEXRAD. So, in conjunction with your question, it's not just how do we use NEXRAD, what are the approaches we might take, but can we use the next generation of radars, liked phased array, as a solution, while balancing the growth of the renewable energy industry.

Mr. FEENSTRA. Thanks for those comments, Mr. Spinrad. I greatly appreciate that type of collaboration. And, you know, we need to all work together on this. And I would just simply ask, would you and other members of your team at NOAA be open to joining with my office, and other representatives from the wind energy industry, to have a fruitful discussion on potential legislative solutions for mitigating the effects of radar obstructions?

Dr. SPINRAD. Of course. We'd be more than happy to cooperate.

Mr. FEENSTRA. Well, I'm very grateful for that, and thank you. This is such a big topic. My district is No. 1 agriculture—or No. 1 wind producer in the country, so thank you for that.

Dr. SPINRAD. Thank you.

Mr. FEENSTRA. And I yield back.

STAFF. Mr. Kildee is recognized.

Mr. KILDEE. I guess I needed to unmute. Thank you very much, Chairwoman Sherrill, for hosting this hearing, and, Dr. Spinrad, thank you so much for your presence and your testimony. I come from Michigan, where the Great Lakes are quite literally our lifeblood. The lakes outline our boundaries, they define who we are as a state, and we have 10,000 miles of Great Lake shoreline in this region. They're central to our livelihood, they're central to our economy. Part of my district that I represent includes the Lake Huron shoreline, which is a part of this really vibrant coastal economy.

According to NOAA, Michigan's coastal economy employs 1.75 million people each year, \$92 billion in wages, and the Great Lakes fishing industry is critical to the health of these communities across the region. According to the Great Lakes Fishery Commission, commercial, recreational, tribal fisheries generate \$7 billion in economic activity annually, and support 75,000 jobs throughout the region. So we look to strengthen and bolster our coastal communities. As we do that, one of the things that has evolved is fish farming, aquaculture.

Now, when done correctly, this is important, when done properly, aquaculture can create a high-quality food source that's abundant and affordable. However, and importantly, when done improperly, it can do much more harm than good. And we've seen in Michigan proposals for net pen aquaculture in the Great Lakes. There's even one aquaculture operation on the Au Sable River, which, if you know, it contains the so-called holy waters of trout fishing, a very sensitive ecosystem that supports trout. These operations can create massive pollution, they can spread disease, they can spawn invasive species. They can threaten this multi-billion fishery in the Great Lakes.

At one time NOAA—the NOAA Sea Grant Program was encouraging aquaculture operations in the Great Lakes, and that's why, here in Congress, I have introduced legislation to ban harmful aquaculture practices in both the Great Lakes and in federally des-

ignated wild and scenic rivers, which would include the Au Sable, in my district. So, Dr. Spinrad, if you could discuss the role of aquaculture in NOAA's concept of a new blue economy, and commit to us that ensuring that aquaculture is not used directly within the Great Lakes, or in the wild and scenic rivers, like the Au Sable? Could you comment on that?

Dr. SPINRAD. Yes. Thank you, Representative Kildee. And I think—I was listening very carefully to the way you asked your question, and you used one phrase—you said when aquaculture is done properly it may have benefits, and I think that's really the sweet spot for what NOAA can bring to the table. And, by the way, as you well know, we're very proud of our resources, the Sea Grant Program, but also the Great Lakes Environmental Research Lab, which provides our main access for research activity in all of the Great Lakes.

Properly, in my opinion, means that the science has been done in a credible, peer-reviewed, valuable manner to assess what is the real impact, what are the real environmental or ecological consequences of any particular approach. That is our responsibility, to drive what States and other local authorities may do then to interpret that science with establishing policies associated with aquaculture. It's the same argument that I would make with respect to offshore aquaculture in the open ocean, that we have a responsibility for ensuring that the determination of what is proper is based on the best possible scientific information we can collect.

And that's where I'm confident that, between Sea Grant, our Great Lakes Environmental Research Lab, we have the horsepower and the intellectual capacity to do those kinds of studies, that will provide the answers that policymakers like yourself will need to make the right decisions.

Mr. KILDEE. Well, I appreciate that very much, Dr. Spinrad. And I wonder if you—in the few remaining seconds we have, if you might comment on other ways we can improve the blue economy in these coastal communities within the Great Lakes?

Dr. SPINRAD. Well, my short answer, sir, is to listen. We, the feds, are doing that right now. We're doing a number of regional climate equity roundtables to hear what are the answers to exactly the question you raised specific to the Great Lakes. I'll be in Detroit in I think the second week in October to do exactly that. And I don't want to presume or predesignate what we think the answer is for building out the blue economy in the Great Lakes. I've got my own personal views, based on my experience, but I really want to listen to the municipalities, the industries, the local communities, the stakeholders, your constituents, and hear what they think they need in order to build out the blue economy on the coasts of the—on the shores of the Great Lakes.

Mr. KILDEE. Well, again, thank you so much, I appreciate this. I appreciate the hearing, Madam Chair, and I yield back.

STAFF. Mr. Casten is recognized.

Mr. CASTEN. Thank you. Mr. Spinrad, thank you so much for coming, and thanks to the Committee. I want to chat a little bit about methane monitoring. As you know, I see you nodding your head, you know, depending on the timeframe, we're talking about 30 to 80 times as potent a greenhouse gas as CO<sub>2</sub>. I'm sure you're



aware we are currently debating some rules about possibly putting a fee on the release of methane. And the nature of that fee is outside the jurisdiction of this Committee. The way we calculate the methane emissions are potentially outside the jurisdiction of this Committee, if we're talking about using, you know, company meters, and metering those out at production, collection, distribution, and consumption facilities. But it's my understanding, and please correct me if I'm wrong, that there's potentially as much as a 60 percent gap between the amount of methane we calculate from bottom-up analyses of meters to top-down analyses from the satellites under your control, and therefore, to some degree, our jurisdiction.

And, you know, some of that is because of malfunctions in the meter, some of that's malfunctions and burps that come out. And what I'm wondering is if you could educate us a little bit, first on the degree to which, you know, either ground or satellite-based systems you have contract methane, and specifically to what degree you have the granularity to actually get down and locate the point of methane release. And let me stop there, I'll have some follow up questions, but I see you nodding your head, and welcome your general thoughts on that question.

Dr. SPINRAD. Yes. Thank you so much, Congressman Casten. The first thing I'd like to do is commit to get a technical briefing to your staff on exactly that. We've got some wonderful scientists working, especially in our laboratory in Boulder, on observational technologies, and I'd like to have them talk specifically about what I know to be some of the highly geographically variable—variations in that difference that you described. So maybe 60 percent in one place, and, like, ten in another, what are the reasons for that? Part of it also is the dynamics of what's driving the distribution of the methane so that you may not be able to observe it with one particular technology or another.

You already started to go down the answer that I was going to bring up, and that is the bottom-up, top-down approach. So we interpret bottom-up, effectively, to mean, give me a list of all the sources. You've got, you know, so many cattle operations, you've got so many big buildings, you've got so many sources in a particular area. Do the math, that means you should have so many tons of methane emitted per day. The top-down is that you are using atmospheric observations to actually make these measurements and try to conclude what the total emission is in a particular area. The gap between that bottom-up and top-down is highly variable as well, and so that's where our research is our trying to figure out how to close the gap. A lot of it depends on understanding the chemical dynamics and the physical dynamics of how the methane moves around, and how it changes.

You are absolutely right, it's a very potent greenhouse gas, but it has a much, much shorter half-life, if you will, than carbon dioxide, which is why it's—some of those variations are dependent on the times on observations were made. So it's a rich area for research, and I'd love to make sure we've got your staff access to our capabilities.

Mr. CASTEN. Well, let's definitely do that. And I want to just—not to pick on the point, but I understand that, you know, the methane is going to move through the atmosphere, and you're

going to try to figure it out, but is—with the data you have, or, if you'd prefer, with the data you could have, subject to future technologies and future funding—do you have the technical ability, at least in theory, in a fiscally uncapped world, to go down and identify the specific location of a methane release, or is that an insoluble problem? Are we always going to be stuck depending on these bottoms-up meters that don't quite tie out?

Dr. SPINRAD. It—my impression is that we have the technical capability, it's a pragmatic question of can you deploy that number of sensors to make the kinds of observations you're talking about? I could characterize, for example, to the millidegree what the difference in temperature is between my home in Falls Church and Capitol Hill, but to do so I'd want to have many, many different temperature sensors between Falls Church and Capitol Hill. Similarly, with methane, our ability to pinpoint is going to depend on the intensity of observational systems that we've got in place.

Mr. CASTEN. OK. Well, I appreciate that, and let's follow up. I'll find, as I'm sure you can appreciate—I want to make sure that if we're going to go through and, you know, and create these monetization of pollution externalities, which I think is a good, market-focused thing to do, that we're including everybody in that mix. And as long as there's a gap, we have a problem, and I don't know at this point whether that's a science problem or an algebra problem, but look forward to the continued conversations——

Dr. SPINRAD. Very good.

Mr. CASTEN. Thank you. I yield back.

STAFF. Mr. Crist is recognized.

Mr. CRIST. Thank you very much, Madam Chair. Thank you, Dr. Spinrad, for being with us today. I represent Pinellas County in Florida, which is located in the Tampa Bay area. Pinellas is surrounded on three sides by water, so literally it's a peninsula on the peninsula of Florida. So, as you can imagine, I've worked a lot with NOAA. It is critical to my district, and Florida as a whole. For that reason, I've been a longtime supporter of the agency, have worked closely with NOAA on a number of issues, including addressing red tide. You may be aware of a bill I introduced last Congress that focused on the prevention and control of harmful algae blooms, so I was pleased to see NOAA's recent announcement of a new funding opportunity to create Harmful Algae Bloom Control Technologies Incubator. Can you tell me more about this new opportunity, and what NOAA is seeking to accomplish by it?

Dr. SPINRAD. Yes. Thank you, Congressman Crist. Thank you for your support over the years, really appreciate that. This is an exciting opportunity. It's reflected in a \$7-1/2 million Federal funding opportunity that we put out for Harmful Algal Bloom Control Technology Incubator. And, as the name suggests, we're going to solicit the best ideas for controlling technologies. What does best mean? What we're going to look for, obviously, is technical feasibility. Is it a sound scientific concept? We also want to look for environmental acceptability. There may be solutions to mitigate harmful algal blooms that add more damage to the environment than the blooms themselves, so we want to look for that environmental acceptability. And then, of course, the feasibility, if you will, in terms of scalability. What works in a laboratory may not necessarily work

in a larger scale environment. So the technical feasibility, the environmental reliability, if you will, and then the scalability are the three main things that we're going to look for in the proposals that we get. And I'm hoping we get overwhelmed with proposals.

Mr. CRIST. Well, as you know, this summer's red tide outbreak in Tampa Bay, and along Florida's Gulf Coast, has been the worst algae bloom observed in years, and I just read news accounts this morning it's returning again off Anna Maria Island. That's why I wrote to Governor DeSantis, urging him to request that NOAA determine the outbreak as a "harmful algae bloom event of national significance", which would then unlock Federal funds for assessment and mitigation. Congress gave NOAA—I'm sorry? Excuse me. Congress gave NOAA and the EPA this authority in 2019, but, despite the growing problem of harmful algae blooms, NOAA and the EPA have yet to utilize this authority. Why hasn't NOAA used this authority yet, if you're aware?

Dr. SPINRAD. So the short answer is that we are moving out on that. We have developed or are developing the draft policy for HABs and hypoxia, that's of national significance, and a *Federal Register* notice inviting comments from the public on that policy should be coming out very soon. So we have moved out on that, and we are working closely with our partners at EPA, who share some responsibilities, especially on freshwater, on that. So we have moved out, sir.

Mr. CRIST. Thank you, sir. As you know, Florida is home to several NOAA facilities. Unfortunately, many of the facilities are in dire need of repairs and upgrades, including the following, Southeast Fisheries Science Center, National Hurricane Center, Atlanta Oceanographic and Meteorological Laboratory in Miami. The impacts of climate change on these facilities makes the situation even more urgent. Can you provide me with an update on NOAA's plans for facility repairs and relocations, particularly in the southeast?

Dr. SPINRAD. Yes, thank you. I would like a bit of a placeholder, because I think we would probably want to spend a little bit more time with you and your staff to get some detailed responses to that, but I can tell you, as somebody who's worked for NOAA for, gosh, almost 20 years now, I've been to almost every NOAA facility, including those in Southeast Florida, over many, many years, and I share concerns about sustaining capabilities. We can't be asking our scientists to doing work in facilities where their safety, and their ability to get clean power and clean water is compromised. So we have undertaken a number of regional assessments of our facilities to see where are the priorities for investment. We have a \$400 million deferred maintenance bill at NOAA, and we're just having a hard time just keeping up.

We are hoping something—some of the moves on the Hill, with respect to infrastructure, will help resolve that, but specifically what facilities, and what priority, and where to spend are part of this comprehensive study. We've done four of the regional studies, we've got two more that we will do as tabletop exercises in the next several months.

Mr. CRIST. Great. Thank you very much, Doctor. I see I'm running out of time, so I will yield back. Thank you, Madam Chair.

STAFF. Mr. Babin is recognized.

Mr. BABIN. Yes. Thank you very much. Thank you Madam Chair, Ranking Member, and Dr. Spinrad, thank you for appearing today as well. I'm the Ranking Member on the Space and Aeronautics Subcommittee of this same Full Committee. While most of NOAA falls under the Environment Subcommittee's jurisdiction, the Office of Space Commerce, or OSC, falls under the Space Subcommittee's jurisdiction. The Committee has a long history of oversight legislation related to space situational awareness, or SSA. Last year the National Academy of Public Administration issued an independent report that concluded, No. 1, the Department of Commerce is best suited to perform SSA tasks within the Federal Government, and that OSC views STM, space traffic management, as predominantly a data management function, rather than as a prescriptive regulatory role. And three, the Department of Commerce, with its proven ability to effectively manage large, diverse, and complex data sets, provides essential technical expertise and other support to the Office of Space Commerce for space situational awareness and traffic management tasks.

As a result of the NAPA report's findings, the *Appropriations Act of Fiscal Year 2021* approved the merger of the Office of Space Commerce with the Office of Commercial Remote Sensing Regulatory Affairs, and also provided \$10 million to initiate a pilot program and initiate an open data architecture for space situational awareness. Rather than using these funds to carry out the law, it appears that NOAA, that's you all, is using these Fiscal Year 2021 funds to pay for more studies to revisit the topics of the NAPA study. These funding cuts come on top of personnel changes that threaten the Department of Commerce's ability to meet its space situational awareness responsibilities. So, Madam Chairwoman, I would like to add two op-eds from the *Space News* to the record, if you don't mind, please. Two op-eds, Madam Chair, I'd like to have entered into the record.

Chairwoman SHERRILL. Without objection.

Mr. BABIN. All right. Thank you. One is by Brian Weeden from the Secure World Foundation, titled "Getting Serious About the Office of Space Commerce", and the other is by Dr. Scott Pace, the director of G.W. Space Policy Institute, and a former Executive Director of the National Space Council, titled "NOAA Is Stalling U.S. Space Traffic Management". Dr. Spinrad, will you commit to implementing United States executive branch policy in carrying out the laws related to space situational awareness?

Dr. SPINRAD. Thank you, Ranking Member, and I really appreciate you raising this issue. I will tell you, this is a subject that I have embraced since I was confirmed at the end of June, and I'm having regular meetings with the Deputy Secretary of Commerce to address all of the issues you've identified. I want to point out that we are taking some very specific actions. I would note, for example, that the data repository associated with space situational awareness that you alluded to, there will be an interagency—or a demonstration conducted here very shortly, within the next several weeks, for our agency partners, and it's our intent then to, based on that demonstration, bring it up to Congress so that you can observe what we've done consistent with the law itself.

We're also looking, based on the NAPA report, at a number of alternatives for the organizational design. The merger that you alluded to is one that requires careful consideration of the operational responsibilities and regulatory responsibilities. Now, we do that at NOAA. We do that in fisheries, we do that in coastal zone management. We just want to make sure we're—we get it right. So we're looking at alternatives. We'll have that analysis of alternatives ready very shortly. And I would point out that the space traffic management is a little bit of a different animal, in terms of need for authorities, do we have the authorities for actually engaging in space traffic management, and we are looking at that as well.

I would close by simply saying that there's another op-ed that you may take a look at that Deputy Secretary Don Graves and I wrote to *Space News* subsequent to the two that you've—

Mr. BABIN. OK.

Mr. SPINRAD [continuing]. Identified, where we tried to clarify what we are doing, consistent with the law.

Mr. BABIN. Well, before I run out of time, I asked this question because the authority of the Office of Space Commerce resides with the Secretary of Commerce, not with NOAA, and certainly not NESDIS (National Environmental Satellite, Data, and Information Service), it is long past time to return that office to the Department of Commerce so that they can leverage all of the expertise in that department, and coordinate with other agencies and nations on a level playing field. So I hope we can see some expedition happening there. Thank you, and I yield back the balance of my time.

STAFF. Mr. McNerney is recognized.

Mr. MCNERNEY. Well, I thank the Chair, and, Dr. Spinrad, thank you for appearing today, and for your dedication to the scientific enterprise. It's really inspiring to see someone that's so long in the business and still enthusiastic. See, a much better understanding is needed of the stratospheric composition and chemistry for more accurate modeling of the climate system dynamics. The GeoXO Satellite Constellation is scheduled to launch in the early 2030's, including the GeoXO Central, which has an atmospheric composition sensor. Dr. Spinrad, will this satellite, as currently planned, help build a baseline understanding of the stratospheric aerosols?

Dr. SPINRAD. Yes.

Mr. MCNERNEY. And how would the resulting data contribute to climate science?

Dr. SPINRAD. So part of climate science—a lot of people tend to think of climate science as purely a physical phenomenon, it's about temperature, or winds, or water. But a lot of the initial conditions, if you will, that set off what's going to happen are driven by atmospheric chemistry in the most fundamental manner. Depending on what the particulates are that are in the atmosphere, they either reflect sunlight, resulting in local cooling, or they may absorb sunlight, which will result in local heating. So having a good understanding of the chemical construct of the particulates in the makeup of the atmosphere is a critical initial component to understanding climate.

Mr. MCNERNEY. Very good. Well, unfortunately, the GeoXO Constellation Satellite launch is still a decade away, but there's an ur-

gent need for actionable data right now. How can NOAA improve its monitoring and modeling of the atmospheric composition in the short term with the tools and equipment that are currently available?

Dr. SPINRAD. So we have a couple capabilities, one of which, of course, is—thank you to the Hill's support for acquisition of another—or of a Gulfstream 550—G-550. We will be putting in for an additional G-550. These aircraft, of course, allow us to do relatively high-altitude stratospheric observations, so having that platform alone will be a major improvement in our observational capabilities.

Mr. MCNERNEY. Very good. What additional resources and police changes does NOAA need to advance its Earth systems science and stewardship mission?

Dr. SPINRAD. I think we actually have a lot of authority. We have 200 different authorities to conduct a lot of these activities, which in itself is an issue we could talk about at some point. But I believe part of this also boils down to understanding what the nature of the inter-agency dynamic is, which is why I've been rather vocal about NOAA having a lead as the primary authoritative source for climate products and services, just as we are for weather, navigational charts, fishery stock assessments. I think that's a required capability.

Mr. MCNERNEY. Well, good, so jurisdictional battles that aren't restricted to Congress. So major advances have been made in our ability to monitor air quality from satellites, and this is of particular importance to my district, which has among the worst air quality in the Nation. I'm excited to see NOAA partnering on the launch of the TEMPO (Tropospheric Emissions: Monitoring Pollution) satellite instrument, which will monitor air quality during daylight hours at a much higher spatial resolution. Can you describe how NOAA is contributing to this mission, and how advanced tropospheric air quality monitoring will contribute to the agency's decisionmaking?

Dr. SPINRAD. Yes. I would like to get back to you on that, please, Congressman, because I think that requires a detailed technical element, and I'd like to be able to make sure we get that right.

Mr. MCNERNEY. OK, very good. Well, you know, I spent my career developing wind energy technology, and I'm excited to see that offshore wind is being considered in the West Coast, but, because of the deeper waters, we require new technology. Is NOAA preparing for upcoming lease sales on offshore West Coast projects, which could come as early as next year?

Dr. SPINRAD. It—we're working very closely with our colleagues at Interior, specifically the Bureau of Ocean Energy Management, on exactly those issues, and we have ongoing discussions with respect to some of the leases on the West Coast right now, yes.

Mr. MCNERNEY. Very good, exciting. Well, with that, I'm going to yield back. Thank you.

STAFF. Ms. Lofgren is recognized.

Ms. LOFGREN. First, thank you for letting me pop on, even though I'm not a Member of this Subcommittee, to ask just a few questions about the wildfire situation. This has been just a catastrophe in the West, and in our home State of California, and cer-



tainly Federal resources are needed to address the risk. I think sometimes we underestimate how improving modeling data could actually help in this situation, so I have just a couple questions. First, how will the next generation of NOAA satellites improve wildfire detection and monitoring? Also, what other spaced-based observation capabilities for near-real time detection has NOAA explored? Have we thought about small satellite constellations? And then, finally, what is NOAA doing on interagency collaboration when it comes to wildfire modeling and detection, as—not just, you know, with other agencies, but also with non-Federal partners to improve prevention and response?

Dr. SPINRAD. Yes, thank you for that question, Congresswoman Lofgren. I hail from Oregon. My home in Central Oregon was within just a few miles of some of the biggest fires this year, so this, for me, is a very personal issue. And, by the way, if I can briefly state, I used NOAA information to make a decision to spend money to do a fuel abatement effort on my property, so this touches people at the very personal level, right in their pocketbook. So I resonate very much with the tone of your question.

At NOAA we are responsible, as you indicated, for the detection side, using our satellites, and also aircraft capability, and one of the dramatic improvements, noted, in fact, by the President just a few months ago, is our lightning mapper. A relatively new capability, but now that we've got higher and higher resolution for detecting lightning, we can, to a certain extent, predict where the fires are going to initiate. Then, of course, comes the human element, where our incident meteorologists are on scene with the firefighters. We need to continue training those incident meteorologists.

A lot of people believe forecasts are mechanical, done by machines or done by computers, and then spit out. It's actually the people that make the difference. And the last part of our responsibility is in the—if you will, the effects of the fire, the smoke. We have new products that we're developing that will allow high resolution accurate forecasts of where the smoke is going to go. You had asked about the research component. We are excited about a Fiscal Year 2022 element that we've got to establish a fire weather test bed, so it'll be a \$15 million investment to conduct the kind of research you're talking about, but also operationalize it for those incident meteorologists. And the last comment I'll make is this—is that the highest level of concern at the White House, in the administration, which is why we have the interagency working group on fire that's looking at the best processes to develop for research and operations, to mitigate and protect the public from these—what are going to be in increased frequency and intensity of these events in the future.

Ms. LOFGREN. Thank you very much for that insight. I'm wondering, in addition to the high-level interagency work, what capacity do you have to work with other actors? For example, you know, in the State of California we have OES (Office of Emergency Services), and we have—and Oregon does as well, and even private sector individuals are getting involved. Do you have the legal authority, do you have the resources, to do all of that, and what's the status?

Dr. SPINRAD. It—we do have a lot of authorities. We have a lot of capability. In fact, in the President's summit on fire back a couple of months ago, I made the personal commitment to the Governors that if they need embedded fire meteorologists, we're ready to provide that. We also have people embedded in the Interagency Fire Center up in Boise. So we do have that capability, where there—there are no constraints with respect to our work with the private sector. And I would say engagement has not been an issue for us, with respect to fires.

Ms. LOFGREN. OK. I thank you so very much. Unfortunately, we used to have a fire season. It's now virtually year-round because of climate change, and not only does it affect, you know, California, and the wildlife, and the loss of property and life, but the smoke comes all the way to the East Coast, so it's an issue for the whole country. And I thank you for your information. I yield back.

Chairwoman SHERRILL [continuing]. Was our last Member. So, before bringing the hearing to a close, I want to thank the Administrator for testifying before our Committee today. The record will remain open for two weeks for additional statements from the Members, and for any additional questions the Committee may ask of the witnesses. The witness is excused, and the hearing is now adjourned. Thank you so much.

[Whereupon, at 11:29 a.m., the Subcommittee was adjourned.]



## **Appendix I**

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### **ANSWERS TO POST-HEARING QUESTIONS**

ANSWERS TO POST-HEARING QUESTIONS

*Responses by the Honorable Richard W. Spinrad, Ph.D.*

HOUSE COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY  
*"Advancing Earth System Science and Stewardship at NOAA"*

Questions for the Record to:

The Honorable Richard W. Spinrad, Ph.D.  
 Administrator  
 National Oceanic and Atmospheric Administration (NOAA)  
 U.S. Department of Commerce

**Submitted by Representative Mikie Sherrill**

1. **Dr. Spinrad**, what is the plan for expanding NOAA's delivery of climate services to ensure that every American, business, and organization has equitable access to the information, tools, and services they need to adapt to a changing climate?
  - a. What additional resources or mandates would help NOAA achieve this vision?

**Answer:** NOAA has existing programs that provide climate information and resilience tools to communities such as the Regional Integrated Sciences and Assessments (RISA) program, the Regional Climate Centers, Regional Climate Services Directors, the Climate Resilience Toolkit, and Sea Grant Extension, Coastal Zone Management Programs, and National Estuarine Research Reserves. However, with additional resources, as proposed in the 2022 President's Budget these programs could be scaled up to cover a greater portion of the Nation and enhance their ability to meet stakeholder needs. For example, additional funding to RISA would facilitate new and expanded projects that increase regional and local capacity to adapt to climate change across the United States by bringing climate resilience expertise to planning discussions on stormwater management, public health, green and gray infrastructure, transportation planning, housing, and small business concerns.

2. How is NOAA positioned to be the lead federal agency for providing climate services?

**Answer:** NOAA leads and/or participates in an array of interagency scientific and policy committees, task forces, etc that support Federal coordination on climate products and services. In concert with broader government-wide efforts, I have made it one of my top priorities to expand upon NOAA's authoritative climate products and services and apply them to a diverse range of missions. Other Federal agencies, State, local, and Tribal governments, businesses, and citizens already look to NOAA's National Environmental Satellites, Data, and Information Services, National Weather Service, National Ocean Service, and National Marine Fisheries Service as the authoritative sources for weather data, information, forecasts, and warnings, charting and mapping, and marine fisheries management, respectively. Regarding climate data, NOAA has one of the longest climate records, ranging from paleoclimate to present, and our comprehensive data spans from the depths of the ocean to the surface of the sun. These data are critical to advancing earth

systems models which will help people prepare for a changing climate. We take a life cycle approach to our data in order to ensure that we are continuously improving our tools and services: observing and collecting data 24/7; processing and archiving data, from paleoclimate to present; conducting climate research and creating models. During that process, we produce tools, products, and educational resources as well as disseminate our forecasts and warnings, predictions, projections, and maps and other data visualization tools. At the end of this pipeline, we assess our data, tools, and services and update and improve them as needed. In addition, NOAA's climate data are the foundation for countless industry and community stakeholders who apply our data and tools to make decisions. This life cycle approach is the key to ensuring our services are reliable, up-to-date, and are both useful *and* usable for a range of stakeholders. This rigorous, science-based approach - coupled with the many products and services we are already providing to other federal agencies, state, local, tribal, and territorial governments, the private sector, and other user bases that stand ready to be expanded - position NOAA to be an authoritative provider of climate information, tools, and services.

- a. How is NOAA working to center equity in its delivery of climate services?

**Answer:** I have established equity as one of my three main priorities for NOAA. This means that equity is not *something* we do, but rather embedded into *everything* we do. Doing so will enable us to fully realize our mission of science, service, and stewardship. To that end, we are working to better understand the needs of our vulnerable and less served communities and to dismantle barriers to access to our programs and services. We have been hosting a series of Climate and Equity Roundtables across the country that focus on regionally-specific climate hazards impacting vulnerable communities. At these listening sessions we are hearing feedback from local stakeholders on how NOAA can improve its products and services to better meet their needs.

We are also focusing the equity lens inward, working to ensure that our NOAA workforce looks like America and the people we strive to serve. We have made progress, but still have work to do to diversify our workforce. Through various programs such as our Educational Partnership Program with Minority Serving Institutions (EPP/MSI) and the Sea Grant John A. Knauss Marine Policy Fellowship Program we are working to build a pathway through which a diverse cadre of STEM students can join NOAA. The EPP/MSI program is a paid internship program that we hope will attract the next generation of climate-smart workers to join NOAA after they graduate. Regarding the Knauss Fellowship, Sea Grant recently adapted the financial, recruitment, outreach, and application process in order to remove barriers to access and participation in the program. By building a stronger road whereby diverse people can join our workforce, we will in turn better serve the diverse communities of America.



HOUSE COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

*“Advancing Earth System Science and Stewardship at NOAA”*

Questions for the Record to:

The Honorable Richard W. Spinrad, Ph.D.

Administrator

National Oceanic and Atmospheric Administration (NOAA)

U.S. Department of Commerce

**Submitted by Representative Charlie Crist**

1. **Dr. Spinrad:** During the hearing, you provided an update on NOAA’s process for facility repairs in the southeast. Why are up-to-date facilities so crucial to fulfilling NOAA’s mission? And how could NOAA’s mission potentially be harmed by outdated facilities?

**Answer:** Deteriorating facility conditions impact NOAA’s ability to effectively operate and require allocation of mission funds to sustain facilities to support operations. A growing backlog of deferred maintenance results in facilities susceptible to more frequent failure until small repairs become no longer effective and necessitate more expensive emergency repair of facility systems or the facility itself. Eventually, the extent of repair, new building code requirements, and need to enhance resilience to climate change warrant facility replacement. NOAA needs up-to-date facilities to eliminate delays caused by frequent failures and enable facilities to support new technologies such as more sensitive laboratory equipment, laboratory tools that increase the efficiency of operations, and increased space to support additional research initiatives.

2. Last month, I introduced a bill that would codify the National Integrated Heat Health Information System (NIHHIS); create an Interagency Committee to strengthen federal efforts to address extreme heat; and establish a financial assistance program to help communities reduce the health impacts of extreme heat. Can you explain how NIHHIS can inform planning and decision-making to protect vulnerable populations and build long-term resilience to extreme heat?

**Answer:** NIHHIS can continue to support regional efforts in the Southwest and Northeast to mobilize communities to appreciate the threat of extreme heat and to take targeted action to address it. For example, the team in the Southwest trained community health workers to prepare for and respond to heat illness in marginalized communities along the U.S.-Mexico border. With increased capacity, NIHHIS could grow to provide sustained weather and climate services --informed by a dedicated research function-- improving heat planning, preparedness and response in all regions of the U.S. NIHHIS is designed to both provide services to community, local, state and tribal decision makers, and to help inform research.

To achieve some national coverage, NIHHIS, with the support of its partners (NOAA, Centers for Disease Control, Environmental Protection Agency, US Forest

Service), also developed an Urban Heat Island community of practice with local teams of citizen scientists, chief resilience officers, museums, health officials, and other community stakeholders. These teams map the distribution of air temperatures in their communities, revealing how the Urban Heat Island effect makes some neighborhoods much hotter than others, and underscoring how unjust historical housing policies contributed to this problem. This effort is empowering residents and leaders in over 30 cities and counties to talk about these issues, and catalyzing action to address them. In 2021, we launched a small pilot grant program to enable scientists to work directly with residents to develop community-focused Heat Action Plans that identify the most cost-effective means to reduce heat risk in cities across the country. This pilot program demonstrated that there was a very large unmet demand for assistance in using climate information to plan and prioritize heat action, and financial assistance to implement those plans.

NIHHIS has also taken action on occupational and athletic heat exposure, partnering with the Korey Stringer Institute and federal agencies such as Occupational Safety and Health Administration (OSHA) and the Centers for Disease Control and Prevention (CDC) to assess existing guidelines for heat exposure and to outline a series of operational and research opportunities to better protect outdoor workers, athletes, and service members. With the announcement of OSHA's rule-making process regarding occupational heat exposure, and building on NOAA's research and experimental new Wet Bulb Globe Temperature forecasts, we plan to work with businesses and other stakeholders to develop decision support tools to help them plan for heat extremes and to protect their workers.

3. I was pleased to see that you're serving as co-chair of the newly created White House Interagency Working Group on Extreme Heat. How will NOAA's position on this Working Group elevate NIHHIS and NOAA's role in extreme heat research and response?

**Answer:** The White House Interagency Working Group on Extreme Heat is a welcome addition to the federal extreme heat community. Many of our partners from the NIHHIS Interagency working group are also part of the new White House group, but there are also new agency representatives that have come to the table due to the strong Administration focus on extreme heat, climate change and equity. Together, these two working groups are leveraging the deep experience and momentum of NIHHIS, as well as the fresh energy of the White House charge.

I have made it one of my top priorities to expand upon NOAA's authoritative climate products and services and apply them to a diverse range of missions. From the individual to the business to the tribe to the government, NOAA provides reliable, accessible, relevant, actionable, easy-to-use climate information, and that includes protecting all Americans from the impacts of increasing extreme heat - now, and in the future. Through NOAA's leadership in creating NIHHIS with CDC to coordinate the federal response to heat, and through my co-chairmanship of the new White House Extreme Heat group, I am ensuring that NOAA is at the helm of

our all-of-government response to extreme heat, and that we are also providing an all-of-NOAA response. Through NHHIS, with renewed support from Congress and the White House, and with our peer agencies, we are positioned to make great strides in reducing heat risk for all Americans.

HOUSE COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

*“Advancing Earth System Science and Stewardship at NOAA”*

Questions for the Record to:

The Honorable Richard W. Spinrad, Ph.D.

Administrator

National Oceanic and Atmospheric Administration (NOAA)

U.S. Department of Commerce

**Submitted by Ranking Member Frank Lucas**

1. Does NOAA have plans to review the current commercial weather data buy provisions? Is purchasing and ingesting data on a rolling basis, rather than through periodic proposals, something that will be considered?
  - a. Does NOAA plan to increase its purchase of existing weather data through the CWDB and/or expand its future purchases to include other commercial data products in the future?

**Answer:** NOAA reviews our commercial data acquisition approach annually as part of our budgeting process. The commercial data purchase strategy is primarily based on information regarding industry capability assessed through NOAA solicitations and influenced by NOAA resources to conduct commercial acquisitions. Experience has shown that NOAA requires 18-24 months to conduct an acquisition and begin using the data in numerical forecast models. Thus, it would be extremely challenging to conduct acquisitions on more frequent time scales.

NOAA chose an Indefinite Delivery Indefinite Quantity (IDIQ) contract to maximize access to industry for the commercial data purchase program and to realize the lowest possible cost to the government for radio occultation (RO) data throughout the contract period. The IDIQ allows multiple awards to RO providers during the ordering period.

The quantity of commercial weather data acquired by NOAA has been determined by several factors, including the need for a stable and continuous data flow, the projected impact on the weather models, the pricing proposed by the vendors, and the available budget. NESDIS plans to continue purchasing RO data under the current contract and award an additional contract in FY 2023. NOAA expects to increase the amount of commercial satellite data purchased in our future acquisitions dependent on funding and data availability.

NESDIS will continue to periodically pulse industry for other to-be-determined commercial data types. NESDIS plans to issue a Request for Information (RFI) later this fall specifically to explore commercial sources of space weather data.

2. Does NOAA plan to leverage commercial data capabilities as part of the Agency's procurement of smaller-footprint satellites related to the NOAA Satellite Observing Systems Architecture?

**Answer:** NESDIS is working with industry to leverage commercial capabilities for possible small satellite procurements, as the NOAA Satellite Observing Systems Architecture (NSOSA) study recommended. NSOSA showed that NOAA would benefit from a "hybrid" solution of business models for acquiring satellite observations, including: use of NOAA-built satellites, use of data from NOAA's International and Interagency partners, and leveraging commercial purchase of data from industry.

Under the NESDIS Joint Venture (JV) initiative, NOAA collaborates with federal agencies and the commercial sector to investigate, mature, and demonstrate new technologies and capabilities. In 2019-2020, NOAA awarded technology study contracts for satellite mission and instrument design analyses to over 34 selected recipients, including small companies developing commercial small satellite technology.

NESDIS will continue to investigate areas of opportunity to partner with the commercial sector on small satellites through the Commercial Data Program (CDP), as most vendors working with and supporting the program are small businesses pursuing small satellite constellation approaches. The NESDIS CDP will continue to assess and leverage commercial data capabilities as part of NOAA's pursuit of cubesat and small satellite constellations.

3. Many of NOAA's Cooperative Institutes are collocated with NOAA research laboratories, creating a strong, long-term collaboration between scientists in the laboratories and in the university. But at the same time, many of the CI researchers don't have to go through the same vetting process as a federal employee. This could open the door to academic and research espionage or theft. This is especially concerning given NOAA's satellite and sensor work with DOD partners. What steps is NOAA taking to ensure the protection of data and research related to national security?

**Answer:** NOAA's Cooperative Institutes (CIs) provide a mechanism to allow external partners to address emerging needs and evolving research priorities. NOAA ensures CIs extensively vet their researchers because the protection of data and research is critical to successful external partnerships. The enterprise management structure of NOAA's CI Program, implemented as a result of the *Prospectus for CIs in the 21st Century (CI21)*<sup>1</sup>, provides additional scrutiny to ensure the protection of data and research related to national security. Senior NOAA leadership serve as Technical Program

<sup>1</sup> [Prospectus for CIs in the 21st Century](#)

Managers for each CI and can identify and mitigate risk to espionage or theft.

A recent example showed that these tools enabled NOAA to safeguard its science and technology while maintaining an open system and expanding research through CI collaborations. An evaluation of a NOAA organization's collocated scientist revealed that a collocated foreign scientist could complete their research without access to NOAA facilities and IT systems. NOAA removed the scientist's access to NOAA systems and facilities and the science continued uninterrupted.

The Cooperative Institutes Handbook<sup>2</sup> and the CI Standard Conditions requires all CI federal award recipients ("CI employees") that will be collocated and require access to NOAA facilities or NOAA Information Technology systems undergo the Personal Identity Verification (PIV) credential process. Because CIs can hire foreign scientists, NOAA also requires federal facilities to ensure that foreign scientists have no access to facilities and information which are restricted to United States citizens. The U.S. Department of Commerce (DOC) and NOAA comply with and implement policies and procedures for hosting foreign national "Visitors" or "Guests" who require access to DOC facilities or are involved in DOC programs and activities (Department Administrative Order (DAO) 207-12, "Foreign Access Management")<sup>3</sup>. DOC and NOAA ensure that laboratories comply with the Export Administration Regulations (EAR) policies to ensure that controlled items are not shared overseas (export) and that technology, data, and information are not shared with foreign nationals in the United States without the appropriate license (Deemed Exports). Furthermore, the Department of Commerce (DOC) Financial Assistance Standard Terms and Conditions (Nov. 12, 2020), at subsection G.05.m., mandate the recipient comply with all applicable laws and regulations regarding export-controlled items. The recipient must establish and maintain effective export compliance procedures at DOC and non-DOC facilities, including facilities located abroad, throughout the performance of the financial assistance award. At a minimum, these export compliance procedures must include adequate restrictions on export-controlled items to guard against any unauthorized exports, including in the form of releases or transfers to foreign nationals.

NOAA, working with our CI partners, has established formal data-sharing agreements to ensure data security of NOAA restricted data. This agreement requires an Interconnection agreement, regular independent security

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<sup>2</sup> [Cooperative Institutes Handbook](#)

<sup>3</sup> [DAO 2017-12](#)

assessments, enforcement of NIST 800-171 standards. It also requires anyone with access to these restricted data have a NOAA background check and an existing NOAA account, this includes CI staff with administrative access to the High Performance Computing (HPC) system. In addition, NOAA reviews and approves access to NOAA projects on the CI system.

The JPSS, GOES-R Series, and Space Weather Program Offices do not fund scientists at NOAA's Cooperative Institutes (CIs) to work on instrument development for its programs or on any research related to national security. CI scientists have access to mission science information that is related to providing data and products for operational meteorology and space weather in support of NOAA's mission. This information cannot be used either in the manufacturing of sensors or satellites.

4. In January of this year, there was some controversy around the continued research related to the airborne phased-array radar, or APAR. The National Science Foundation chose not to fund the National Center for Atmospheric Research's \$70 million proposal. Can you give an update on what NOAA is doing related to next generation radar for the hurricane hunter fleet? Is NOAA utilizing the work NCAR had done to date or has NOAA abandon developing this as an operational radar system?

**Answer:** Current grant funding from NOAA to NCAR ends in November 2021. We have been informed that in order to keep the program running, NCAR needs bridge funding of \$12.5M over FY22 and FY23. NSF has committed \$1.3M in FY22. Engineering halted at the conclusion of the back-end design review in November 2021. Engineering could restart if NSF awards a contract through its biennial Mid-Scale Research Infrastructure (MSRI) competition in February 2023.

NOAA has conducted Requests for Information (RFIs) to determine options for collecting data from airborne doppler radar from the NOAA WP-3D replacement aircraft. The results of the RFI, identified one specific aircraft type (acquisition requirements underway to formally identify that aircraft type) and there are currently no airframes that can carry the tail doppler radar, or TDR, in its current configuration. APAR, if proven, could potentially collect airborne doppler radar, but it is still in R&D. NOAA will continue to assess potential TDR and APAR options.

5. The FY 21 appropriations report came with instructions for NOAA to enter a memorandum of agreement (MOA) with NASA for their Gulfstream V to serve as a backup to the NOAA Gulfstream Hurricane Hunter. Can you give an update on this MOA? Is transitioning or adapting other planes a model that is sustainable?

**Answer:** This agreement with NASA was signed and approved for implementation in April 2021. The agreement provides the NASA GV as a back-up during



hurricane season on a space-available basis (i.e. NASA will fly when not tasked otherwise or in maintenance). The NASA GV will be instrumented with a dropsonde system; it will not have a flight level data system or tail doppler radar (TDR). During 2021, NASA is completing engineering and installing the required modifications to instrument their aircraft with a dropsonde system. The NASA aircraft will be ready to serve as an operational backup for the G-IV in the CY2022 Hurricane season. While this model provides some redundancy in capability, it is not without drawbacks, including cost, scheduling, and diminished capability.

6. During the hearing, you confirmed that you would look into NOAA publishing a request for information or a request for proposals on space weather commercial data in accordance with the PROSWIFT Act (51 U.S.C. 60607). Can you please provide information regarding the timeline and details of those potential requests?

**Answer:** In accordance with 51 U.S.C. 60607, as enacted by the Promoting Research and Observations of Space Weather to Improve the Forecasting of Tomorrow (PROSWIFT) Act, NESDIS plans to release a Request for Information (RFI) specifically to assess the availability of commercial sources of space weather data in the first quarter of Fiscal Year (FY) 2022. We are working to define the general requirements for commercial space weather data that would be incorporated into the RFI. Current plans are to post the RFI and allow vendors one month to respond. If the RFI response evaluation finds there is a possibility for purchasing commercial data that meets NOAA's space weather requirements, then NESDIS may initiate a Request for Proposals (RFP) to move forward with a space weather commercial data pilot study in late FY 2022 or thereafter.



## **Appendix II**

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ADDITIONAL MATERIAL FOR THE RECORD

**SPACENEWS****Op-ed | NOAA is stalling U.S. space traffic management**by [Scott Pace](#) — June 18, 2021

Rather than move forward with efforts to work with industry on space traffic management solutions, the Commerce Department is funding studies of topics that in some cases were addressed in a report last year by NAPA. Credit: SpaceNews illustration

As demonstrated by [the uncontrolled reentry of a Chinese rocket last month](#), irresponsible space activities can put billions of dollars and human life at risk. Recognizing the reality of increasing space activities and the need for the national security community to focus its resources on security threats, the Trump administration issued Space Policy Directive 3 (SPD-3), "[National Space Traffic Management Policy](#)" in 2018. The Department of Commerce was tasked to create an "open architecture data repository" (OADR) to provide basic space situational awareness (SSA) and space traffic management (STM) services, functions historically provided by the U.S.

military. This policy was intended to allow Commerce to focus on enabling growth in the U.S. commercial space industry while allowing the national security community to focus on threats in and from space.

The National Space Council developed SPD-3 through an in-depth interagency process that recognized the Department of Defense faces modernization challenges with legacy systems and rejected oversimplified comparisons between space traffic and air traffic. The open architecture approach was intentionally designed to enable massive data fusion, leverage the most advanced analytic tools and encourage continuous innovation for a rapidly changing space environment. The major elements of SPD-3 echo similar interagency discussions that also occurred during the Obama administration and which are reflected in the 2020 National Space Policy.

In 2020, Congress commissioned a study by the National Academy of Public Administration (NAPA) to identify the appropriate agency to take on the STM job. After a six-month effort, NAPA concluded that Commerce was best positioned to perform the work. Building on that endorsement, Commerce began making progress on standing up a STM data repository. Requests for information were issued and an industry day event attracted more than 250 participants offering services across the value chain of SSA and space safety. There was no need for a lengthy or expensive development program at government expense; American industry was ready to start providing space data, storage and services immediately.

Unfortunately, fulfilling that vision has hit a roadblock in Commerce's fiscal year 2022 budget request, specifically in the Office of Space Commerce. Instead of spending \$10-15 million for commercial space traffic data and services, as recommended by NAPA, the budget for the entire office remains at \$10 million, with no funds for commercial data. Rather than begin populating an open repository with commercial data, NOAA is using fiscal year 2021 funds to pay for more studies by three federally funded research and development centers, revisiting the topics of the NAPA study, and talking vaguely of a future pilot program. These funding cuts come on top of personnel changes at the Office of Space Commerce that threaten the ability to meet its SSA and STM responsibilities.

Ensuring the long-term sustainability of space activities has been a priority for multiple administrations and SPD-3 was the end result of a near decade of effort. NOAA's current approach is wasting both money and time, with the latter being especially harmful in today's highly competitive environment. Existing systems can barely handle the more than 4,600 satellites in orbit now, let alone the nearly 100,000 satellites planned for launch over the next decade. Ceding U.S. leadership on this means either accepting more accidents and collisions in space or relying on another country to create an international solution at some indeterminate

time in the future. The European Commission has multiple STM studies that could create potential barriers to U.S. industry-led technical standards, and there are Russian and Chinese proposals that would, at best, be opposed to an open architecture and, at worst, be hostile to U.S. industry.

We stand at inflection point with four options: 1) proceed with the open architecture data repository as directed in SPD-3 and rely on commercial industry, 2) create a unique U.S. government solution at much greater cost and delay with far lower flexibility to change with technology advances, 3) rely on uncertain foreign or international systems, or 4) have satellite owner/operators pursue their own solutions outside of governments.

Commerce does not need a traditional “program of record,” nor should it repackage legacy solutions that will only fail to address existing and growing data deficits; rather, it should seek to buy “space situational awareness as a service.” Large constellations such as Starlink, OneWeb, and Kuiper require more precise and timely data than U.S. Space Command provides and private sources for such data already exist. While it would be preferable, for a host of policy and diplomatic reasons, to have a trusted Commerce-sponsored data repository, the government is not vital to closing the business case for SSA data. But it should encourage new commercial services such as orbit optimization, proximity coordination, attribution and others as part of an entirely new space safety industry. An open data approach also encourages secondary industries, like insurance, through improved risk assessments for different orbits and constellations.

There are some aspects of STM, such as assuring compliance with international law and supporting research, where government is necessary. However, unlike NOAA weather satellites, there is no technical, economic or policy reason for SSA data to be a government monopoly. The OADR could be created using plentiful cloud storage services, ingested data from U.S. Space Command and NOAA’s own Space Weather Prediction Center, and a variety of existing commercial data sources. In effect, Commerce could create “space sustainability services version 1.0,” and periodically iterate with block upgrades as civil, commercial and international capabilities evolve.

For our security and our prosperity, it is vital that the United States lead the world in ensuring the long-term sustainability of space activities. This requires new levels of SSA commensurate with a growing, dynamic environment. If the new leadership at Commerce is unable to overcome the inertia at NOAA, then Congress may need to be more directive with funding and time tables. If the government fails to create a trusted, open data repository, the commercial space sector

and its investors will need to create their own solutions, which may or may not be emulated by other countries. Regardless, this is an urgent issue in which government must either lead or get out of the way.

*Scott Pace is a former Executive Secretary of the National Space Council and Director of the Space Policy Institute at the Elliott School of International Affairs.*

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|--------------------------|----------------|--------------------------|--------------------------|-----------------------------|
| POLICY & POLITICS        | COMMERCE DEPT. | OFFICE OF SPACE COMMERCE | SPACE POLICY DIRECTIVE 3 | SPACE SITUATIONAL AWARENESS |
| SPACE TRAFFIC MANAGEMENT |                |                          |                          |                             |



## SPACENEWS

### Op-ed | Getting Serious About the Office of Space Commerce

by [Brian Weeden](#) — May 10, 2021



"Key nonpolitical staff who were instrumental in developing and implementing the vision for a revitalized Office of Space Commerce are already leaving, just as the civil space situational awareness pilot program is finally getting underway," writes Brian Weeden. Credit: SpaceNews photo illustration

### "Things fall apart; the centre cannot hold." — Yeats

**I**n the absence of an active push, attempts to create organizational change and improvement tend to revert to the way things used to be. After three years of an active push to increase the role of the Office of Space Commerce (OSC) in promoting and enabling commercial space activities, that vision is beginning to revert to the way things used to be. Immediate

intervention is needed by the new leadership at the Department of Commerce to prevent a complete loss of progress and yet another delay in reshaping U.S. efforts to support and leverage the burgeoning commercial space sector.

#### **Changing Role for the Office of Space Commerce**

Over the last few years, OSC has emerged as a key agency supporting the U.S. commercial space sector. Current U.S. law and national space policy designates OSC as the lead agency for representing and promoting commercial perspectives within interagency discussions, developing a civil space situational awareness pilot program that improves our ability to detect and prevent on-orbit collisions, modernizing the regulation and oversight of commercial space activities, and promoting the U.S. commercial space sector globally. All of these lines of effort are critical to ensuring that the commercial space sector continues to grow and provide the innovation and new capabilities that support U.S. national security, economic development, and societal benefits.

OSC was originally created in 1988 with goals of promoting the commercialization of space and the U.S. commercial space sector. But for most of its existence it did not receive much attention, and by the end of 2016 it had a permanent staff of three people and an annual budget of \$500,000.

This changed dramatically under the Trump administration. In July 2018, Kevin O'Connell was brought in as the new director of OSC, a position that had not been filled for several years and was given significant political support from the Secretary of Commerce and the White House to begin to rebuild the office toward the original vision. Under O'Connell's leadership, additional staff was added and complemented by "loans" of expertise from across the department. The office was empowered by administration leadership to not only take on the mantle of acting as the advocate for commercial space within the U.S. government but also to help lead the modernization of U.S. government oversight and regulation of private sector space activities.

This leadership role has bipartisan roots. Following the 2010 National Space Policy, the Obama administration started efforts to update export controls, reform licensing of commercial remote sensing, and establish a national space traffic management (STM) regime. Additionally, there was a push to establish "mission authorization" to address the gap between existing regulatory powers and the innovative new missions that the commercial sector was developing. Some of these efforts were more successful than others, and some were intended to go to the Department of Transportation instead of Commerce, but there was significant agreement on the core problems that need to be solved.

Under the Trump administration, significant progress was made on these same goals. Space Policy Directive 3 (SPD-3) created the first formal U.S. policy on STM and cemented the role of OSC in taking on the responsibility for creating civil space situational awareness capabilities and creating the foundation for a future STM regime. OSC also played a significant role in implementing an overhaul of commercial remote sensing regulations and greatly increased its outreach and engagement with the commercial space sector. And after two years of discussion, OSC was able to convince Congress to authorize and fund a pilot program for civil SSA in December 2020. The U.S. space industry was widely supportive of these enhanced roles for OSC.

#### **The Need for Action**

Unfortunately, many of these changes were not formalized before the change of administration. OSC was not elevated into a separate bureau, and instead was left within the National Oceanic and Atmospheric Administration (NOAA) and thus vulnerable to reversion once the top-down political push disappeared and the existing organizational inertia took over. That reversion is understandable, given NOAA's important focus on Earth remote sensing, but also frustrating given the long and meandering process over the last decade to try and implement civil SSA, STM, and mission authorization to address widely-recognized challenges.

As it stands, OSC may still muddle through the civil SSA pilot program but is unlikely to achieve the other policy goals and directives assigned to it. Those goals — promoting commercial space, acting as its champion within the government, fostering development of commercial standards and norms of behavior, and addressing regulatory gaps — require political will to finish implementing the expanded vision for OSC. Another key is continuing the push to move OSC out from underneath NOAA and into a separate Bureau, which is necessary for it to have the independence it needs to establish a new organizational culture and capacity.

The Biden administration needs to act quickly to address this situation before it is too late. Key nonpolitical staff who were instrumental in developing and implementing the vision for a revitalized OSC are already leaving, just as the civil SSA pilot program is finally getting underway. The new leadership at the Department of Commerce needs to first and foremost halt additional changes and move with utmost speed to appoint a new director of OSC. That director needs to be empowered to continue the work started over the two previous administrations and now enshrined in the 2020 U.S. National Space Policy. Fully meeting this vision will likely mean continuing to push for the creation of a separate Bureau of Space Commerce.

There has been strong bipartisan support over the last two administrations that we need to modernize the way that the U.S. government supports and oversees commercial space activities. Increasing the promotion of commercial perspectives within interagency discussions and

globally, developing civil space situational awareness capabilities, and laying the foundation for space traffic management are key elements of this modernization. OSC has made significant strides toward implementing these new roles and we cannot afford more delays.

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*Brian Weeden is the director of program planning for the Secure World Foundation, a nonprofit dedicated to the long-term sustainable use of space for benefits on Earth. He is a former U.S. Air Force officer and is a partner in Lquinox Consulting, LLC.*

OFFICE OF SPACE COMMERCE

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