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Earth Prediction Innovation Center

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Good afternoon Chairwoman Fletcher, Ranking Member Marshall, and Members of the Subcommittee. Thank you for the opportunity to testify at this hearing. The National Oceanic and Atmospheric Administration (NOAA) is entrusted with the responsibility to provide environmental information and predictions to the public to enable informed decisions on a broad range of phenomena. Part of NOAA's core mission is to protect lives and property, and to safeguard the national economy. NOAA does this by issuing weather forecasts and warnings to American citizens every day.

With such an important task, it is imperative that NOAA provide accurate and timely weather information. We strive to produce the best weather forecast in the world, underpinned by cutting-edge research, collaborative external partnerships, and thousands of dedicated scientists. The quest to improve our ability to predict extreme weather events is ongoing.

Following Hurricane Sandy, Congress provided supplemental funding for NOAA to take its first large step towards increasing computing capacity and improving its global forecast models. Congress's desire to improve NOAA's weather mission culminated in the passage of the *Weather Research and Forecasting Innovation Act of 2017* (the Weather Act). This groundbreaking legislation contains a number of important directives for NOAA, including transitioning research to operations, sub-seasonal to seasonal weather forecast improvement, and satellite data innovation. Since starting at NOAA, implementing the Weather Act has been my top priority.

One section in the Weather Act that I would like to draw attention to is the mandate to create a community global weather research modeling system. While NOAA has complied with the letter of this directive by making the global weather modeling code available, we have been unable to fully honor the spirit of the statutory requirement. The existing version of this code was unique to NOAA computers. This means that while the public has access to the source code, without access to NOAA's internal computers, they encounter significant and time-consuming difficulties in actually running the model themselves.

To solve this problem, NOAA needed to rewrite millions of lines of code to run on non-NOAA computers that were publicly accessible. Likewise, NOAA needed a strategy to allow for

greater accessibility by the public. To achieve this, NOAA will need to port its weather model code to the commercial cloud, where it can be hosted by one or more providers.

Making NOAA's model code available to the public will allow external world-class scientists and researchers the opportunity to collaborate on new improvements. This is a new way of thinking. Instead of keeping research and development inside of NOAA, the entire weather enterprise will be able to work with us to improve our modeling system, thereby accelerating advancements to our mission of protecting life and property. This strategy is the core principle of NOAA's new Earth Prediction Innovation Center (EPIC).

Building on the tenets of the Weather Act, and recently authorized in the National Integrated Drought Information System Reauthorization Act of 2018, EPIC will serve as the core research-to-operations-to-research hub for building and maintaining a community modeling framework. EPIC's innovative structure will link scientists and software engineers in academia, the private sector, and partner agencies with the research, development, and operational activities inside the agency. Doing so will help accelerate model improvement, enhancing NOAA's ability to provide accurate warnings of weather-based threats, and helping to re-establish the preeminence of U.S. operational forecast skill.

While EPIC is initially focused on making short and medium range weather forecast model code publicly available, other areas of NOAA will see benefits as well. Once integrated into the infrastructure of NOAA, which is currently anticipated to occur by Fiscal Year (FY) 2023, EPIC will be used with the Unified Forecast System to improve the forecast skill of NOAA's other modelling initiatives, such as climate and ocean models. NOAA's coastal ocean and wave models have been community-based for years and serve as a proof of concept for EPIC.

Public accessibility of model codes, data and supporting infrastructure through scalable, commercial cloud-based High-Performance Computing architecture will enable external research partners to develop, test and provide feedback on the American modeling system. This platform will support underlying research required to improve the model forecasts, especially of extreme events such as hurricanes, floods, tornadoes, winter storms, and wildfires.

To this end, at the White House Summit on Partnerships in Ocean Science and Technology on November 14, we announced the draft NOAA Cloud Strategy and released the draft for public comment. Structured as a virtual center, EPIC will also manage model evaluation, source code versions, and user training. Where appropriate, NOAA will also look to partner with other federal agencies and academia to further this initiative.

The President's FY20 Budget proposed \$15.0 million for EPIC. NOAA recognizes the importance of the EPIC program and has already started implementing several steps to plan for its future. Last month, NOAA held an industry day to engage outside collaborators ranging from universities to commercial cloud vendors. NOAA has also issued a Request for Information (RFI) for the governance structure of the program, and has conducted extensive market research via the RFI, EPIC Community Workshop, and the Industry Day/Vendor Meetings. NOAA looks forward to the next step of issuing a Request for Proposals and the other integral activities that will advance this critical program.

Chairwoman Fletcher, Ranking Member Marshall, and Members of the Subcommittee, thank you again for inviting me to participate today. I would be pleased to answer any questions you may have about NOAA's EPIC program.