

FY 2017 Joint Hurricane Testbed (JHT), Hazardous Weather Testbed (HWT), Hydrometeorology Testbed (HMT)

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## ANNOUNCEMENT OF FEDERAL FUNDING OPPORTUNITY

## EXECUTIVE SUMMARY

Federal Agency Name(s): Oceanic and Atmospheric Research (OAR), National Oceanic and Atmospheric Administration (NOAA), Department of Commerce

Funding Opportunity Title: FY 2017 Joint Hurricane Testbed (JHT), Hazardous Weather Testbed (HWT), Hydrometeorology Testbed (HMT)

Announcement Type: Initial

Funding Opportunity Number: NOAA-OAR-OWAQ-2017-2005004

Catalog of Federal Domestic Assistance (CFDA) Number: 11.459, Weather and Air Quality Research

Dates: Letters of Intent (LOIs) submitted by Principal Investigators (PIs) must be received electronically no later than 5:00 p.m. Eastern Time (ET) on Friday October 21, 2016. Response letters to PIs will be sent from NOAA by about Friday November 18, 2016. Full application packages must be submitted through Grants.gov no later than 5:00 p.m. ET on Wednesday January 4, 2017. Expected project start date is July 1, 2017.

Funding Opportunity Description: This funding opportunity is being issued by the NOAA OAR Office of Weather and Air Quality (OWAQ). There will be three separate competitions resulting from this announcement, one for each of the three high impact weather testbeds supported by OWAQ's U.S. Weather Research Program (USWRP): Joint Hurricane Testbed (JHT), Hazardous Weather Testbed (HWT), and the Hydrometeorology Testbed (HMT).

These funding competitions will focus on new applied research, development, and demonstration of high impact weather and water research. The ultimate goal (after the award ends and assuming NWS decides to accept it) would be NWS's transition of project outcomes to operational weather and water forecasting services in three to five years from now.

The High Impact Weather Testbed program, a component of the USWRP, supports projects that transition applied research to operations and services through close collaboration with NOAA. Its focus is on mature projects that are ready or nearly ready to be tested in a NOAA quasi-operational forecasting environment through one of the above testbeds. It is in these testbeds where project outcomes, such as new data or products, improved analysis techniques, or better statistical or dynamic models and forecast techniques, will be presented to operational forecasters in a quasi-operational environment (a testbed) and evaluated for potential future implementation in the NWS forecast offices at the local, regional, and/or national center levels to

improve services to the public.

NOAA's National Weather Service (NWS) is also announcing another separate federal funding opportunity that is a companion to this funding opportunity and similarly supports projects to transition new research to NWS operations through the Collaborative Science, Technology, and Applied Research (CSTAR) Program. Please search for funding opportunity number NOAA-NWS-NWSPO-2017-2004957 in [grants.gov](https://www.grants.gov). The current OAR testbed funding opportunity supports mature projects that are ready or nearly ready for testbed collaborations and demonstrations, while testbed demonstrations are not required with the CSTAR funding opportunity.

## FULL ANNOUNCEMENT TEXT

## I. Funding Opportunity Description

## A. Program Objective

The primary objectives of this funding opportunity are to support applied research and development that leads to the demonstration during the project period of new high impact weather and water-related applications, including new data or products, improved analysis techniques, better statistical or dynamic forecast models and techniques, and communication of that information to better inform the public. It is expected that NOAA's support of these new capabilities will speed the transition of this new research into operations in order to improve NOAA weather and water services for the public.

The high impact weather and water focus areas included in this announcement include tornadoes, severe wind and hail storms, tropical cyclones, winter weather such as heavy snow and ice, and flooding, including coastal, inland, and flash flooding. The ultimate goal is to link together research and operations in these areas for practical benefits to NOAA's customers.

To accomplish these objectives, this announcement invites the scientific community to participate directly with NOAA organizations and staff in the achievement of practical project outcomes that could be operationally implemented in the next three to five years. These outcomes will be tested, demonstrated, and evaluated during the course of the funded projects, and if successful, they may be later applied and transitioned for use in National Weather Service (NWS) forecast offices at the local, regional, and national levels. Close collaboration with NOAA is critical and therefore required. Projects that address improvements to NOAA's existing or near-term future technologies, e.g., numerical models or forecast techniques that NOAA already employs, are most appropriate for this funding opportunity as opposed to those that propose totally new revolutionary models or approaches that would not reasonably be expected to be operationally implementable in the next three to five years.

The three relevant NOAA testbeds are a) the Joint Hurricane Testbed (JHT), b) the Hazardous Weather Testbed (HWT), and c) the Hydrometeorology Testbed (HMT). The testbeds each have their specific science priorities, and each will be tied to separate peer-reviewed competitions. Thus there will be a total of three separate competitions resulting from this one announcement: JHT, HWT, and HMT. OAR will fund the three testbed competitions through the U.S. Weather Research Program (USWRP). Each testbed is described below.

NOAA collaborates with the external science community on cooperative research activities and provides financial support for research-to-operations (R2O) transition projects through the USWRP managed by OAR's Office of Weather and Air Quality (OWAQ) to accelerate the transition to operations and enhance the public benefits to be derived from these research activities. OWAQ sponsors a portfolio of USWRP-supported high impact weather testbeds, including the JHT, HWT, HMT, through coordination with each of these testbed's managers and staff and through funding of R2O projects to be demonstrated, tested, and evaluated within their testbeds. These testbeds are jointly managed by both OAR and NWS staff. The USWRP testbed program supports advanced projects seeking to transition to operations where testbed interactions and demonstrations in a quasi-operational environment are key aspects. To get a sense for the types of current and past JHT, HWT, and HMT testbed projects funded by OWAQ through these USWRP testbeds, please go to <http://owaq.noaa.gov/GrantsandProjects.aspx>.

NOAA's testbed objective is to foster a two-way exchange of information between the research and operational communities, including research-to-operations (R2O) transitions and operations-to-research (O2R) communications, that are enabled through organized experimentation in a simulated operational NWS environment. This will involve close collaboration, facilitated by the testbed staff, between funded researchers and operational center forecasters. For example, NOAA operational forecasters may actually run or utilize output from experimental techniques during their operational shifts or during episodic experimental periods, and they may then provide direct feedback to the researchers for possible improvement.

Science projects focusing on high impact weather that are relatively mature and not in the early or middle stages of development or proof-of-concept are appropriate for these testbeds and this funding opportunity. This includes those projects that propose practical outcomes that could be transitioned operationally to NOAA in the next 3-5 years. Given this expectation, it is expected that projects selected for funding from this announcement should be ready or nearly ready to test and demonstrate their new capabilities in one of the testbeds during the project period. In the parlance of NOAA and other federal agencies, this requirement translates to the higher "technology readiness levels". Readiness levels, as adopted by NOAA and other federal agencies, are a means to broadly classify the technical maturity of a project using a numerical scale from 1 to 9 and a corresponding progressive spectrum from research to development to demonstration to deployment as follows.

READINESS LEVEL	DESCRIPTION
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1 (Basic Research)	Basic principles have been observed and reported
2 (Applied Research)	Technology concept and/or applications have been formulated
3 (Development)	Analytical and experimental critical function and/or characteristic proof-of-concept
4 (Development)	Component/subsystem validation in laboratory environment
5 (Development)	System/subsystem/component validation in relevant environment
6 (Demonstration)	System/subsystem model or prototyping demonstration in a relevant end-to-end environment
7 (Demonstration)	System prototyping demonstration in an operational environment
8 (Demonstration)	Actual system completed and “mission qualified” through test and demo in operational environment
9 (Deployment)	Actual system “mission proven” through successful mission operations

Projects that are most appropriate for the three testbed competitions should generally fall in or near the “demonstration” level of technical maturity, i.e., readiness levels of about 5 through 8 during the duration of the project. Transitioning a mature demonstrated capability from level 8 to 9 is beyond the scope of the testbeds and this funding opportunity.

Testing in the testbed facilities during the project performance period and working with the associated testbed staff to plan this testing and demonstration is a key required component of the project. Given the up-to-2-year project period (see Section II.B), this necessarily requires mid to high readiness levels at project start-up. Ideally, the transition of a funded project from, say, readiness level 5 or 6 at start-up to 8 at completion is OAR’s driving goal in funding these testbed projects. As a result, projects in early stages of development or proof-of-concept that are not ready or nearly ready for testbed demonstration during the two-year project period (those with start-up readiness levels of 4 or below) are not the primary focus of this testbed funding opportunity.

Applicants are encouraged to contact the appropriate testbed manager in advance to discuss projects to be proposed, testing plans, and the associated costs. Upon selection of a proposal for funding, the testbed staff will coordinate with the PIs on project administration and planning, experimental schedules, and engagement with its test facility. They will provide access to the NOAA-funded testbed facility and infrastructure (staff, computer hardware, software, and data) to facilitate the testing and evaluation in an environment that closely matches that of the operational entity. In preparation for the testing and evaluation, the PI, testbed staff and leadership, and operational forecasters (if appropriate) will collaboratively develop a test plan describing what will be tested, what the schedule milestones are, and how each group will be involved in the evaluation process, including development and review of

documentation, training, instructions, and success metrics. PIs must be involved directly in the evaluation as well as the earlier process to make any necessary system adjustments when preparing their project for testing in the testbed. Performance progress will be monitored throughout the project by the testbed staff and OWAQ through communications and periodic progress reports by the PIs. Completed projects satisfying NWS metrics for success and operational constraints (e.g., added value, ease of use, computational efficiency, etc.) may be selected later for operational implementation by appropriate NWS operational offices.

The science focus of a specific proposed project will determine which testbed is most appropriate. The overarching themes of each testbed are described below.

a) Joint Hurricane Testbed

The JHT mission is to facilitate the rapid and smooth transfer of new technology, research results, and observational advances of agencies, the academic community, and other groups into improved tropical cyclone analysis and prediction at operational centers. It is based at the NWS National Hurricane Center (NHC) in Miami, Florida. The operational forecast centers where JHT projects could be tested and evaluated include the NHC, the NOAA Central Pacific Hurricane Center (CPHC), and the Joint Typhoon Warning Center (JTWC) operated by the United States Navy and Air Force. For additional details about JHT, past funded projects, science priorities, business practices, and measures of success, go to <http://www.nhc.noaa.gov/jht/>.

b) Hazardous Weather Testbed

HWT develops, tests and evaluates severe weather forecast and warning techniques for the entire United States. The HWT is a facility jointly-managed by the OAR National Severe Storms Laboratory (NSSL), the NWS Storm Prediction Center (SPC), and the NWS Norman Weather Forecast Office, all located at the National Weather Center in Norman, Oklahoma. The HWT serves as a critical step in the process of bringing new hazardous weather science to NWS operations by examining ways to increase the lead-time and accuracy for weather and water warnings and forecasts for severe convective weather. The HWT consists of two primary programs normally conducted in an annual “Spring Experiment.” The Experimental Forecast Program (EFP) and the Experimental Warning Program (EWP) are focused on testing and evaluating new applications, techniques, and products to support NWS SPC and WFO severe convective weather operations, respectively. Projects selected for funding may be part of the Spring Experiment or at another more suitable time. For additional details about HWT, go to <http://hwt.nssl.noaa.gov/>.

c) Hydrometeorology Testbed

HMT facilitates engagement with the scientific community through the development, testing, and transition to operations of new hydrometeorology capabilities focusing on precipitation and land surface processes associated with high-impact weather that can lead to flooding. HMT is managed by OAR Earth System Research Laboratory's Physical Science Division in Boulder, Colorado and NWS Weather Prediction Center (WPC) in College Park, Maryland. HMT also partners with the NWS Weather Forecast Offices and River Forecast Centers and the National Water Center. HMT's annual Winter Weather Experiments and the summer Flash Flood and Intense Rainfall Experiments at WPC's facility provide excellent opportunities to test and evaluate new data, analysis techniques, models, and applications. The testbed has these major activity areas: quantitative precipitation estimation, quantitative precipitation forecasting (rain, snow, ice), snow information, hydrologic and surface processes, probabilistic and ensemble forecasting techniques, short to medium range forecasting, and decision support tools. For additional details about HMT, go to <http://hmt.noaa.gov/>.

B. Program Priorities

The program priorities are listed in detail below for each of the three competitions. Applicants should clearly indicate in the proposal the competition for which they are applying and address one or more of the associated priorities described below.

1) Joint Hurricane Testbed

The program priorities for the JHT competition are:

JHT-1: (Observations/analyses) Improved capability to observe the tropical cyclone and its environment to support forecaster analysis and model initialization. This would include techniques to improve the utility of microwave satellite and radar data for tropical cyclone intensity and location analysis (e.g. develop a "Dvorak-like" technique using microwave imagery), to modernize the satellite-based classification system used for monitoring subtropical cyclones (e.g., the Herbert-Poteat Technique), and to improve techniques for estimating the intensity of tropical cyclones passing over and north of sea-surface temperature gradients.

JHT-2: (Observations/analyses) Develop guidance on the best flight track strategies for synoptic surveillance missions that take into account hurricane forecaster use as well as data assimilation needs.

JHT-3: (Forecast tools) Guidance for tropical cyclone intensity change including the following: the onset, duration, and magnitude of rapid intensification events; over-water rapid weakening events; as well as statistically based real-time guidance on guidance, which could include multi-model consensus approaches provided in probabilistic and other formats.

JHT-4: (Forecast tools) Guidance for tropical cyclone genesis including the following: techniques or products to support pre-genesis disturbance track, intensity, size, and wind speed probability forecasts; guidance for tropical cyclone genesis at both the short-range (0-48 hours) and the medium-range (48-120 hours) that exhibits a high probability of detection and a low false alarm rate for, and/or provides probability of, genesis; and techniques to diagnose and predict the formation of tropical cyclones via transition of non-classical disturbances, e.g. monsoon depressions, subtropicals, hybrids, etc., and to forecast track, intensity, and structure prior to tropical cyclone transition.

JHT-5: (Forecast tools) Guidance for tropical cyclone track including the identification, and then reduction of, the occurrence of guidance and official track outliers, focusing on both large speed errors (e.g., accelerating recurvers and stalling storms) and large direction errors (e.g., loops), and on specific forecast problems, including interactions between upper-level troughs and tropical cyclones, track forecasts near/over land--especially elevated terrain, and extratropical transition; as well as statistically based real-time guidance on guidance, which could include multi-model consensus approaches provided in probabilistic and other formats.

JHT-6: (Impacts of storm surge, winds, waves) Advanced coastal inundation modeling and/or applications, visualization, or dissemination technology that enhances operational storm surge forecast accuracy or delivery.

JHT-7: (Impacts of storm surge, winds, waves) Operational analysis of the surface wind field in tropical cyclones, including the analysis of the maximum sustained winds, and winds affecting elevated terrain and high-rise buildings; as well as guidance for changes in tropical cyclone size/wind structure and related parameters, including combined sea heights.

JHT-8: (Impacts of storm surge, winds, waves) Development of probabilistic wave height forecasts in tropical cyclones for a possible new public product geared toward the marine community.

JHT-9: (Applications) Develop tropical cyclone climatology software that provides statistics on closest point of approach to a station, bearing and distance to a station, cyclone intensity statistics for a point or location, return period statistics, etc.

## 2) Hazardous Weather Testbed

The program priorities for the HWT competition are:

HWT-1: Identify and validate concepts and techniques to improve NOAA's convection-allowing ensemble forecast system performance through the Day 1 and/or Day 2 periods for tornado, large hail, damaging wind, and lightning applications, including sensitivity to factors such as number of ensemble members, data assimilation methodology, experimental observation systems, scale-appropriate initial conditions and lateral boundary conditions perturbations, and physics diversity.

HWT-2: Identify and validate post-processing techniques for NOAA's deterministic models and ensembles to create skillful and reliable probabilistic thunderstorm and severe hazard threat guidance for the Day 1 through Day 8 forecast periods, including assessment of the limits to predictability for these hazards.

HWT-3. Identify and validate innovative verification techniques/scale-appropriate metrics for thunderstorm and severe weather forecasts applicable to operational products and/or convective storm guidance from convection-allowing, regional, and global modeling systems.

HWT-4. Identify and validate very short-term (up to 3 hrs) convection-resolving prediction systems and techniques to provide very high temporal and spatial resolution probabilistic guidance for convective warning operations, including incorporation of advanced mesoscale and convective scale data assimilation, rapidly updated storm-resolving numerical weather prediction, extraction of relevant storm characteristics and hazard information, and post-processing to provide reliable and skillful guidance.

HWT-5. Identify and validate techniques to efficiently and effectively utilize very high temporal and spatial resolution multi-sensor (including Doppler radar and emerging observational systems), dynamically consistent 3-D objective analyses to provide the best "state of the environment" to support improved warnings and short-term forecasts for convective hazards.

HWT-6. Identify and validate next-generation, short-fuse, convective storm forecasting tools and techniques that can be applied to environmental and uncertainty fields in a high spatial- and temporal-resolution, four-dimensional, gridded database.

HWT-7. Apply and integrate relevant social and behavioral science methodologies into the aforementioned HWT areas so as to improve forecasters' use of the data, techniques, and guidance, with a particular emphasis in utilization of storm resolving modeling systems.

HWT-8: Apply and integrate relevant social and behavioral science to improve end-users' ability to receive, assess, understand, and respond to forecasts and warnings for convective weather hazards, including understanding and messaging of probabilistic hazard information.

### 3) Hydrometeorology Testbed

The program priorities for the HMT competition are:

HMT-1: Identify and validate new or improved methods, models, or decision support tools to improve flash flood monitoring and forecasting.

HMT-2: Identify and validate new or improved methods, models, or decision support tools to support ensemble precipitation and/or hydrologic prediction (this could include evaluation of existing models).

HMT-3: Identify and validate assimilation of observations into NOAA's hydrologic models to improve initial states.

HMT-4: Identify and validate new or improved tools, methods, models, or evaluation of data fusion techniques for improved quantitative precipitation estimates.

HMT-5: Identify and validate new or improved tools, models, or methods to improve heavy rainfall, snowfall, winter storm and icing forecasts and warnings, to be subjectively and objectively evaluated in a pseudo-operational environment.

HMT-6: Identify and validate new or improved methods, observations, and models to improve understanding or evaluate performance of extreme precipitation events.

HMT-7: Apply and integrate relevant social and behavioral science methodologies into the aforementioned HMT priorities to improve forecasters' use of the data, techniques, and guidance; to improve the ability of forecasters to depict, convey, and otherwise communicate anticipated hazards; and/or to improve end-users' ability to receive, assess, understand, and respond to forecasts and warnings for heavy precipitation events.

HMT-8: Identify and validate new or improved methods, models, or decision support tools that incorporate uncertainty information into NOAA's short and medium range ensemble forecasts.

### C. Program Authority

Authority is provided by the following: 15 U.S.C. 313; 49 U.S.C. 44720 (b); 33 U.S.C. 883d; 15 U.S.C. 2904; 15 U.S.C. 2934.

## II. Award Information

### A. Funding Availability

The total funding amount available is anticipated to be approximately \$700,000 per year for each of the 3 competitions (JHT, HMT, and HWT) for a total of about \$2.1M per year. Awards are limited to a maximum of \$150,000 total per year per project (for multi-institution projects, these are total project amounts, not per institution amounts). We anticipate making new awards for 4-6 JHT projects, 4-6 HWT projects, and 4-6 HMT projects. Initial year and subsequent renewal funding of any project is contingent upon the availability of these funds.

### B. Project/Award Period

These testbed projects may have durations up to two years. When a proposal for a multi-year award is approved, funding will initially be provided for only the first year of the project. Funding for subsequent years will be contingent upon 1) satisfactory progress as presented in regular written performance progress reports in relation to the stated goals, milestones, and phased deliverables of the proposal, and 2) the availability of NOAA funds.

### C. Type of Funding Instrument

The funding instrument for extramural awards will be a Cooperative Agreement based on the envisioned substantial involvement of NOAA scientists and forecasters in projects funded by this notice. It is required that one or more NOAA components, such as NWS forecast offices, NCEP national forecast centers, regional headquarters, or OAR laboratories be substantially involved in the project. For testbed projects involving investigators from multiple institutions, separate awards will be issued to each institution that submits a winning proposal for those projects.

Proposals from NOAA federal employee scientists selected for funding shall be awarded by an intra-agency fund transfer. Proposals from a non-NOAA federal agency selected for funding will be funded through an inter-agency transfer. PLEASE NOTE: Before non-

NOAA federal applicants may be funded, they must demonstrate that they have legal authority to receive funds from another federal agency in excess of their appropriation. The only exception to this is governmental research facilities for awards issued under the authority of 49 USC 44720(b). Because this announcement is not proposing to procure goods or services from applicants, the Economy Act (31 USC 1535) is not an appropriate legal basis.

If the applicant is a university that has a NOAA Joint or Cooperative Institute (CI), the institution is encouraged to submit a proposal on behalf of the CI. The proposal must specify the name of the CI, its award number, and the NOAA-approved research theme applicable to the work to be performed in the proposal's project narrative. The proposal will use the facilities and administrative rate (F&A or indirect cost rate) associated with the main CI award. If the CI proposal is selected for funding, NOAA will notify the university that a separate competitive award will be issued with its own award number. However, the competitive award will include a Special Award Condition (SAC) that evidences the link between it and the CI award. The SAC would provide (1) that the university has submitted the proposal on behalf of the CI; (2) that the existing University/NOAA Memorandum of Agreement will be incorporated by reference into the terms of the competitive award, and (3) that any progress report(s) for the competitive award must follow the timetable of and be submitted by the CI directly to the funding program. Copies of these progress reports will be attached to the CI's performance report as an appendix.

### III. Eligibility Information

#### A. Eligible Applicants

Eligible applicants are institutions of higher education; other nonprofits; commercial organizations; state, local and Indian tribal governments; and Federal agencies.

Applicants must ensure that they are eligible for the competition for which they are applying. Otherwise the application(s) will be rejected. Applications from non-Federal and Federal applicants will be competed against each other.

#### B. Cost Sharing or Matching Requirement

No cost sharing is required under this announcement.

#### C. Other Criteria that Affect Eligibility

Applicants are required to partner with NOAA organizations and employees for proposed projects, either as co-PIs on the proposal or through clearly-defined work

components for NOAA organizations as described in the proposal. Federal employees (NOAA or otherwise) may serve as PIs or co-PIs, but NOAA will not fund their federal salary costs. Travel costs or other reasonable costs for federal employee PIs or co-PIs may be funded. In these cases, funds will be transferred to the federal employee's organization through either an inter-agency fund transfer (if statutory authority allows) or an intra-agency fund transfer from NOAA (see Section II.C).

#### IV. Application and Submission Information

##### A. Address to Request Application Package

Application packages for full proposals are available at:  
[www.grants.gov/web/grants/applicants/apply-for-grants.html](http://www.grants.gov/web/grants/applicants/apply-for-grants.html).

There is no similar application package for Letters of Intent (LOIs).

##### B. Content and Form of Application

The instructions for preparation of LOIs and full proposals provided below are mandatory. Failure to adhere to these requirements will result in LOIs and/or full proposals being rejected and returned without review.

###### 1. Letter of Intent (LOI)

Prior to submitting a full proposal, PIs are strongly encouraged, but not required, to submit a pre-application in the form of a LOI for each planned project (one LOI only for joint projects from multiple institutions). The LOI should provide a concise description of the proposed work and a brief budget. The purpose of the LOI review process is to provide information to potential applicants on the relevance of their proposed project to the competition in advance of preparing a full application. Full applications will be encouraged only for LOIs deemed most relevant to this announcement's priorities. However, PIs who do not submit a LOI or who are not encouraged to submit a proposal after review of their LOI will not be precluded from submitting a full proposal.

(a) The LOI must be no more than two pages in length, using a 12-point font and one inch margins, and it must include a project header at the top with the following information: title, the name(s) of the PI(s), their home institution(s), and the name of the funding competition to which they are applying (either JHT, HWT, or HMT).

(b) The LOI must contain a brief description of the intended project, methodology, timelines,

and deliverables or project outcomes and its relevance to one or more of the specified priorities identified in Section I.B. Identify which specific NOAA organization is expected to be the recipient beneficiary of the project outcomes (e.g., a local weather or river forecast offices, a national forecast service center, etc....be specific).

(c) Briefly describe the current technology readiness level (see Section I.A.2) of the project to demonstrate its maturity and readiness for testing in the testbed and how you intend to interact with the testbed to demonstrate and test your proposed capabilities to advance readiness level.

(d) The LOI must include a brief budget which summarizes how resources will be allocated (e.g., salaries, computing and communications, indirect charges, and travel) along with a brief budget justification.

(e) LOIs will be reviewed by the Program Office following the criteria specified in Section V.A.

(f) All PIs will be notified by NOAA whether a full proposal is encouraged or discouraged after the review of their LOI. Even though a full proposal may be discouraged, a PI is not precluded from submitting a full proposal. PIs will be provided upon request a short synthesis of the factors from the review that led to the recommendation.

## 2. Full Proposal

(a) The full application (proposal) must be dated and display page numbers. It must include a title page that identifies all of the following information: each PI and the respective institutional representative by full name, title, organization, telephone number, mailing address, e-mail address, and the total requested funds for each annual period for each institution. If there are several institutions submitting separate applications for the same joint project, the names of ALL institutions along with their lead PI information and total requested funding for each annual period for each institution must appear on the title page of each of the separate joint applications.

(b) A one-page abstract must be included and must contain a brief summary of the proposed work to be completed and the identification of the desired competition category from section I.A (either JHT or HWT or HMT). The abstract must appear on a separate page, headed with the proposal title and the name(s) of the PI(s) and their institution(s).

(c) All proposals must provide a Statement of Work that includes:

(1) The proposed duration of the project (must be compliant with Section II.B requirements);

(2) The proposed work must be completely described, including: identification of the problem to be addressed and its relevance to the specific science priorities identified in Section I.B; the conceptual framework; scientific hypotheses and objectives; results from prior research; proposed methodology and work plan; and operational applicability and past collaborations with operational forecasters. Include a reference list with the most important references (this list may be excluded from the page limit count defined below).

(3) Project deliverables or technology transfer outcomes, and your performance measures of success. The benefits of the proposed project to the general public and the scientific community should also be discussed. Identify which NOAA organization is expected to be the ultimate recipient beneficiary of these project outcomes (e.g., local weather or river forecast offices, a national operational center, etc.). Be specific.

(4) Describe (i) the current technology readiness level (Section I.A.2) of the project at start-up as well as projected end-state readiness level at project end, and (ii) your conceptual plans for how you would utilize the testbed to demonstrate your proposed capabilities and then transition those capabilities to NOAA near the end of the project if successful. There should be sufficient description to demonstrate its start-up maturity and readiness for testing in the testbed during the project period (readiness levels at or above 5 at start-up). Development of a more comprehensive testing and transition plan in coordination with NOAA will be required within 6 months after the project start date if the project is selected for an award.

(5) A timeline with key milestones for conducting the project and delivering the scientific and technical results throughout the course of the project;

(6) A brief description of travel associated with data collection, project meetings, testbed planning meetings, testbed experiments (including NWS forecaster participation), and the presentation of results at scientific conferences as appropriate.

The above Statement of Work items in 2.(c).1-6 must be fully contained within no more than TEN PAGES using a 12-point font and one-inch margins (the exception is the reference list in section 2.c.2 above). For separate applications from multiple institutions for the same joint project, identical SOWs should be submitted in each separate institution's application, but they must clearly describe the work contributions of each funded PI.

(d) Data Management Plan: See section VI.B.4 below for details and required submission of this information as a part of the application.

(e) A Curriculum Vitae (CV) for all PIs and co-PIs with a reference list of all publications within at least the last three years must be included. CV's are optional for collaborator partners.

(f) Current and pending financial assistance support: Each investigator must submit a list that includes project title, supporting agency, investigator months, total dollar value and duration. Requested amounts should be listed for pending support.

(g) All applicants must submit a detailed itemized Budget Table broken out by year (in addition to the SF424A) and a Budget Justification that demonstrates cost effectiveness. It should include the PI's scientific and technical support staff salaries and fringe benefits, facility requirements, computing and communications, supplies and travel. The information on the SF-424A and this separate budget table must be consistent and should include only the amount of funding that will be provided to the institution submitting the proposal. It should not include budget information for PIs or co-PIs at other institutions who may be contributing to a joint project. However, in cases of multiple applications from different institutions associated with the same project, the Lead PI for the joint project should additionally include a separate Summary Budget Table in his/her application that displays the total SUMMARY budget for all partners on a joint project in addition to the detailed budget for his/her own institution. The summary budget table may be included on the proposal's title page as described in section IV.B.2.a.

If indirect charges are included in the budget, the applicant must have an approved negotiated Indirect Cost Rate Agreement and must include it as a part of the application package. If an applicant has not previously established an indirect cost rate with a Federal agency they may choose to negotiate a rate with the Department of Commerce or use the de minimis indirect cost rate of 10% of Modified Total Direct Cost (MTDC; as allowable under 2 C.F.R. §200.414). The negotiation and approval of a rate is subject to the procedures required by NOAA and the Department of Commerce Standard Terms and Conditions Section B.06. The NOAA contact for indirect or facilities and administrative costs is:

Lamar Revis, Grants Officer  
NOAA Grants Management Division  
1325 East West Highway  
9th Floor

Silver Spring, Maryland 20910  
lamar.revis@noaa.gov

(h) The full proposal package includes the information described above as well as the required federal forms: (1) Application for Federal Assistance (SF-424), (2) Budget Information - Non-Construction Programs (SF-424A), (3) Certifications (CD-511), (4) Assurances - Non-Construction Program (SF-424B), and (5) Disclosure of Lobbying Activities (Standard Form LLL). Applicants must use the Standard Form SF 424A Budget Information-Non Construction Programs that is contained in the standard NOAA Grants and Cooperative Agreement Package. Pay careful attention to show the yearly budget breakout on the SF 424A for multi-year proposals.

(i) This announcement does not require any National Environmental Policy Act (NEPA) questions to be answered as part of the application. This will be done after project selection. For additional information on NEPA, see section VI.B.3.

#### C. Unique Entity Identifier and System for Award Management (SAM)

Each applicant is required to:

- (i) Register in SAM before submitting an application;
- (ii) Provide a valid unique entity identifier in the application; and
- (iii) Continue to maintain an active SAM registration with current information at all times during which it has an active Federal award or an application or plan under consideration by NOAA (or any other Federal agency).

NOAA may not make a Federal award to an applicant until the applicant has complied with all applicable unique entity identifier and SAM requirements. If an applicant has not fully complied with the requirements by the time NOAA is ready to make a Federal award, NOAA may determine that the applicant is not qualified to receive a Federal award and use that determination as a basis for making a Federal award to another applicant.

#### D. Submission Dates and Times

LOIs must be received by NOAA no later than 5:00 p.m. Eastern Time (ET) on Friday October 21, 2016. NOAA determines whether an LOI has been submitted before the deadline by the date and time on the e-mail. LOIs received after the deadline will not be reviewed, but in such cases PIs are still permitted to submit a full proposal. It is expected that response letters to all PIs who submitted LOIs by the due date will be sent via e-mail

from NOAA around Friday November 18, 2016.

Complete application packages must be submitted no later than 5:00 p.m. ET on Wednesday January 4, 2017. The date and time receipt indication from Grants.gov will be the basis of determining timeliness. Applications received after that time will be rejected and will not be reviewed.

#### E. Intergovernmental Review

Applications under this program are not subject to Executive Order 12372, "Intergovernmental Review of Federal Programs".

#### F. Funding Restrictions

Funding beyond the first year will be dependent upon satisfactory performance and the continued availability of funds. NOAA is not responsible for proposal preparation costs.

#### G. Other Submission Requirements

LOIs must be sent electronically to NOAA by e-mail to [oar.owaq.competition@noaa.gov](mailto:oar.owaq.competition@noaa.gov) by the due date. Full application (proposal) packages from non-federal government applicants must be submitted electronically through the <http://grants.gov> website by the due date. Federal government applicants must e-mail their complete applications to [oar.owaq.competition@noaa.gov](mailto:oar.owaq.competition@noaa.gov) by the due date.

Applicants should note that it can take between 3-5 business days or as long as 3 weeks to register with Grants.gov if all steps are not completed in a timely manner, and registration is required only once. Users of Grants.gov will be able to download a copy of the application package, complete it offline, and then upload and submit the application via the Grants.gov site. If an applicant has problems downloading the application forms from Grants.gov, contact Grants.gov Customer Support at 1-800-518-4726 or [support@Grants.gov](mailto:support@Grants.gov). To use Grants.gov, applicants must have a Dun and Bradstreet Universal Numbering System (DUNS) number and current registration in the System for Award Management (SAM) system. Applicants should allow a minimum of five days to complete the SAM registration. Registration is required only once, but must be renewed periodically. In all, there are approximately five steps needed to set up your organization's Grants.gov account (see [http://www.grants.gov/applicants/get\\_registered.jsp](http://www.grants.gov/applicants/get_registered.jsp)).

### V. Application Review Information

#### A. Evaluation Criteria

Applicants are required to address in their proposal the criterion described in this section which are the fundamental basis for reviewing, scoring, and ranking of the proposals. The evaluation criteria and weighting of the criteria are as follows for all competitions (for a total of 100%):

1. Importance/Relevance and Applicability of Proposed Project to Program Goals (25%):

This criterion ascertains whether there is intrinsic value to NOAA in the proposed work and relevance to NOAA's top priorities.

a. How well does the proposal address one or more of the NOAA science priorities listed in Section I.B?

b. Is the research/science at a sufficiently mature level at start-up that there is reasonable expectation that proposed outputs or knowledge will be ready for NOAA operational use and deployment once the project completes?

c. What is the likelihood that the proposed science activities will improve operational forecasting services upon completion?

d. What is the degree of collaboration with one or more NOAA operational units throughout the project? Were the intended end-users identified and appropriate?

e. What is the degree of integration of social/behavioral science into projects examining forecaster or end-user interpretation and utilization of new technology, guidance, or products?

2. Technical/Scientific Merit (50%):

This criterion assesses whether the approach is technically sound and/or innovative, if it is mature enough to deliver practical results during the project time period, if the methods are appropriate, and whether there are clear project goals and objectives.

a. Were focused scientific objectives and strategies proposed, including data management considerations, project milestones and timelines, and project deliverables or outcomes that can be reasonably accomplished during the project period?

b. Does the proposal appear to provide significant new knowledge through a single award

with no assumptions regarding follow-on support?

c. Was a high-level testing and transition plan provided that adequately describes tasks and costs and relevant participants?

d. Does the proposal include performance metrics that can measure and evaluate the overall success or failure of the project?

### 3. Overall Qualification of Applicant (15%):

This criterion ascertains whether the applicant possesses the necessary education, experience, training, facilities, and administrative resources to accomplish the project.

a. Do PIs document past scientific collaborations with operational meteorologists?

b. Have past collaborations been successful, especially projects related to transitioning research to operations?

c. Have researchers demonstrated the ability to conduct successful research and transition programs related to the NOAA priorities in Section I.B and publish peer reviewed articles?

### 4. Project Costs (10%):

This criterion evaluates the budget to determine if it is realistic, efficient, and commensurate with the project needs and time-frame.

a. Are the requested costs realistic, reasonable, allowable, allocable, necessary and commensurate with the project needs and time period?

b. Has the applicant proposed cost-efficient ways of accomplishing the project?

c. What is the appropriateness and reasonableness of the budget relative to the benefits to be gained?

d. Is there a high ratio of operationally useful results versus proposed costs?

### B. Review and Selection Process

Once a full application has been received, an administrative review will first be conducted to determine compliance with all submission requirements, completeness of the application, and responsiveness to the NOAA priorities in Section I.B. If all requirements are satisfied and the application is responsive to the NOAA priorities, the application will move to the next stage of review. The competition identified by the applicant for the proposed project (JHT, HWT, or HMT) will be reviewed by NOAA. If it is inappropriate, NOAA may reassign the proposal to the most appropriate competition if other requirements are otherwise compliant.

All compliant proposals will receive an independent, objective review in accordance with the criteria specified above in Section V.A. of this announcement. Such review will be conducted by designated reviewers, consisting of at least three experts who can be federal and/or non-federal employees. NOAA selects reviewers on the basis of their professional qualifications and expertise as related to the unique characteristics of the application to the extent possible. All reviewers' scores will be used to produce a rank ordering of the projects, with separate rank ordering and selection for each of the three competitions (JHT, HWT, or HMT) based on the expected number of awards in each competition as described in Section II. A. The Selecting Official from OAR/OWAQ will then make selection recommendations to the NOAA Grants Officer. Any application considered for funding may be required to address the issues raised in the evaluation of the application by the reviewers, program officer, selecting official, and/or grants officer before an award is issued.

### C. Selection Factors

The merit review ratings shall provide a rank order to the Selecting Officials for final funding recommendations. The Selecting Officials shall award in the rank order unless the proposal is justified to be selected out of rank order based upon one or more of the following factors:

1. Availability of funding.
2. Balance/distribution of funds: a) geographically, b) by type of institutions, c) by type of partners, d) by research areas, and e) by project types.
3. Whether this project duplicates other projects funded or considered for funding by NOAA or other federal agencies.
4. Program priorities and policy factors.
5. Applicant's prior award performance.

6. Partnerships with and participation of targeted groups.

7. Adequacy of information necessary for NOAA staff to make a NEPA determination and draft necessary documentation before recommendations for funding are made to the Grants Officer.

Regarding Selection Factor 2b, while an institution may submit more than one application, the selecting official may limit the awards to only one per institution.

#### D. Anticipated Announcement and Award Dates

Applicants should use July 1, 2017 as the proposed start date.

## VI. Award Administration Information

### A. Award Notices

All applicants will receive notification from NOAA that their full application (proposal) has either been recommended or not recommended for funding to the NOAA Grants Officer after completion of the review process. All applicants will receive their average scores for their application and overarching reviewer comments. Notices of recommendation for funding are not an authorization to initiate the project. Official notification of funding, signed by a NOAA Grants Officer, will come later if approved and is the only authorizing document that allows the project to begin.

### B. Administrative and National Policy Requirements

#### 1. Department of Commerce Pre-Award Notification Requirements:

The Department of Commerce Pre-Award Notification Requirements for Grants and Cooperative Agreements contained in the Federal Register notice of December 30, 2014 (79 FR 78390) are applicable to this solicitation and may be accessed online at <http://www.gpo.gov/fdsys/pkg/FR-2014-12-30/pdf/2014-30297.pdf>

#### 2. Limitation of Liability:

Funding for programs listed in this notice is contingent upon the availability of appropriations. In no event will NOAA or the Department of Commerce be responsible for application preparation costs. Publication of this notice does not oblige NOAA to award any specific project or to obligate any available funds. If one incurs any costs prior to receiving

an award agreement signed by an authorized NOAA official, one would do so solely at one's own risk of these costs not being included under the award or of not receiving an award.

### 3. National Environmental Policy Act (NEPA):

If recommended for funding, applicants whose proposed projects may have an environmental impact will be asked to furnish sufficient information to assist NOAA in assessing the potential environmental consequences of supporting the project. NOAA must analyze the potential environmental impacts, as required by the National Environmental Policy Act (NEPA), for each project which seeks NOAA funding. Detailed information on NEPA can be found at the following NOAA NEPA web site: [www.nepa.noaa.gov](http://www.nepa.noaa.gov), including our NOAA Administrative Order 216-6A for NEPA, [http://www.corporateservices.noaa.gov/ames/administrative\\_orders/chapter\\_216/216-6A](http://www.corporateservices.noaa.gov/ames/administrative_orders/chapter_216/216-6A), and the Council on Environmental Quality implementation regulations, [https://ceq.doe.gov/ceq\\_regulations/regulations.html](https://ceq.doe.gov/ceq_regulations/regulations.html).

If needed by NOAA for NEPA assessment, applicants will be asked to provide detailed information on the activities to be conducted, locations, sites, species, and habitat to be affected, possible construction activities, and any environmental concerns that may exist (e.g., the use and disposal of hazardous or toxic chemicals, introduction of non-indigenous species, impacts to endangered and threatened species, aquaculture projects, and impacts to coral reef systems). In addition to providing specific information that will serve as the basis for any required impact analyses, applicants may also be requested to assist NOAA in drafting an environmental assessment if NOAA determines an assessment is required.

Applicants will also be required to cooperate with NOAA in identifying feasible measures to reduce or avoid any identified adverse environmental impacts of their proposal. The failure to do so shall be grounds for not selecting an application. In some cases if additional information is required after an application is selected, funds can be withheld by the Grants Officer under a special award condition requiring the recipient to submit additional environmental compliance information sufficient to enable NOAA to make an assessment on any impacts that a project may have on the environment.

### 4. Data Management Plan:

a. Environmental data and information collected or created under NOAA grants or cooperative agreements must be made discoverable by and accessible to the general public, in a timely fashion (typically within two years), free of charge or at no more than the cost of reproduction, unless an exemption is granted by the NOAA Program. Data should be

available in at least one machine-readable format, preferably a widely-used or open-standard format, and should also be accompanied by machine-readable documentation (metadata), preferably based on widely used or international standards.

b. Proposals submitted in response to this Announcement must include a Data Management Plan of up to two pages describing how these requirements will be satisfied. The Data Management Plan should be aligned with the Data Management Guidance provided by NOAA in the Announcement. The contents of the Data Management Plan (or absence thereof), and past performance regarding such plans, will be considered as part of proposal review. A typical plan should include descriptions of the types of environmental data and information expected to be created during the course of the project; the tentative date by which data will be shared; the standards to be used for data/metadata format and content; methods for providing data access; approximate total volume of data to be collected; and prior experience in making such data accessible. The costs of data preparation, accessibility, or archiving may be included in the proposal budget unless otherwise stated in the Guidance. Accepted submission of data to the NOAA National Centers for Environmental Information (NCEI) is one way to satisfy data sharing requirements; however, NCEI is not obligated to accept all submissions and may charge a fee, particularly for large or unusual datasets.

c. NOAA may, at its own discretion, make publicly visible the Data Management Plan from funded proposals, or use information from the Data Management Plan to produce a formal metadata record and include that metadata in a Catalog to indicate the pending availability of new data.

d. Proposal submitters are hereby advised that the final pre-publication manuscripts of scholarly articles produced entirely or primarily with NOAA funding will be required to be submitted to NOAA Institutional Repository after acceptance, and no later than upon publication. Such manuscripts shall be made publicly available by NOAA one year after publication by the journal.

##### 5. Unpaid or delinquent tax liability:

In accordance with current Federal appropriations law, NOAA will provide a successful corporate applicant a form to be completed by its authorized representatives certifying that the corporation has no Federally-assessed unpaid or delinquent tax liability or recent felony criminal convictions under any Federal law. If a form is provided, an award may not be issued until it is returned and accepted by NOAA.

#### 6. Universal Identifier:

To enable the use of a universal identifier and to enhance the quality of information available to the public as required by the Federal Funding Accountability and Transparency Act of 2006, to the extent applicable, any proposal awarded in response to this announcement will be required to use the Central Contractor Registration and Dun and Bradstreet Universal Numbering System and be subject to reporting requirements, as identified in OMB guidance published at 2 CFR Parts 25, 170 (2013), [http://www.ecfr.gov/cgi-bin/text-idx?SID=1ccffb4c1d4de03add6a041113460f9&mc=true&node=se2.1.200\\_1300&rgn=div8](http://www.ecfr.gov/cgi-bin/text-idx?SID=1ccffb4c1d4de03add6a041113460f9&mc=true&node=se2.1.200_1300&rgn=div8)

#### 7. Review of Risk.

After applications are recommended for funding by the selecting official, the Grants Management Division performs administrative reviews. The reviews will include financial stability of an applicant, quality of the applicant's management systems, history of performance, and the applicant's ability to effectively implement statutory, regulatory, or other requirements imposed on non-Federal entities. Upon review of these factors, if appropriate, special conditions that correspond to the degree of risk may be applied.

#### 8. Freedom of Information Act (FOIA):

U.S. Department of Commerce regulations implementing FOIA are found at 15 C.F.R. Part 4, "Public Information." These regulations set forth rules for the Department regarding making requested materials, information, and records publicly available under the FOIA. Applications submitted in response to this Federal Funding Opportunity may be subject to requests for release under the Act. In the event that an application contains information or data that the applicant deems to be confidential commercial information which is exempt from disclosure under FOIA, that information should be identified, bracketed, and marked as "Privileged, Confidential, Commercial or Financial Information." Based on these markings, the confidentiality of the contents of those pages will be protected to the extent permitted by law.

#### C. Reporting

Award recipients will be required to submit financial and performance (technical) progress reports via NOAA's electronic Grants Online system. All reports will be submitted on a semi-annual schedule and must be submitted no later than 30 days following the end of each 6-month period from the start date of the award. The comprehensive final report is due 90 days after the award expiration. Copies of all submitted reports will become the property of the U.S. Government.

The Federal Funding Accountability and Transparency Act of 2006 includes a requirement for awardees of applicable Federal grants to report information about first-tier sub-awards and executive compensation under Federal assistance awards issued in FY 2011 or later. All awardees of applicable grants and cooperative agreements are required to report to the Federal Sub-award Reporting System (FSRS) available at [www.FSRS.gov](http://www.FSRS.gov) on all sub-awards over \$25,000.

## VII. Agency Contacts

For questions about this announcement, contact Richard Fulton, OWAQ Testbed Portfolio Manager, via email at [richard.fulton@noaa.gov](mailto:richard.fulton@noaa.gov).

## VIII. Other Information

To use [grants.gov](http://grants.gov), applicants must have a Dun and Bradstreet Data Universal Numbering System (DUNS) number and be registered in the Central Contractor Registry (CCR). Allow a minimum of five days to complete the CCR registration. [Note: Your organization's Employer Identification Number (EIN) will be needed on the application form.] Applicants are strongly encouraged not to wait until the application deadline date to begin the application process through [grants.gov](http://grants.gov).