NOAA Reviewer Instructions for Joint Technology Transfer Initiative (JTTI) Proposals
Technical Review

Fiscal Year (FY) 2021 Weather Program Office (WPO) Joint Technology Transfer Initiative
NOAA-OAR-WPO-2021-2006592

12/15/2020

The following instructions will be used by the peer review panel to complete their technical reviews of the full proposal submissions for the above announcement of Notice of Funding Opportunity (NOFO) that was published by NOAA on grants.gov on August 12, 2020.

1) NOAA's Grants Online system will be used by the reviewers to access and download the assigned proposals and to submit evaluation scores and comments for each proposal. All reviewers will have a Grants Online profile created for them by NOAA, permitting online access to the proposals and review forms. When reviewer assignments are made to the proposals by NOAA, one email will be sent out to each reviewer by Grants Online, which contains a unique login name and password for this competition and the list of assigned proposals. Any additional correspondence from WPO to reviewers via direct email will be limited to alerting reviewers to the upcoming review deadline and requesting completion of any reviews that are past due.

2) All system-related questions and technical difficulties with the Grants Online review system not directly related to a proposal's content should be directed to the Grants Online Help Desk, which can be reached at GrantsOnline.Helpdesk@noaa.gov ((301) 444-2112 in the Washington, DC Metro area, (877) 662-2478 toll free). For all other non-system-related questions, contact the Review Panel Chairman (RPC) Chandra Kondragunta in the NOAA/OAR Weather Program Office (chandra.kondragunta@noaa.gov, 202-603-2567).

3) Multiple proposals may be assigned to each reviewer. **Reviewers should review their assigned proposals and enter their scores and comments into the Grants Online scoresheet by close of business Friday, January 29, 2021**. This date is approximately 6 weeks after the proposals have been distributed to them (Friday December 18, 2020). Please inform the RPC immediately if that date is not possible and not at the last minute of the review period when it's then too late to re-assign.

4) Please inform the RPC if there might be a conflict of interest for one or more assigned proposals that require recusal for any reason that the reviewer believes could compromise their ability to provide an objective unbiased review (e.g., close relationships, work affiliations, financial interest, etc.). A proposal assigned to a

reviewer requesting to be recused will be reassigned to another reviewer by the RPC. All non-Federal Government employee reviewers must read and sign the Form CD571 "Reviewer Conflict of Interest and Confidentiality Certification for Non-Governmental Peer Reviewers" before proposal reviews can be submitted through the Grants Online System. This form, available electronically within the system, must be printed out, signed, scanned, and uploaded into Grants Online. Instructions for approving the form can be found in the Grants Online Reviewer Quick Reference Guide (see page 9-11), which will be provided in the user's profile.

5) Reviewers will be provided an electronic copy of the full NOFO in Grants Online, via their user profile. They should review it to understand the overall intent and application requirements of the competition and, in particular, read the important section I "Funding Opportunity Description" that includes two subsections, "Program Objectives" and "Program Priorities", specifying NOAA's focused priorities for work to be funded by this NOFO for each competition. Appendix A, included below for the reviewer's convenience, is a condensed version of those sections from the NOFO that contains the specific information for this particular competition. The other important section to become familiar with is section V.A "Evaluation Criteria" (see Appendix B included below for the reviewer's convenience) which identifies the Evaluation Criteria that will be used to score all competition's proposals and appropriate questions to consider for each one when evaluating them. This year, JTTI also included an information sheet, providing additional guidance on program priorities and proposal evaluation (see Appendix C). The two NOFO sections and information sheet are key to providing the standard baseline information necessary to review and score each of the proposals.

6) For Technical reviews, reviewers will evaluate the proposals against four Evaluation Criteria of section V.A of the NOFO: criterion 2, 3, 4, and 5. These four criteria have a maximum possible score of 70 points. In order to reduce reviewer biases and to better standardize review scores, the following scoring rubric should be used in scoring.

Total Score	**Guidance**
> 60 (Outstanding)	Eval-2: The proposal is technically sound and has a high probability of success. Eval-2: Project methodologies are novel. Eval-2: Project milestones and outputs are very clear and well documented. Eval-2: Performance metrics are very clear and feasible. Eval-3: The PIs have extensive knowledge and experience. Eval-4: The proposed budget is extremely reasonable given the project's scope and schedule. Eval-5a outreach: The proposal includes specific and effective education and outreach strategies.

	Eval-5b D&I: The proposal includes a clear D&I statement that emphasizes a strong commitment to fostering a diverse and inclusive workforce as well as furthering their institutional commitment. **Reviewer has no concerns with the proposal** **Strongly recommend for funding**
49-60 (Good)	Eval 2: The proposal is technically sound, but lacks rigor. The probability of success is moderate to high. Eval 2: Project methodologies are mostly novel. Eval 2: Project milestones and outputs are clear and documented. Eval 2: Performance metrics are clear and appear feasible. Eval 3: The PIs have sufficient knowledge and experience. Eval 4: The proposed budget is reasonable given the project's scope and schedule. Eval-5a outreach: The proposal includes education and outreach strategies. Eval-5b D&I: The proposal includes a D&I statement that describes how the PIs have implemented and will further their institution's commitment to diversity and inclusion. **Minor concerns with the proposal** **Recommend for funding**
42-48 (Adequate)	Eval 2: The proposal has some technical flaws. The approach may or may not be sufficient to address the problem. The probability of success is low to moderate. Eval 2: Project methodologies are mostly known and understood. Eval 2: Project milestones and outputs are somewhat clear and somewhat documented. Eval 2: Performance metrics are minimally clear and/or feasible. Eval 3: - The PI's have limited knowledge and experience in the area of research for their project. Eval 4: The proposed budget is somewhat reasonable given the project's scope and schedule. Eval-5a outreach: The proposal provides vague education and outreach strategies. Eval-5b D&I: The proposal provides a somewhat generic D&I statement that slightly expands on their institution's commitment to diversity and inclusion.

	Major concerns with the proposal **Recommend only if funding is available**
< 42 (Poor)	Eval 2: The proposal is technically flawed, such that the risk of project failure is unacceptably high. Eval 2: No novel project methodologies are proposed. Eval 2: Project milestones and outputs are unclear and poorly documented. Eval 2: Performance metrics are either missing or unclear and unfeasible. Eval 3: The PIs have no knowledge and experience. Eval 4: The proposed budget is unreasonable given the project's scope and schedule. Eval-5a outreach: The proposal does not include education and outreach strategies. Eval-5b D&I: The proposal includes a generic D&I statement that does not sufficiently differ from their institution's commitment to diversity and inclusion. **Significant concerns with the proposal** **Not recommended for funding**

7) All reviewers will submit their review through the Grants Online system, filling out a numerical score and comments in the appropriately labeled boxes. **Comments are highly recommended to explain your scores, even though GrantsOnline system says comments are not required.** A sample of these boxes is shown in Appendix D. Anonymity of each reviewer's individual scores and comments will be maintained by NOAA to the extent permitted by law.

8) Each proposal should be reviewed independently of other reviewers and the proposal Principal Investigators (PIs) and co-PIs and others listed on the proposal title page. No direct contact can be made by the reviewers to any PIs or co-PIs to ask questions or get clarifications.

9) Reviewers must destroy or delete any copies of proposals (hard copies or electronic copies) downloaded from Grants Online once their reviews are completed.

10) After all reviews are submitted by the deadline, NOAA will consolidate the reviews and scores, and selections will be made according to the NOFO criteria.

11) Key Dates:

- Friday December 18, 2020 – Grants Online distributes emails to the reviewers with login information to Grants Online to kick off the review period.

- Friday January 29, 2021 – Completion date for all individual review score forms in Grants Online for all proposals.

Appendix A. Notice of Funding Opportunity (NOFO) Description

The information below, specific to this Joint Technology Transfer Initiative (JTTI) competition, is extracted directly from the published NOFO and is included here for the reviewer's convenience.

A. Program Objective

1. Joint Technology Transfer Initiative

The U.S. faces a spectrum of high impact environmental hazards that cause havoc on people's lives and the nation's economy. Through improved forecasting of the events, better communication and preparedness, loss of lives and property damage can be reduced. While NOAA is the sole U.S. government authority for issuing official weather forecasts and warnings for life threatening events, the broader weather enterprise plays an important role in communication and dissemination of weather information tailored to specific customers.

Through this JTTI announcement, WPO/OAR/NOAA is seeking proposals to support further development, testing and evaluation of mature weather research that has potential for improving NOAA's NWS operational capabilities, with particular emphasis on (i) In collaboration with the Unified Forecast System (UFS) community, further develop, test and enhance data assimilation techniques, develop and evaluate physics, improve model component coupling techniques and capabilities, and utilizing Artificial Intelligence/Machine Learning (AI/ML) for improving forecasts, (ii) Further development and enhancement of physics suite tuning and evaluations, post-processing techniques and tools, and (iii) Improve forecasts and messaging of extreme weather and high impact weather events (e.g., severe convection, winter storms, extreme rainfall). Applicants are encouraged to visit the UFS website (https://www.ufscommunity.org/) and the NWS website (http://www.weather.gov/) to learn more about the NWS current capabilities, as well as the NOSC website (https://nosc.noaa.gov/), the DTC website (http://www.dtcenter.org/testing-evaluation/data-assimilation), and future plans (https://www.weather.gov/news/192203-strategic-plan).

In order to successfully transition new technology to NOAA operations shortly after the

completion of selected projects, the JTTI program will focus on projects associated with Readiness Levels 4 to 8. As such, projects that are best suited to submit to JTTI are at a stage where the concept has already been proven to work successfully in the local environment and has potential for further prototype development and testing in a pseudo-operational environment. The potential investigators are highly encouraged to contact one of the NOAA testbed managers if they plan to test their products in a NOAA testbed, website (https://www.testbeds.noaa.gov/). In order for NOAA to successfully transition the new technologies developed as a result of this funding opportunity into NOAA operations, applicants must identify a NOAA/NWS operational office (receiving party) that will be responsible for testing and evaluation for feasibility to implement the research into operations. Ultimately, the implementation decision lies with the NWS. Applicants are highly encouraged to collaborate (and demonstrate collaboration using the NOAA Collaborator Acknowledgment described in Section IV.B.2.h) with the NOAA/NWS scientists throughout the project (see Section V.A.1.(6) and (7)).

For additional program information on JTTI and this competition, please review the supplemental Information Sheet for the JTTI competition in the grant package associated with this announcement at https://www.grants.gov.

B. Program Priorities

NOAA's highest priorities for each of the eight separate competitions funded through this announcement are identified below. Applicants for a given competition below should clearly indicate and address in their proposal one or more of the associated priorities for that specific competition. Proposals not directly associated with one or more of these priorities are discouraged.

1. JTTI

WPO, in collaboration with the NWS, developed the following three priorities (each with sub-priorities) for the JTTI Program.

JTTI-1: In collaboration with the UFS community (https://ufscommunity.org/) and/or the UFS/R2O Project (https://www.weather.gov/media/sti/UFS-R2O-Project-Proposal-Public.pdf), further develop, test and enhance data assimilation techniques, develop and evaluate physics, improve model component coupling techniques and capabilities, and utilize Artificial Intelligence/Machine Learning (AI/ML) for improving forecasts:

JTTI-1(a): Test and improve methods for coupled data assimilation strategies for GFSv17/GEFSv13 or other applications within the UFS. This includes (i) developing and testing multi-scale hybrid EnVar (with Joint Effort for Data assimilation Integration (JEDI) if available) for UFS (particularly multi-scale covariance localization), (ii) developing and testing initialization and ensemble strategies for the Rapid Refresh Forecast System (RRFS) (e.g., multi-physics, stochastic physics etc.), (iii) initializing regional nested, coupled domains for the Hurricane Analysis and Forecast System (HAFS), or (iv) further develop and/or improve quality control and bias corrections (utilizing machine learning) for high frequency remote sensing observations (radar, satellite radiance, lightning etc.).

JTTI-1(b): Develop hierarchical testing approaches for land model evaluation and coupling in the context of the UFS. The land models of interest include but are not limited to the current land component in the UFS, but should be ready to run with the UFS by the end of the project. Projects on developing and implementing land-only reanalysis and reforecast

datasets and metrics for evaluating the fidelity of UFS in capturing key land processes and land-atmospheric coupling, isolating and quantifying the impacts of the land component on coupled system particularly in terms of surface temperature and precipitation forecasts from weather to subseasonal timescales, and assimilating land-relevant observations to improve land initiate states, are strongly encouraged.

JTTI-1(c): Accelerate the use of AI in product generation in operations, particularly for better use of existing ensembles, and creation of auto-tuning and auto-calibration capabilities for machine learning techniques to reduce operations and maintenance costs.

JTTI-2: Work with the UFS community (https://ufscommunity.org) and/or the UFS R2O Project (https://www.weather.gov/media/sti/UFS-R2O-Project-Proposal-Public.pdf)to further development and enhancement of physics suite tuning and evaluations, post-processing techniques and tools, to include:

JTTI-2(a): Develop post-processing software for the UFS, including novel algorithms and methods for model bias correction and calibration such as machine learning and artificial intelligence, software optimization and compression techniques, visualization techniques, and probabilistic data sets and statistics derived from ensemble systems.

JTTI-2(b): Physics improvements for the UFS, including: (i) Improve and enhance existing Common Community Physics Package (CCPP) physics parameterizations including addressing known biases. This includes tuning of coefficients or physics parameters, adding new (or unaccounted) processes/forcing terms to existing packages. Test and evaluate these schemes at weather to subseasonal scales, or (ii) Work with the UFS community to develop a systematic evaluation of physics suites (not individual schemes) and tuning of physics configurations (optimization of physics configurations), with a focus on scale-aware physics. For example, should we turn the cumulus scheme on or off for Convection-Allowing Models (CAM)? Or turn on shallow convection only?

JTTI-2(c): Develop novel verification metrics, methods, algorithms, and graphical displays for all UFS applications using METplus, METExpress, and METViewer using existing and emerging data sets to help diagnose systematic errors, test and improve new

UFS applications, and provide real-time model performance characteristics.

JTTI-3: Improve forecasts and messaging of extreme weather and high impact weather events (e.g., severe convection, winter storms, extreme rainfall), to include:

JTTI-3(a): Further develop, test and evaluate tools and models that convey probabilistic hazard information to assist forecasters in diagnosing the magnitude and evolution of high impact and extreme weather events.

JTTI-3(b): Further develop, test and evaluate new or improved ways of enhancing forecaster use of probabilistic information, including quantifying impacts, in short-range and medium-range weather forecasts.

JTTI-3(c): Utilize social and behavioral science during the development, testing, and evaluation of forecast tools that can be used to diagnose forecast uncertainty of high impact and extreme events. This includes projects focused on usability, human factors, and co-creation of software development.

Appendix B. NOFO Evaluation Criteria

The information below is extracted directly from the published NOFO and included here for the reviewer's convenience.

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 this review event (for a total of 70 points):

2. **Technical/Scientific Merit** (35 points)

This criterion assesses whether the approach is technically sound and/or innovative, if the methods are appropriate, and whether there is clear project goals and objectives. The reviewers will consider the following questions in their assessment of this criterion:

(1) How technically sound are the proposed methods and solutions to the scientific problem?

(2) How achievable are the proposed methods and solutions to the scientific problem?

(3) How does the proposed project improve technology, concepts, or methods and advance the field of study?

(4) If applicable, how does the proposed project improve technology, concepts, or methods to eventually improve NOAA operations?

(5) How novel are the concepts, approaches, or methods employed?

(6) How clear and feasible is the schedule for milestones, outputs, and advancing Readiness Levels (RLs)?

(7) How clearly defined are metrics to evaluate project success and/or failure?

3. **Overall Qualifications of Applicants** (15 points)

This ascertains whether the applicant possesses the necessary education, experience, training, facilities, collaboration environment, and administrative resources to accomplish the project. The reviewers will consider the following questions in their assessment of this criterion:

(1) How will the applicant's education, experience, training, facilities, and/or resources help accomplish the project?

(2) How effective are the collaborative arrangements and partnerships needed to accomplish the project?

(3) How effectively has the applicant demonstrated the ability to conduct successful research?

(4) How effectively has the applicant demonstrated the ability to publish peer reviewed articles?

(5) How effectively have the applicant and co-investigators demonstrated experience in transitioning research to operations related to the NOAA priorities in Section I.B?

4. **Project Costs** (10 points)

This criterion evaluates the budget to determine if it is realistic, efficient, and commensurate with the project needs and time-frame. The reviewers will consider the following questions in their assessment of this criterion:

(1) Are the requested costs realistic, reasonable, allowable, allocable, necessary, and commensurate with the project outputs/products and outcomes/benefits, and time period?

(2) How impactful are the potential benefits relative to the cost?

(3) Has the applicant proposed cost-efficient ways of accomplishing the project?

5. Outreach, Education, Diversity, and Inclusion (10 points)

This section will be scored out of a total of 10 points, with 5 points allocated for Education and Outreach and 5 points for Diversity and Inclusion.

a. Outreach and Education (5 points). This criterion assesses whether the project provides a focused and effective education and outreach strategy regarding NOAA's weather mission to provide weather, water, and climate data, forecasts and warnings for the protection of life and property and enhancement of the national economy. This section will be scored out of 5 points. The reviewers will consider the following questions in their assessment of this criterion:

(1) How well does the proposal include activities or outputs for sharing project progress and results with the general public(s) and/or scientific community through a website, hosting workshops, developing training materials, or other engagement activities?

(2) Does the proposal include the publication of the results in a peer-reviewed publication and presenting results at a national conference or workshop?

(3) Does the proposal promote the education and field experience of undergraduate and graduate students, and/or are opportunities developed to share with K–12 educators?

(4) Does this proposal utilize educational scholarship or internship programs?

(5) How well does the proposal describe its Data Management Plan and intentions for sharing data generated during the project?

b. Diversity and Inclusion (5 points). This criterion also assesses the project's compliance with NOAA's policy on diversity and inclusion, as defined in Section IV.2.f, and its potential broader impact on D&I. This section will be scored out of 5 points. The reviewers will consider the following elements in their assessment of this criterion:

(1) How clearly does the proposal's D&I statement describe how the project will address and promote diversity and inclusion?

(2) Does the proposal provide specifics on how the applicants have already implemented D&I in their group, at their institution, or in the preparation of the proposal (e.g. diverse project team, utilizing new and existing partnerships and programs, etc.)?

(3) Does the proposal provide specifics on how the applicants will further advance D&I in the context of their project (e.g. diverse project team, utilizing new and existing partnerships and programs, etc.)?

Appendix C. Information Sheet

Information about the JTTI Program:

National Oceanic and Atmospheric Administration (NOAA) collaborates with the American Weather Enterprise on cooperative research activities and provides financial support to transition weather technologies from the American Weather Enterprise to NOAA's National Weather Service (NWS) operations through several funding programs. The Joint Technology Transfer Initiative (JTTI), created by the Congress in 2016, is one such program to accelerate the transition of matured weather research to NWS operations. The mission of the JTTI is to ensure continuous, cost effective development and transition of the latest scientific and technological advances into NWS operations. Within NOAA's Office of Oceanic and Atmospheric Research (OAR), the Weather Program Office (WPO) manages and implements the JTTI program in close collaboration with the NWS.

Through this Joint Technology Transfer Initiative (JTTI) announcement, WPO/OAR/NOAA is seeking proposals to support further development, testing and evaluation of mature weather research that has potential for improving NOAA's Unified Forecast System capabilities (https://ufscommunity.org/).

Projects that are suitable for the JTTI program are matured enough that can transition to NOAA operations within the next 2-5 years. As such, projects that are most suitable for this competition are at Readiness Level (RL) 4 or above which mean the concept has been already developed and validated in their own or laboratory environment and ready to be tested in the NOAA environment. Prototype development suitable for UFS is allowed. As per NAO 216-105B, NOAA uses Readiness Levels to track the progress of the Research to Operations transition projects. For a full description of NOAA Readiness Levels, investigators are directed to NOFO for this competition and announcement in Appendix A of this NOFO. Investigators are encouraged to understand the Readiness Level of their project and assign the appropriate RL for the project. Note that projects that are in exploratory stage or addressing basic research (RLs less than 4) are not suitable for the JTTI competition. They may be suitable for other competitions of the associated NOFO.

Information on JTTI Program Priorities:

This year's JTTI priorities focused on three main themes: (i) In collaboration with the Unified Forecast System (UFS) community (UFS Community Site, UFS R2O Project Proposal), further develop, test and enhance data assimilation techniques, develop and evaluate physics, improve model component coupling techniques and capabilities, and utilizing Artificial Intelligence/Machine Learning (AI/ML) for improving forecasts, (ii) Further development and enhancement of physics suite tuning and evaluations, post-processing techniques and tools, and (iii) Improve forecasts and messaging of extreme weather and high impact weather events (e.g., severe convection, winter storms, extreme rainfall). Detailed program priorities are identified in the program priorities section IB of the associated NOFO. Proposals must address one of the priorities listed in the priorities section of the NOFO and must be at Readiness Level 4

1 or above. PIs of proposals addressing priorities JTTI-1 and JTTI-2 are highly encouraged to consult the UFS R2O proposal and the UFS R2O team members in developing their proposals.

Information on Testing and Evaluation:

As mentioned before, JTTI is a research to operations transition program. Typically, a good transition project follows the development, demonstration and deployment phases. Projects must have a good test and evaluation plan to demonstrate the value of the outcome of the project to the community. Investigators are highly encouraged to contact the respective testbed managers (https://www.testbeds.noaa.gov/) to assess the suitability of the project to test in that particular testbed and visit section IV.B.2.h of the associate NOFO for details on collaboration and submission requirements. If the proposal is funded, in coordination with the testbed manager, the PIs are required to develop a test plan within six months of the start of the project. Successful transition projects will be assigned a Point of Contact from the NWS to guide through the transition process. The PIs, in coordination with the NWS POC, are also required to develop a high level research to operations transition plan within the first six.

Although the deployment phase of the project is not part of this funding call, projects must have an end goal where the outcome of the project will be implemented. Investigators must identify the receiving office in the NWS where the outcome of this project will be implemented. As such, investigators are highly encouraged to collaborate with the NWS scientists and visit section IV.B.2.h of the associated NOFO for details on submitting collaboration acknowledgement form. Investigators are highly encouraged to identify a clear transition path with demonstration of the value of the products through evaluation in one of the testbeds or other evaluation mechanisms and a receiving office in the NWS with collaborators from NWS.

Guidance on Proposal Evaluation:

Investigators should understand that Joint Technology Transfer Initiative (JTTI) is a program that
is intended to accelerate those projects that are aligned with one or more of the current program priorities (as identified in the NOFO) to a funding end-state where if the project results in a proposed transition of output to UFS or to one of NWS operational unit. During the review process, reviewers will focus, among other evaluation criteria, on a project's transition ability after funding has expired, how the final deliverable(s) would serve to better the weather community and the public it serves as a whole, and if the final product would fit within the framework of the UFS. It is in the best interest of the principal investigators, then, to demonstrate in their proposal how their project meets those goals. Those projects not demonstrating a strong possibility of transition to operations after funding ends, or supporting a concept that is hyper localized (i.e. "stovepiping") will not be rated highly by reviews.

In order for project investigators to understand the needs and environments of the weather enterprise, investigators are encouraged to form collaborations with an operational center, especially those within the National Weather Service where a project's final product could be housed if selected for transitioning after funding completion. This collaboration should be

supported with evidence, such as a signed letter of support or the inclusion of a staff member as a non-paid collaborator, pursuant to the eligibility requirements described in the NOFO. The importance of this operational collaboration is seen throughout the evaluation criteria that reviewers will use to grade an incoming application. If there are plans to utilize a testbed for project demonstration/collaboration purposes, principal investigators are required to state their intentions clearly in their statement of work.

Appendix D. Sample Grants Online Score Form Boxes