

Department of Commerce (DOC)

**National Oceanic and Atmospheric
Administration (NOAA)**

**Office of Oceanic and Atmospheric Research
(OAR)**

Weather Program Office (WPO)

Earth Prediction Innovation Center (EPIC)

**5-Year Indefinite-Delivery/Indefinite-Quantity
(IDIQ) Contract**

PERFORMANCE WORK STATEMENT (PWS)

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1. EXECUTIVE SUMMARY

This Draft Performance Work Statement (PWS) outlines the Earth Prediction Innovation Center (EPIC) high-level requirements for advancing weather modeling skill, reclaiming and maintaining international leadership in the area of numerical weather prediction, and improving the transition of research into operations. The general objective and scope of this PWS is to continue and expand activities previously completed, and to develop new strategic outcomes and a strategic implementation plan for defining success for this contract.

The overarching scope of this contract is to:

1. Continue and expand software engineering and scientific and technical support services on open-source code repositories as well as on-premise, cloud, and limited testing environments;
2. Develop stakeholder and community engagement activities;
3. Provide robust user support and easy access for advanced Earth system models, applications and components, including the latest version of the Unified Forecast System (UFS), a community-based, coupled, comprehensive Earth modeling system;
4. Extend the modeling framework toward including Artificial Intelligence (AI) based numerical weather prediction models, state-of-the-art weather prediction approaches, workflows and associated pre- and post-processing technologies.

Responsibilities include establishing an extramural, virtual center to enhance weather prediction. This involves leveraging the Weather Enterprise, promoting cross-sector collaborations to improve global weather prediction, supporting innovative research to advance weather forecast capabilities leveraging NOAA resources, and creating accessible community weather research modeling systems readily portable to operational environments. Developed systems should meet public accessibility requirements, operate independently from secure NOAA systems, and employ innovative strategies such as cloud-based computing and AI and/or machine learning (ML) approaches.

EPIC will continuously integrate and develop the community-modeling environment with all partners in the Weather Enterprise through community-based, coupled, comprehensive Earth system models to improve Numerical Weather Prediction (NWP) and accelerate NOAA's Research-to-Operations and Operations-to-Research (R2O2R) process, spanning local to global domains and predictive time scales from sub-hourly analyses to seasonal predictions.

2. BACKGROUND

The Weather Research and Forecasting Innovation Act of 2017 (WRFIA, Public Law 115-25) directs NOAA to prioritize improving weather data, modeling, computing, forecasting, and warnings to protect life and property and enhance the enhancement of the national economy. The authorizing language for EPIC, in the National Integrated Drought Information System Reauthorization Act of 2018 (NIDISRA, Public Law 115- 423), calls for NOAA to accelerate community-developed scientific and technological enhancements into the operational applications for NWP, which requires "advancing weather modeling skills, reclaiming and maintaining international leadership in the area of numerical weather prediction, and improving the transition of research into operations."

EPIC's vision is to enable the most accurate and reliable operational numerical forecast model in the world. EPIC's mission is to be the catalyst for community research and modeling advances that continually inform and accelerate advances in our nation's operational forecast modeling systems. In the near term, this means enhancing NWP skill of Earth system models, applications and components used in NOAA's weather forecasting suite, including the UFS. In the long-term, this means expansion to other operational model applications such as high-resolution convective-allowing models and fully coupled sub-seasonal-to-seasonal, water, and ocean forecast systems.

This contract shall provide all scientific and technical support services supporting activities outlined in this PWS. The contract will be managed by NOAA's Weather Program Office (WPO) within NOAA's Oceanic and Atmospheric Research (OAR) line office.

3. OBJECTIVES AND SCOPE

The objective of this contract is to make continuous progress building upon the strategic outcomes achieved in past performance from activities associated with the EPIC Program¹, and to develop a new strategic implementation plan for defining success of the EPIC, including:

1. Maintenance and expansion of EPIC.
2. Enabling strong collaboration with the Earth Sciences community to nurture a highly inclusive and diverse modeling community of practice across the Weather Enterprise.
3. Maintenance and expansion of a publicly accessible end-to-end testing and development environment on the cloud, from pre- to post-processing, for core Earth system model applications.
4. Demonstrate EPIC success by bringing in innovations to improve Weather and Climate model performance.

The scope for maintaining EPIC includes but is not limited to the following activities:

- Project management,
- Infrastructure and software engineering,
- Codebase support,
- Code management,
- Systems integration,
- Data management,
- Tracking NWP performance and skill improvement,
- Advanced user support,
- Community and continuous stakeholder engagement.

Based on the established framework¹, the general scope is to maintain and expand the foundational aspect of EPIC following and improving existing procedures and protocols to deliver products that are key to realize EPIC's vision and mission as part of a new strategic implementation plan, extending the existing EPIC strategic implementation plan². Therefore, recommendations for new approaches, products and

¹ <https://epic.noaa.gov>

² <https://epic.noaa.gov/epic-strategic-implementation-plan/>

services in addition to the currently-suggested objectives and scope are sought that can further realize EPIC's vision and mission as detailed in the EPIC Strategic Plan³.

A summary of tasks is provided in Section 4. Sections 5 and 6 provide an overview of deliverable packages and associated high-level requirements, respectively. A more detailed enumeration and description of tasks, deliverables and requirements will become available in a comprehensive PWS once a request for proposals (RFP) is published. Tasks, deliverables and requirements listed in this PWS are notional, providing a high-level perspective in lieu of full details, and are subject to modifications, extensions and new scope of work to be specified via the RFP and in post-award contract task-orders.

4. TASKS

This section provides summarized task headings expected to be expanded in post-award contract task orders.

- 4.1. Develop a Project Management Plan (PMP) to fulfill the requirements of the contract.
- 4.2. Establish, maintain and continuously support a cross-cutting community infrastructure to accelerate research to operations and operations to research.
- 4.3. Establish, coordinate and continuously support a code management framework.
- 4.4. Support the development and integration of modeling systems and applications.
- 4.5. Plan and support community software releases for relevant Earth system models, applications and components.
- 4.6. Coordinate, support and continuously update an advanced user support framework, including the development and maintenance of user support products and services.
- 4.7. Support, maintain and continuously update a community engagement strategy, including community engagement products and services.
- 4.8. Support, maintain, and continuously update a key stakeholder engagement strategy, including the development and maintenance of stakeholder engagement products and services.
- 4.9. Establish, maintain and continuously support a public-facing community modeling infrastructure of global Artificial Intelligence (AI) based numerical weather prediction models.

5. SUMMARY OF DELIVERABLE PRODUCT AND SERVICE CATEGORIES

This section provides categories of products and services to be delivered as a part of this contract.

³ https://wpo.noaa.gov/wp-content/uploads/2022/09/Signed_EpicStrategicPlan2021-0903.pdf

Categories and timelines are expected to be expanded in post-award contract task orders.

Deliverable	Time or Frequency	Medium/Form at/# of Copies	Submit To
Per 4.1, A contract IDIQ PMP.	One month after the start of the contract period of performance.	Microsoft (MS) Word Report via email.	Technical Point of Contact (TPOC) and Contracting Officer Representative (COR)
Per 4.2, A cross-cutting community infrastructure to accelerate research to operations and operations to research, that is developed, deployed, and continuously updated.	A software architecture design and operating plan in the first quarter. Documentation updated quarterly at a minimum. Products and services released and reported according to timelines determined on a task-order (TO) basis. A comprehensive report annually.	Online ⁴ , artifacts for HPC resources ⁵ , MS Word Reports, and Power-Point presentations or additional documentation artifacts, where applicable, via email.	TPOC and COR
Per 4.3, A code management framework that is established, and continuously supported, coordinated and updated.	A code management plan in the first quarter. Documentation updated quarterly at a minimum. Products and services released and reported according to timelines determined on a task-order (TO) basis. A comprehensive report annually.	Online, artifacts for HPC resources, MS Word Reports, and Power-Point presentations or additional documentation artifacts, where applicable, via email.	TPOC and COR

⁴ Online refers to websites, wiki pages, GitHub, and any other EPIC-related and community web-based resources. All online deliverables require a snapshot (word doc or PDF) reflecting their content and state at delivery time.

⁵ HPC resources refer to cloud and on-premise capabilities.

Deliverable	Time or Frequency	Medium/Form at/# of Copies	Submit To
Per 4.4, Support activities for the development and integration of Earth system models, applications, and components.	A systems integration plan in the first quarter. Documentation updated quarterly at a minimum. Products and services released and reported according to timelines determined on a task-order (TO) basis. A comprehensive report annually.	Online, artifacts for HPC resources, MS Word Reports, and Power-Point presentations or additional documentation artifacts, where applicable, via email.	EPIC PM and COR
Per 4.5, Community software releases for relevant Earth system models, applications and components, including release plans and a framework for continuous coordination and support.	A general release procedure plan in the first quarter. Documentation updated quarterly at a minimum. Products and services released and reported according to timelines determined on a task-order (TO) basis. A comprehensive report annually.	Online, artifacts for HPC resources, MS Word Reports, and Power-Point presentations or additional documentation artifacts, where applicable, via email.	EPIC PM and COR
Per 4.6, An advanced user support framework that includes the development and maintenance of user support products and services, and is continuously coordinated, supported and updated.	A standard operating plan (SOP) in the first quarter. Documentation updated quarterly at a minimum. Products and services released and reported according to timelines determined on a task-order (TO) basis. A comprehensive activity report annually.	Online, artifacts for HPC resources, MS Word Reports, and Power-Point presentations or additional documentation artifacts, where applicable, via email.	EPIC PM and COR
Per 4.7, A community engagement strategy	A standard operating plan (SOP) in the first quarter. Documentation updated quarterly at	Online, artifacts for HPC	EPIC PM and COR

Deliverable	Time or Frequency	Medium/Form at/# of Copies	Submit To
that includes community engagement products and services, and is continuously supported, maintained and updated.	a minimum. Products and services released and reported according to timelines determined on a task-order (TO) basis. A comprehensive report annually.	resources, MS Word Reports, and Power-Point presentations or additional documentation artifacts, where applicable, via email.	
Per 4.8, A key stakeholder engagement strategy that includes the development and maintenance of stakeholder engagement products and services, and is continuously supported, maintained, and updated.	A standard operating plan (SOP) in the first quarter. Documentation updated quarterly at a minimum. Products and services released and reported according to timelines determined on a task-order (TO) basis. A comprehensive report annually.	Online, artifacts for HPC resources, MS Word Reports, and Power-Point presentations or additional documentation artifacts, where applicable, via email.	EPIC PM and COR
Per 4.9, A public-facing community modeling infrastructure of global Artificial Intelligence (AI) based numerical weather prediction models that is established, and continuously maintained and supported.	A software architecture design and operating plan in the first quarter. Documentation updated quarterly at a minimum. Products and services released and reported according to timelines determined on a task-order (TO) basis. A comprehensive report annually.	Online, artifacts for HPC resources, MS Word Reports, and Power-Point presentations or additional documentation artifacts, where applicable, via email.	EPIC PM and COR

6. PERIOD OF PERFORMANCE

The projected contract period of performance is five (5) years following the date of award.

7. PLACE OF PERFORMANCE

The place of performance is to be at the direction and discretion of the contractor to fulfill the requirements of this contract in an acceptable manner.

8. CONTRACT TYPE

The Government intends to award a single-award firm-fixed price IDIQ contract.

9. PERFORMANCE REQUIREMENT SUMMARY (PRS)

This section provides high-level requirements for the categories of products and services to be delivered. Requirements are expected to be expanded to include detailed requirements for actual deliverables, which will be specified via the RFP and in post-award contract task orders.

Required Service	PWS Section	Performance Standard	Method(s) of Surveillance	Incentive
Develop an IDIQ PMP to fulfill the requirements of this contract.	4.1	<ul style="list-style-type: none">• In accordance with the Project Management Book of Knowledge (PMBOK), Seventh Edition,• Includes component management plans addressing requirements such as project scope, schedule, cost, risk and opportunity, configuration, code release, communications and reporting, staff onboarding and training, innovations, in- and out-transitions, quality assurance, stakeholder engagement, subcontracting, OCI avoidance and procurement.• Project management approach prioritizes strategic goals,• Consistent with Agile project management principles,• Provides consistent community and stakeholder engagement activities,• Integrates priorities across development teams, business owners and stakeholders,• Ensures a high-rate of objectives completion and business value.	100% inspection by the TPOC and COR.	Past Performance Review

Required Service	PWS Section	Performance Standard	Method(s) of Surveillance	Incentive
Establish, maintain and continuously support a cross-cutting community infrastructure to accelerate research to operations and operations to research.	4.2	<ul style="list-style-type: none"> • Develop, deploy and continuously update a CI/CD pipeline across cloud and on-premise HPC resources. • Ensures an automated build and build-testing framework, with a developmental high-performance computing and software infrastructure configuration sandbox, an end-to-end public-facing cloud testing and development environment, and a platform-agnostic unified community model development platform. • Supports a hierarchical testing framework (HTF) and a hierarchical system development (HSD) framework. • Infrastructure is cloud- ready, portable, interoperable and platform-agnostic, using infrastructure as code (IaC) where possible, automation, portable HPC stacks (e.g., spack stack), consistent with containerization approach, • Provides a flexible architecture to facilitate testing new system architectural innovation, absorbing scientific innovation provided by the community, and facilitating coordination with community stakeholders. • Aligned with NOAA best practices and Information Technology (IT) requirements, including NOAA Central Operations (NCO) HPC implementation standards, • Services and products developed within the NOAA system boundaries are documented and aligned with the NIST SP800-53-r5 risk management framework. 	100% inspection by the TPOC and COR.	Past Performance Review

Required Service	PWS Section	Performance Standard	Method(s) of Surveillance	Incentive
		<ul style="list-style-type: none"> All services and products are properly documented, with full technical description, benchmarking results and relevant metrics across HPC resources. 		
Establish, coordinate and continuously support a code management framework.	4.3	<ul style="list-style-type: none"> Coordinate code management, integration, and updates. Establish and maintain continuous integration, deployment workflows, and EPIC's Unified Workflow (UWF) toolkit support. Manage software testing, including regression, cross-platform, and integration tests, and ensure computational performance. Ensure stability during system upgrades and connectivity with component models. Conduct benchmark retrospectives and maintain compatibility across platforms. Document meetings, stakeholder communications, and support systems like ticketing and wikis. Integrate new model tests into regression frameworks, validate results, and ensure standards compliance. Align activities with NOAA best practices, coordinate with stakeholders, and document operational standards and dependencies. 	100% inspection by the TPOC and COR.	Past Performance Review
Support the development and integration of modeling systems and applications.	4.4	<ul style="list-style-type: none"> Supports the development and publication of system architecture, infrastructure and governance documents, Coordinates code reviews and integrates pull requests, 	100% inspection by the TPOC and COR.	Past Performance Review

Required Service	PWS Section	Performance Standard	Method(s) of Surveillance	Incentive
		<ul style="list-style-type: none"> • Develops and deploys a minimal set of workflows end-to-end (WE2E) tests, • Integrates verification and validation metrics for selected cases, • Improves the workflow of selected components, • Benchmarks the computational performance of end-to-end configurations of selected applications and components, • Delivers optimized prototypes, • Support and documentation includes and integrates relevant systems, applications and components serving both operational and research communities, • Activities include and are portables across all supported HPC platforms, and integrated with the EPIC CI/CD pipeline framework, • Leverages community collaboration, • Integrated systems are ready for operational hardening whenever possible, • Accommodates O2R and facilitates R2O, • Updates relevant systems, applications and components documentation, • Includes all components such as dynamical cores, pre-processing, physics, post-processing, verification and validation, and workflow, and the necessary initial conditions (ICs), lateral boundary conditions (LBCs), • Fosters academic and industrial community usage, distribution and engagement. 		

Required Service	PWS Section	Performance Standard	Method(s) of Surveillance	Incentive
Plan and support community software releases for relevant Earth system models, applications and components.	4.5	<ul style="list-style-type: none"> • Develops and publishes updated release vision and charter documents. • Coordinates and supports release efforts, including the preparation, testing, and deployment of cloud-ready prototypes. • Provides end-to-end support for release activities. • Implements community software releases. • Clearly identifies key stakeholders for each release and makes plans easily accessible to them. • Manages open-source code repositories to ensure consistent operation across on-premise, cloud, and testing environments, ensuring platform-agnostic releases of systems, applications, and components. • Includes compilers that support both community development and transitions to operational applications. • Addresses data dependencies and provides user-friendly evaluation tools, work datasets, and comprehensive documentation. • Coordinates activities with relevant communities and key stakeholders. 	100% inspection by the TPOC and COR.	Past Performance Review
Coordinate, support and continuously update an advanced user support framework, including the development and	4.6	<ul style="list-style-type: none"> • Manages continuous development, coordination, and management of user support forums, ensuring accessibility and integration via EPIC online portals. • Provides technical and logistic support for community events, including the development and provision of tutorials and instructional materials. 	100% inspection by the TPOC and COR.	Past Performance Review

Required Service	PWS Section	Performance Standard	Method(s) of Surveillance	Incentive
maintenance of user support products and services.		<ul style="list-style-type: none"> Develops documentation for community Earth system models, ensuring consistency with standards developed in collaboration with stakeholders. Deploys interfaces for seamless user access to code repositories and cloud-based sandboxes, supporting all relevant systems and applications. Supports the development, deployment, and maintenance of interfaces facilitating user access to cloud-based sandboxes and code repositories. Maintains a list of subject matter experts (SMEs) and a database of contract staff with expertise to reduce dependency and ensure robust support. Integrates all framework elements into EPIC online portals and resources, ensuring accessibility to users of all backgrounds and expertise levels. Reviews all framework elements by technical and non-technical teams to ensure quality, accessibility, and compliance with established standards. Ensures readiness for cloud and on-premise platforms, addressing full functionality needs and compatibility with supported environments. 		
Support, maintain and continuously update a community engagement strategy,	4.7	<ul style="list-style-type: none"> Supports web-based artifacts, including portals, websites, wiki pages, online resources, user interfaces, and social media platforms. Manages schedules for maintenance, design, and content updates of web- 	100% inspection by the TPOC and COR.	Past Performance Review

Required Service	PWS Section	Performance Standard	Method(s) of Surveillance	Incentive
including community engagement products and services.		<p>based artifacts.</p> <ul style="list-style-type: none"> • Provides frameworks for planning meetings, workshops, and showcasing program outcomes at conferences. • Develops content for web-based artifacts, including social media, and continuously updates communication strategy documents. • Expands web-based artifacts to address community and stakeholder queries, such as frequently asked questions pages. • Plans and develops community engagement artifacts, such as newsletters, integrated into the ECP and general community support framework. • Ensures all artifacts follow responsive design, 508 compliance, human-centered design best practices, SEO guidelines, and approved style guidelines. 		
Support, maintain, and continuously update a key stakeholder engagement strategy, including the development and maintenance of stakeholder engagement products and services.	4.8	<ul style="list-style-type: none"> • Develops and deploys a continuous key stakeholder engagement framework aligned with EPIC program goals and community missions. • Creates opportunities to incorporate stakeholder feedback into relevant work items. • Maintains a key stakeholder database accessible to program members. • Conducts quarterly stakeholder engagement analyses to identify and prioritize key stakeholder needs. • Ensures accessibility of communications and information display interfaces for all stakeholders. 	100% inspection by the TPOC and COR.	Past Performance Review

Required Service	PWS Section	Performance Standard	Method(s) of Surveillance	Incentive
		<ul style="list-style-type: none"> Increases stakeholder engagement evidenced by participation in EPIC-hosted events. Tracks engagement metrics for all stakeholder categories. Facilitates periodic meetings with key stakeholders to incorporate feedback into project vision and work items. 		
Establish, maintain and continuously support a public-facing community modeling infrastructure of global Artificial Intelligence (AI) based numerical weather prediction models.	4.9	<ul style="list-style-type: none"> Establish a public-facing and open source GitHub repository for AI-based Earth system models in alignment with IT policies. Integrate functionalities to support research and operational versions of common models and ensure community co-development of workflows for AI models. Optimize the computational performance of AI workflows for selected benchmark cases and develop prototype AI-based coupled forecast systems. Develop and publish draft integration plans for operationally-relevant capabilities of AI systems, allowing easy initialization, training, and visualization. Ensure coordination with community developers and application teams, consistent with code management framework, benchmarking, workflows, metrics, evaluation, and integration plans. Ensure that AI models are fully functional on selected computing platforms and provide properly documented services and products. 	100% inspection by the TPOC and COR.	Past Performance Review