

**National Oceanic and Atmospheric Administration
National Weather Service
Weather and Climate Computing Infrastructure Services (WCCIS)
Operational Analysis
FY 2009**

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Executive Summary

This report focuses on the operational state of the Weather and Climate Computing Infrastructure Services (WCCIS) program as of the end of the fiscal year 2009, and is based on guidance developed by the Department of Commerce. This annual operational analysis report is a status review of the program in terms of financial performance, customer results and performance measures. It details financial and technical performance against established baselines/requirements and evaluates customer results. The program continues to meet established cost, schedule and performance parameters and directly facilitates NOAA’s strategic goal to “Serve Society’s Needs for Weather and Water Information.”

This operational analysis (OA) is an annual, in-depth review of the program’s performance based on the following:

- Customer Results
- Strategic and Business Results

- Financial Performance
- Innovation

1.0 Customer Results

The WCCIS program is fully meeting the customer’s needs and the program is delivering the services intended. During 2009, the WCCIS program directly contributed to the NOAA/NWS mission and was critical in supporting the issuance of weather watches and warnings that protect both life and property. The value of this program in terms of lives saved and property protected mandates a continued need for this investment.

1.1 Customer Requirements and Costs

This investment supports the creation of weather forecasts and seasonal to inter annual climate forecasts in support of NOAA Climate and Weather and Water mission goals. Included in this investment is support for all of National Centers for Environmental Prediction (NCEP) centers:

- Climate Prediction Center (CPC) – assesses/forecasts the impact of short term climate variability and weather-related extreme events
- Storm Prediction Center (SPC) – provides accurate tornado and severe weather forecasts
- Aviation Weather Center (AWC) – provides aviation warnings and forecasts for hazardous flight conditions
- Tropical Prediction Center (TPC) – provides forecasts on the movement and strength of tropical storm weather systems
- Hydrometeorological Prediction Center (HPC) –provides quantitative precipitation analysis and forecasts products
- Ocean Prediction Center (OPC) – issues warnings and forecasts for coastal areas as well as for the Atlantic and Pacific Ocean (north of 30 degrees North)
- Space Weather Prediction Center (SWPC) – issues forecasts and warnings for space weather disturbances
- Environmental Modeling Center (EMC) – improves numerical weather guidance through applied research in data analysis, modeling and product development

The NWS' National Centers for Environmental Prediction (NCEP) headquarters is located in Camp Springs, MD. Remote centers are located in Boulder, CO, Kansas City, MO, Norman, OK and Miami, FL. NCEP is Where America's Climate and Weather Services Begin. Virtually all the meteorological data collected over the globe arrives at NCEP, where environmental scientists analyze this information and generate a wide variety of environmental guidance information.

1.2 Performance Measures

The current performance of the system is documented in the table below

Fiscal Year	Strategic Goal(s) Supported	Measurement Area	Measurement Category	Measurement Grouping	Measurement Indicator	Baseline
2009	3.1 Advance understanding and predict changes in the Earth's environment to	Customer Results	Timeliness and Responsiveness	Response Time	Help Desk Tickets- Percentage of IT system support help desk tickets resolved within	94% of help desk tickets resolved within 48 hours

Fiscal Year	Strategic Goal(s) Supported	Measurement Area	Measurement Category	Measurement Grouping	Measurement Indicator	Baseline
	meet America's economic, social, and environmental needs.				48 hours of issuance	
2009	3.1 Advance understanding and predict changes in the Earth's environment to meet America's economic, social, and environmental needs.	Mission and Business Results	Information and Technology Management	Information Systems Security	IT Security Patch Deployment - Percentage of required security patches deployed to supportable systems	97% of software patches deployed within 14 days of identified security need
2009	3.1 Advance understanding and predict changes in the Earth's environment to meet America's economic, social, and environmental needs.	Mission and Business Results	Information and Technology Management	IT Infrastructure Maintenance	Percentage of operational systems on cyclic replacement.	100% of operational systems
2009	3.1 Advance understanding and predict changes in the Earth's environment to meet America's economic, social, and environmental needs.	Processes and Activities	Quality	Errors	Improvement of Forecasts and Models - Push software releases/updates designated to ensure quality improvements for the forecaster and modeler community	4 software releases per year, with one release each quarter
2009	3.1 Advance understanding and predict changes in the Earth's environment to meet America's economic, social, and environmental needs.	Technology	Reliability and Availability	Availability	Networks Uptime - Percentage of time that system networks are up and available for all end users	Networks available 99.5% of the time

2.0 Strategic and Business Results

This investment is meeting the business needs of the organization, as demonstrated by the Performance Measures. These performance measures are derived from processes critical to the success of the agency mission. Furthermore, the accomplishment of these business processes directly facilitates NOAA's strategic goal to "Serve Society's Needs for Weather and Water Information." Specifically, the work performed ensures the viability of the infrastructure that carries mission-critical data to NWS forecasters responsible for issuing "Watches" and "Warnings" to the Public.

The high-speed network is based on dense wavelength-division multiplexing (DWDM) and Gig services. The high-speed network interconnects the following NOAA and partner facilities:

- The operational Central Computing System, Gaithersburg, MD

- The backup Central Computing System, Fairmont, WV
- The new NOAA facility currently under construction called NOAA Center for Weather and Climate Prediction (NCWCP), Riverdale, MD
- Mid-Atlantic Crossroads (MAX), University of Maryland, College Park, MD
- National Weather Service, Telecommunications Operations Center, Silver Spring, MD
- National Oceanic and Atmospheric Administration, Network Operations Center, Silver Spring, MD

The lower speed network is based on Multiprotocol Label Switching (MPLS) services. The lower-speed network interconnects the following NOAA and partner facilities to the high-speed network described above:

- Tropical Prediction Center/National Hurricane Center, Miami, FL
- Storm Prediction Center, Norman, OK
- Aviation Weather Center, Kansas City, MO
- Joint Agricultural Weather Facility, Washington, DC

2.1 WCCIS Helps to Achieve Strategic Goals

NCEP delivers national and global weather, water, climate and space weather guidance, forecasts, warnings and analyses to a broad range of users and partners. As a steady state operational investment, the NWS Weather and Climate Computing Infrastructure Services (WCCIS) organization provides system support and maintenance, administration and other user support services on a 24-hour basis for NCEP operational computing and communications systems. The organization ensures a secure and reliable system of systems infrastructure that comprises radar imaging, satellite imaging, model guidance, and sounding media used in the visualization and analysis of weather and climate information. Support is provided for all local and wide area networks, high-performance operational computing systems, servers and workstations, personal computers, and ancillary systems used within NCEP; visualization and graphics tools and applications; peripheral devices; and the necessary user interfaces for this infrastructure. The WCCIS serves as an IT utility with four core capability areas: (1) Production Management: Ensures 24x7 product generation monitoring and management (includes model guidance, web graphics, and text products); (2) Systems Integration: Ensures software systems needed by forecasters to visualize and analyze model guidance, radar and satellite information and other weather observation media are available and that these systems support the on-time generation of value-added forecast products; Ensures that NWS model guidance output is immediately available for use by the public on a nearly real-time basis; Designs and develops software applications, including web, database, decoders, text, graphics, and data monitoring products. Maintains scientific numeric modeling applications and associated scientific data bases. (3) Shared Infrastructure Services: Ensures an IT infrastructure that adequately supports the production management and system integration functions (e.g., WAN/LAN, operating software, enterprise data repository, hardware platform management). Ensures the security of the NCEP information and computing environment; Administers servers, workstations, and network devices on a 24-hour basis; and (4) Management: Supports project management tools for the effective execution of investments in support of NCEP and NWS objectives; Ensures that acquired infrastructure meets a criteria that includes cost effectiveness (e.g. best value to the government for performance); flexibility and scalability; and consistent alignment with the NWS

Enterprise Architecture blueprint; Ensures NCEP managers have the systems necessary to efficiently and effectively direct financial and human resources in a manner consistent with the NWS mission and the public's interest. The first three of these capability areas are supported through a combined team of Government FTE and contractor personnel. The use of combined FTE and contractor teams allows NCEP to provide the needed capability at the best balance of cost and benefit. In any given capability area, one or more than one contractor may be leveraged to provide the needed services. The management capability area is supported by Government FTE resources. Consequently, WCCIS facilitates the technical environment used to make operational the numerical weather and climate prediction models, to disseminate the output of these models and to create and maintain the meteorological applications necessary to visualize and analyze this output. The visualization and analysis of output results is the knowledge necessary to create the weather and climate forecasts, guidance, watches, warnings and analyses at the NCEP service centers. The operational support provided by the increased WCCIS investment will fulfill requirements for cyclical replacement of systems. Additionally, the WCCIS provides programmatic support to NCEP in the following areas: (a) the acquisition, development, and use of special tools for monitoring information systems; (b) the availability of training and documentation for current and future information processing systems; (c) the review and evaluation of concept studies which guide NCEP in the development, implementation, and operation of information systems; (d) the preparation of requirements initiatives and other information resources management documents necessary for the acquisition and administration of software and hardware systems; (e) system acquisition and contract management; (f) and the recommendation, formulation, and preparation of policies and procedures needed to provide system security, control, and accountability as required by NCEP and/or Federal rules and regulations.

2.2 Business Results

WCCIS provides the infrastructure for NCEP and NOAA partners to create and disseminate weather, climate and other environmental products. These products support numerous and diverse business and national needs. A small subset of these products include hurricane and severe weather products used by emergency managers, aviation products used by the aviation industry, space weather products used by DOD and commercial businesses, climate products used by agricultural industries, water products used by operational forecasting centers, ocean products used by commercial shipping industries and many other products.

2.2.1 Program Management and Controls

- Financial performance is typically subjected to a periodic review for reasonableness and cost efficiency. Monthly budget reviews are held with the program manager, CORs and contract managers to ensure contracts are within cost and on schedule. Monthly reports from contractors are required to ensure the Government has the information it needs to evaluate cost performance. A detailed review of work and priorities is undertaken if cost is significantly above base lined values. Also, any necessary corrective actions are also identified and implemented. Weekly budget meetings were conducted by senior staff to oversee and manage the expenditure of funds for IT hardware and software investments. A NCEP integrated IT spending plan was formulated at the beginning of the year and was executed was reported on by the NCEP centers on a monthly basis to NCO senior level management. Monthly Status reports prepared by Project Manager - each report contains

a detailed summary of achievements by each individual. Monthly Invoices reviewed for accuracy. A checklist of items is reviewed to verify charges such as labor costs, support staff, and miscellaneous ODC charges. COTRs receive a courtesy copy of the monthly invoices which COTRs review to determine if hours charged are within range, etc. COTRs notify contracting officials when the invoice is accepted, but they are responsible for authorizing payment.

2.2.2 Monitoring Cost, Schedule and Performance

Cost – The COTRs monitor monthly invoices to ensure they correspond to the baseline. Contract modifications are reviewed by the COTR, Program Manager and Contracting Officer prior to implementation and weekly during routine status meetings.

Schedule – These contracts provide for developmental and operational mode support (7X24X365). Service delivery is non-stop except during planned upgrades or unscheduled outages. Daily operational status meetings are conducted at NCEP/NCO and attended by Government and contractor personnel engaged in Production Suite support. Weekly status meetings are conducted by NCEP/NCO with participation by NCEP, facility managers and others (such as communications support personnel) as required.

Performance – Program status (cost, schedule and performance) is summarized on monthly NCO Quad charts. Performance-based measurements such as on-time product generation, system reliability and run time variability are verified daily.

2.3 Reviews

FY09-11 funding requests covered in this investment were reviewed as part of the ongoing NOAA PPBES process and by the NITRB and the NWS CFO, as well as by the NOAA programs this investment supports.

2.4 Security

The WCCIS systems were accredited under requirements spelled out in DOC Information Technology (IT) security program (04/30/07) that are based on OMB and NIST guidance. System Security Plans, Risk Assessments, and Contingency Plans were certified and approved for WCCIS in August 2009. Annual contingency testing and FISMA self assessment were completed August 2009. Management, operational, and technical security controls are adequate to ensure the confidentiality, integrity and availability of information.

2.5 Performance Measures

The current performance of the system is documented in the table below

Performance Measures

Measurement Area	Indicator	2009 Baseline	Calendar Year 2009	Comments
Customer Results	Help-desk Tickets Closed within 48 Hours	90%	92%	Hardware delivery time makes achieving 48 hour turn-around difficult to achieve
Mission and Business Results	Security Patch Deployment within 14 Days	96%	98%	Exceeds baseline in this critical security element
Mission and Business Results	Systems Under IT Lifecycle Management	75%	100%	Includes all network systems and operational IT systems
Processes and Activities	Improvement of Forecasts and Models - Push software releases/updates designated to ensure quality improvements for the forecaster and modeler community	quarterly	quarterly	4 software releases per year, with one release each quarter
Technology	NCEP Network Availability	99.5%	99.5%	WAN and LAN

2.6 Other

3.0 Financial Performance

3.1 Current Performance vs. Baseline

The annual IT Expenditure Report submitted to and approved by the NWS OCIO provides a primary baseline for the performance measurement for this investment. WCCIS financial performance for 2009 falls within budget authority and planned costs. Total planned 2009 expenditures were \$5,217,000 and \$5,217,000 was spent. The two primary contracts incorporated into the WCCIS are with Perot and Chugach World Services. All two contracts provide support services to NCEP. A large number of Government personnel also participated in this program providing technical management, technical direction and acquisition authority. A considerable portion of

the budget is devoted to systems (hardware, software, maintenance, integration services) acquisition.

3.2 Performance Measures

Monthly updates are provided by the COTRs to NCO senior management describing the ongoing status of schedule and cost performance as well as identifying issues and project risks.

3.3 Cost Benefit Analysis

3.4 Financial Performance Review

Financial performance is typically subjected to a periodic review for reasonableness and cost efficiency. Monthly budget reviews are held with the program manager, CORs and contract managers to ensure contracts are within cost and on schedule. Monthly reports from contractors are required to ensure the Government has the information it needs to evaluate cost performance. A detailed review of work and priorities is undertaken if cost is significantly above base lined values. Also, any necessary corrective actions are also identified and implemented.

4.0 Innovation to Meet Future Customer Needs

A significant change in the delivery of services was addressed. Working in close cooperation with NOAA, NCEP developed a Statement of Need and conducted a full and open acquisition to allow communication suppliers to develop better mechanisms to meet agency requirements. As a result, a new contract was established that will better meet customer requirements and reduce costs to the Government. The winning contractor used new technology to devise an innovative network configuration that can serve NCEP's needs into the future. Specifically, NCEP has tied its MPLS network to reach its remote service centers (located in Miami, FL, Kansas City, MO, Boulder, CO and Norman, OK) rather than relying on less reliable individually leased lines. Within NCEP the contract employs DWDM technology (wavelength-division multiplexing is a technology which multiplexes multiple optical carrier signals on a single optical fiber by using different wavelengths (colors) of laser light to carry different signals. This allows for a multiplication in capacity, in addition to making it possible to perform bidirectional communications over one strand of fiber) to provide expandable service at the lowest possible cost.

Additionally, resources have been applied to the planning and execution of the relocation of four of NCEP centers' personnel and equipment to a new building in College Park MD; the planning of the transition of the NCEP NAWIPS application to the NWS forecasting application standard, AWIPS; and support of the upgrade of the NCEP's primary and backup operational supercomputers from an IBM Power5 to Power6 configuration.

4.1 Number and Types of Users

The IT infrastructure in this supports portions of NCEP's nine centers. It also supports provides the networking infrastructure for the NCEP operational supercomputing environment, as well as all the support and maintenance activities for such services as LINUX and Windows administration support, Directory Services, Compute Farm processing and security support, as well as the developmental and operational support of the NAWIPS application and Model Web Analysis processes.

4.2 Other

4.4 Funding Levels

Recent trends in government spending indicate that agencies should not expect significant increases in their budgets. This, coupled with the requirement to accommodate more users and incorporate evolving technology, will force the program to find efficiencies and to do more with the same amount of resources.

Project to Address Challenge: *Continuing to provide first class support to the NCEP center's mission and goals and providing 24X7X365 support for NCEP operational environment.*

The amount of data that is requested for ingestion into the NCEP operational environment as well as the operational products being requested by the user community is growing at a tremendous rate. This situation is putting a great deal of pressure on the NCEP IT infrastructure to stay ahead of the future requirements. Additionally, funding requests have been made through the FY12 PPBES process for: (1) expansion of the networking capabilities to support projected data requirements for the next generation satellite systems i.e. GOES-R and NPOESS (2) development of an alternate processing site to support critical failover of NCEP IT infrastructure.