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U. S. DEPARTMENT OF COMMERCE

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Mr. Chairman and members of the Committee, I am Mark Paese, Director of Maintenance, Logistics, and Acquisition Services for the National Weather Service (NWS), of the National Oceanic and Atmospheric Administration (NOAA) within the Department of Commerce. I am pleased to be here today to discuss NOAA Weather Radio All Hazards (NWR). I will outline how our system currently works and our vision for the future.

Introduction and background

Known as the "Voice of the National Weather Service," NOAA Weather Radio All Hazards is provided as a public service. The NOAA Weather Radio All Hazards (NWR) network includes 935 transmitters, covering all 50 states, adjacent coastal waters, Puerto Rico, the U.S. Virgin Islands, and the U.S. Pacific Territories. The NWR nationwide network of radio stations provides coverage to over 97% of the population. This extensive system of radio transmitters allows the National Weather Service to transmit routine programming containing observations and forecasts, with this routine programming interrupted to broadcast alerts and warnings of severe weather and other hazardous information 24 hours a day. Each transmitter is automatically fed information from the local NWS weather office typically via telephone lines, while some more remote locations use microwave transmissions. It takes only seconds from when the forecaster hits the send button until the message is transmitted on the network. NWR requires a specific radio receiver or scanner, readily available at most electronic stores, capable of receiving the broadcast. This NWS direct broadcast includes special codes identifying alerts and warnings, with many receivers equipped to monitor these codes.

NWR receivers should be as common as smoke detectors especially given their capability to wake people in the middle of the night when hazardous conditions threaten. In addition to the traditional weather radio that many are familiar with, NOAA Weather Radio All Hazards receivers can be integrated into devices to turn on alarms, lights, bed shakers, and other equipment especially useful for the hearing impaired community and those with special needs.

Agreements with local, state, and federal emergency managers and first responders, and working with the Federal Communications Commission's (FCC's) Emergency Alert System, allow NWR to act as a direct, official source for comprehensive weather and emergency information — an

"all hazards" warning system. In June 2004, NOAA and the Department of Homeland Security signed an agreement allowing DHS to send critical all-hazards alerts and warning directly through the NOAA Weather Radio All Hazards network, further leveraging NWR as a backbone of a national emergency alert and warning system. With this agreement in place, NWR is the only Federal government warning system that can be targeted to specific areas to deliver a message from the President. NOAA Weather Radio All Hazards also broadcasts warning and post-event information for all types of hazards — both natural, such as earthquakes, tsunamis, hurricanes, and volcano activity, and man made, such as chemical releases or oil spills. Many emergency dispatch centers, institutional (day care, elder care, hospitals, schools, etc), building and manufacturing security operations centers monitor NWR for emergency warning information as a public safety tool.

NWS warnings are carefully developed to ensure critical information is conveyed as directly as possible, regardless of the transmission on NWR or any of the other dissemination systems. Each warning contains several components, which are included based on NWS discussions with users, including private sector, emergency managers, and the public. We also worked with sociologists and others to ensure the information in our messages is worded as clearly as possible for the public to understand what to do. The messages include appropriate "call to action" statements advising people of actions to take (seek shelter indoors, avoid crossing high water, etc.). The messages also contain critical event and geographic information for other dissemination and computer systems to decode and retransmit. For example, the Emergency Alert System (EAS) operated under FCC rules is automatically activated by NWR broadcasts of warnings.

Upcoming Challenges for NOAA Weather Radio All Hazards

While our current network works well, NWR has some challenges. We need to ensure a fully functioning network through continued maintenance, upgrading older solid state transmitters, public education and awareness about the capabilities of the network, installing backup power at locations without this capability to ensure continued service when commercial power fails, and upgrading the telecommunication feed from the NWS office to the transmitter.

The number of NWR transmitters has more than doubled in the past decade. Today, 935 transmitters are in operation, with three more scheduled to come on line by the end of the September. NWR intends to upgrade older transmitters to new technology standards. These upgrades to 400 transmitters will be completed by FY 2011. We will be increasing coverage to 100% for areas of the nation particularly vulnerable to severe weather and tornadoes, such as tornado alley. Current projections call for meeting this goal in 2007. We also plan to provide backup power to all NWR stations by 2012, which includes about 440 currently without that capability. We have a plan to provide a more reliable and robust communication feed directly to the transmitters. Converting to this new process should be complete in FY 2009.

Next Generation Warning System

Existing dissemination systems were developed to meet user requirements for information. Any future warning system must go beyond direct radio broadcasts and include visual forms of information readily available through advancing technology (e.g., cell phones, Personal Digital Assistants, etc). Future systems should also improve on existing geo-targeting/referencing to be able to reach people where they are — home, work, or on the move — and to reduce warnings to people who are not in the hazardous zones.

Hazardous weather and water forecasts, warnings, and other hazards information are delivered as quickly as possible using "push" and "pull" dissemination technologies, which respectively send information and allow information to be retrieved. "Push" occurs when messages and information are broadcast or sent to the recipient (e.g. a radio is push technology). "Pull" technology includes mechanisms in which information is transmitted in response to a request from a user (e.g. using Internet browsers to request information).

Push (send) capabilities distribute scheduled and unscheduled warnings, forecasts, and information using a predetermined priority. Warnings are given the highest priority. For example, NOAA Weather Radio All Hazards is a "push" technology; it provides 24-hour access to weather information and other all-hazards information. NWR is one component of the existing NWS dissemination infrastructure, which also includes NOAA Weather Wire Service, Emergency Managers Weather Information Network or EMWIN, Family of Services, and NOAAPort. Pull (retrieve) capabilities make warnings, forecasts, and information available for people to acquire as needed. The Internet is our primary use of a "pull" technology; it enables users to retrieve environmental information as needed from NOAA web pages and other locations.

Recognizing the rapid advances in information technologies, the Department of Homeland Security and NOAA co-chair an effort to develop a government-wide plan for the Integrated Public Alert and Warning System (IPAWS). The government's ability to effectively warn the public of danger will be greatly improved by implementing IPAWS. Public safety is a fundamental responsibility of federal, state and local governments. Public warnings save lives by informing, reducing fear, recommending action, and assisting emergency managers. The Administration is formulating an overall plan for emergency broadcasts and warning systems. There are many warning systems in place across the country, ranging from local phone warning capability, local sirens, paging systems, Internet notification, to national level-warning programs, including the NOAA Weather Radio All Hazards. Each of these systems by themselves can reach the public directly, but each has limitations. An integrated system employing all of these capabilities will be far better than any single system.

In FY 2004, NOAA began developing a capability to reduce the time it takes for an emergency manager to input a hazard warning into NOAA Weather Radio All Hazards and reduce the possibility of transcription errors. This system, known as HazCollect, will reduce the amount of

time it takes to input a message into the system — from seven minutes to less than two minutes. This capability will allow emergency managers direct access to Emergency Alert System (EAS) via NOAA Weather Radio All Hazards, and is expected to be fully operational in FY 2006.

A Vision for the Future

Our Vision - Reach each person in the Nation. NOAA's vision is to ensure access and delivery of environmental warnings, forecasts, and information to every person in the United States. This dissemination system should provide climate, water, weather and other hazard information the public wants, when they want it, where they want it, how they want it, and should ensure persons at risk receive timely alerts. Warnings do not become effective until those in harm's way hear the warning and take appropriate action. Advanced, universally accessible dissemination technologies are necessary to deliver environmental information for the protection of life and property. Universal access depends upon partnerships within communities to increase awareness and coverage.

To achieve this vision, it is essential to use emerging technologies to improve communication performance measured by operational availability, latency, cost effectiveness, and most importantly, customer satisfaction. We need to make warnings and information available, via convenient methods and formats (e.g., industry standards such as GIS, XML and Real Simple Syndication (RSS)), to as many individuals as possible. We are working now to make this happen.

The emergency information community and the government must work together to develop a dissemination program that is integrated and adaptable to change. The Common Alerting Protocol (CAP), recently agreed upon by the emergency management community, is one example of how the collaboration of the emergency management community and the government has increased the effectiveness of the alerting system. HazCollect will use the CAP format for emergency messages.

To be most effective, emergency information must penetrate all technologies — radio, TV, satellite radio, satellite TV, fixed telephony, mobile telephony and the Internet, including voice over Internet provider (VOIP), in addition to system-specific receivers like NWR — and recognize the limitations of each. No single technology or system will reach all end-users. The most critical information must be "pushed" to the end users.

We must account for a broad spectrum of users, from those who want simple access to basic information to those who want customized access in order to extract information to meet their needs and, finally, those who want to download data in bulk.

Current and future technologies must be leveraged to combine common functions into streamlined dissemination process. Because many push systems share common features, current and future technology advances will facilitate merging the functionality of the various systems while fulfilling their individual requirements. A properly planned network will yield reliable,

and cost effective services.

The NWS depends on close working relationships with media and vendor groups to disseminate NWS information, especially warnings and forecasts, and must consider the essential role of its partners in dissemination. We will work more closely with industry leaders so NWS will be able to reach the public through such target technologies as satellite radio, satellite television, cable television, broadcast television, mobile/cellular telephony, fixed telephony (land lines), commercial radio, and Internet (including VOIP).

Flexibility must be "built in" to formats, standards and protocols used to disseminate information. NWS and the entire all-hazards community should adopt policies to put themselves in a position to efficiently modify the formats and protocols used for dissemination as industry standards evolve and as new technologies become available. For example, the Internet text format known as Extensible Markup Language (XML) is necessary to support more sophisticated and automated data discovery, selection and retrieval mechanisms. XML is a simple, very flexible text format originally designed to meet the challenges of large-scale electronic publishing. XML is also playing an increasingly important role in the exchange of a wide variety of data on the Internet and elsewhere. NWS will also need to respond to the growing popularity of GIS formats.

We need to improve performance to keep pace with the need for more data and information in various formats by maintaining adequate processing speed, appropriate latency, and cost effectiveness. As science and technology continue to advance, more data sets, and more information will become available. Data compression techniques will allow more information to be transmitted by fully exploiting the communications infrastructure.

Finally, we need to investigate emerging technologies to fulfill dissemination requirements beyond the next few years. Technologies such as software-defined radio (SDR)/cognitive radio would allow the user more precision and flexibility in deciding which information to hear. Cognitive radio knows where it is, what services are available, and what services interest the user. Wi-Fi (wireless fidelity) and voice over wireless LAN (VoWLAN) provide an expanded opportunity to reach a more mobile public.

Conclusion

NOAA Weather Radio All Hazards is a proven dissemination network that has save lives. We will continue to exploit our existing technology. However, technological advances will continue to drive how we can best communicate critical information to an ever more mobile and technology equipped public. It is our responsibility to ensure critical emergency information is available and can reach the people as easily and conveniently as possible. We will continue to work to achieve our vision to reach every person in our great Nation.