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DEVELOPING THE NATIONAL CLIMATE SERVICE

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AND
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Mr. Chairman and Members of the Committee, thank you for this opportunity to appear and present a stakeholder perspective regarding formation of a National Climate Service. My name is David Behar. I am the Deputy to the Assistant General Manager at the San Francisco Public Utilities Commission (SFPUC). The SFPUC is the sixth largest municipal water provider in the U.S. and manages water and power facilities that serve 2.5 million Bay Area residents, as well as wastewater and stormwater facilities in San Francisco. For the City and County of San Francisco, I also am helping develop a City-wide Climate Adaptation Plan encompassing all City departments facing climate change-related vulnerabilities, similar to programs underway in New York City, Chicago, and other cities across the U.S.

I also serve as Staff Chair of the Water Utility Climate Alliance (WUCA), a consortium of eight water utilities dedicated to providing leadership and collaboration on climate change issues affecting drinking water utilities by improving research, developing adaptation strategies, and creating mitigation approaches to reduce greenhouse gas emissions. WUCA is chaired by SFPUC General Manager Ed Harrington and includes some of the largest water providers in the nation serving 36 million Americans. WUCA members include Denver Water, the Metropolitan Water District of Southern California, New York City Department of Environmental Protection, Portland Water Bureau, San Diego County Water Authority, Seattle Public Utilities and the Southern Nevada Water Authority. In my spare time, I serve on the Board of Directors of the oldest municipal water agency in California, Marin Municipal Water District (MMWD), a position to which I was elected in 2006.

The Stakes for Water and Wastewater Utilities

According to two recent EPA reports to Congress, water and wastewater utilities in the U.S. will need to invest some $480,000,000,000 over the next twenty years to keep our systems in a state of good repair[1]. This figure does not include climate change response,

but we know those investments will be made as our climate is changing, and the life cycle of those assets -- including transmission lines, treatment plants, outfalls, urban drainage systems, dams -- is measured in periods from several decades to over a century. This is the same timeframe for climate change projections that are commonly presented in the scientific literature. But many of today's climate projections are so uncertain as to be unusable as we weigh how best to spend that $480 billion. We need information on a host of climate parameters for which past hydrology is no longer an indication of future conditions. These include temperature, precipitation, changes in the mix of precipitation falling as rain and snow, changes in runoff timing, changes in demand, drought duration and frequency, extreme events including storms and heat waves, and sea level rise. The models often don't simulate important aspects of climate successfully and don't agree with one another in terms of the scale of expected change and in some cases even the direction of change. A key issue is that the global climate models don't produce data at the temporal and spatial scale that we need to make decisions – that is, at the watershed and the sewershed levels. Of course, compounding the difficulty is the fact that, in the absence of national and international agreements on curbing greenhouse gas emissions, we face a multitude of emissions scenarios as well.

Water utilities, and others planning a response to climate change, are handcuffed by uncertainty – but we're not paralyzed. The challenge lies in taking steps today that make sense before factoring in the effects of climate change, but that also create resiliency to climate change in whatever form that change takes in the future. These we refer to as "no regrets" strategies. For many utilities but particularly in the growing but arid west, aggressive water conservation strategies have taken center stage, as are projects that diversify supply to include drought-resistant sources such as recycled water and

[1] "Drinking Water Infrastructure Needs Survey and Assessment: Third Report to Congress." USEPA Office of Water, 2005. "Clean Watersheds Needs Survey 2004: Report to Congress." USEPA, January 2008.

conjunctive use groundwater programs. In San Francisco, for example, due to a combination of these programs, since the 1970's we have reduced our consumption of Hetch Hetchy water by 27% while population increased 13%. In Southern California, the Metropolitan Water District, a WUCA member and the largest municipal water agency in the nation, has developed over the past 20 years 600,000 acre feet of conservation, 250,000 acre feet of water recycling, and over 100,000 acre feet of groundwater recovery and augmentation, while increasing local storage capacity by a factor of fourteen. Even as population has grown by 3.5 million, total water use in MWD's service area has actually declined.

But we know such strategies alone may not allow us to escape the projected effects of climate change on our water systems. And because it can take decades to plan, fund, design,
permit, and construct new or renewed projects, we are thinking today about our infrastructure needs of 2030, 2050, and beyond.

"Actionable Science"

When it comes to climate science, water utilities are looking for what WUCA utilities call *"actionable science."* We define actionable science as

> Data, analysis, and forecasts that are sufficiently predictive, accepted, and understandable to support decision-making, including capital investment decision-making.

We've come up with this term to convey our understanding that perfect information on climate change is neither available today nor likely to be available in the future, but that over time, as the threats climate change poses to our systems grow more real, predicting those effects with greater certainty is non-discretionary. We're not yet at a level at which

climate change projections can drive climate change adaptation. This makes us nervous – and it's not terribly comforting for our ratepayers either.

At least two things must happen from our perspective in the short term to provide society with some reassurance at this early but ominous phase of climate change adaptation planning. First, we need increased investment in climate science that will, as swiftly as possible, provide local entities of all stripes with intelligence about the future that is of a quality and scale that meets the definition of "actionable." Second, partnerships must be built between local and regional entities whose systems are vulnerable to the effects of climate change and the research community (including social scientists, economists, and legal researchers), policymakers, and others to assist those entities in understanding the range of futures they face and provide decision support in the face of less than perfect information.

Accessible Science: The National Climate Service

Today's hearing, on the subject of a National Climate Service, lies along the path, we hope, to providing *"accessible science"* to those who are assessing their vulnerability to climate change – and planning their adaptation response. These science "users" include water utilities, local governments, public health officials, parks and wildlife managers, coastal zone agencies, urban planners, farmers, homeowners, NGOs and other public and private sector interests.

I've seen from my own personal experience both at the SFPUC and as a board member at MMWD how difficult it can be to access sound climate information. Even a sophisticated water agency has difficulty finding answers to the most basic questions and accessing data compatible with their systems models. University researchers are busy teaching and publishing, agency staff in Washington D.C. are unknown to us, and those who we call "users" of climate information are often left to scramble haphazardly to

collect tidbits of information from a multiplicity of sources as we seek to create resilient communities ready to adapt to the effects of climate change.

We commend the Climate Working Group of NOAA's Science Advisory Board for its thoughtful and focused report "Options for Developing a National Climate Service" (February 26, 2009). The report identified "Key Attributes" of a National Climate Service worth citing here:

> The Service will achieve its mission by promoting active interaction among users, researchers, and information providers. The Service will be user-centric, by ensuring that scientifically-based information is accessible and commensurate with users' needs and limitations. (p. 5)

We agree.

Several organizational options were outlined in this report and we concur with those who have suggested that each option contains elements of what a future NCS should look like.

In our view, a powerful and responsive NCS should be like a wheel, with a hub (headquarters) and spokes (regional centers). To leverage the metaphor a bit further: without the hub, the wheels come off. And at the end of the spokes is where the rubber hits the road.

An NCS, we believe, requires the support of a lead federal agency with budgetary authority and responsibility for critically important science and data management functions. It seems clear that NOAA, with its broad and deep expertise and responsibilities in these areas, is well positioned to assume this role. In addition, oversight, as well as coordination and cooperation between the lead and other federal agencies such as EPA, USGS, NASA, USDA, and others is critically important. We need the federal family to come together to create a cohesive federal structure that supports the NCS mission. Hopefully, lessons have been learned from the example of the U.S. Climate Change Science Program, which has been widely criticized for failing to

achieve a consistent and transparent vision across the federal enterprise and for doing a poor job of engaging with stakeholders.

Stakeholders and researchers alike strongly believe that the success of an NCS mission depends substantially on creating a robust and geographically distributed regional presence. Such a presence would feature engaged, multidisciplinary teams of physical scientists, social scientists, communications specialists, and modelers *in the communities facing adaptation challenges*. These "boots on the ground" experts understand their region and its unique conditions and are active participants in an ongoing and iterative conversation with climate information users that builds a familiarity that informs both sides. They aren't paratroopers, either – they are a part of the communities they serve.

For the user, we need an accessible go-to entity we can count on to help us sift through the ever-changing science, gather the raw data, benchmark against the experience of others, educate our publics, and work with us in assessing our vulnerabilities. In addition, all these players together will organically develop research partnerships with a responsive university community, bringing a "grass-roots science" approach that can complement the "Big Science" pursuits in the area of climate modeling and atmospheric and oceans science that underpin our understanding of global climate change. All this work should be part of a set of ongoing relationships, born of a shared mission that is at the heart of the term "service," between climate scientists and engineers, economists and rate administrators, oceanographers and urban planners, elected officials and agency managers.

These conversations are far from easy. I have attended workshop after workshop with climate scientists and decision makers that are intended, like an arranged marriage, to create an advantageous union. Usually the climate scientists present their research. Then comes an uncomfortable silence. Usually one of the climate scientists who did not present makes a comment. Then we move on to the next presentation. At one recent workshop track I forced myself to announce that I didn't understand the last speaker's

presentation, but it seemed important that at some point I do. It was like a great weight had been lifted from my fellow non-scientists in the room.

The greatest advances in multi-disciplinary understanding on the subject of climate change simply don't happen in one-off workshops. They take practice. They happen over time and are based on sustained relationships.

This decentralized, user-centric approach is far from unprecedented in the federal government. Closest to home, the NOAA-funded Regional Integrated Sciences and Assessments (RISA) program offers a notable demonstration model. These university-based partnerships, with very small but essential core funding from NOAA, have done outstanding work in the Southwest, Colorado Basin, Pacific Northwest, California, and elsewhere. They have benefited many stakeholders that have had the good fortune to work with them and they are today at the heart of both general public and stakeholder education about climate change adaptation effects for water utilities and others. They bring the multidisciplinary conversations and a science-meets-policy-meets-decision making focus that we need. They are already the most useful spokes of our wheel.

A project Denver Water, another of WUCA's member utilities, is helping lead illustrates the power of the RISA model and how its expansion could pay dividends across the United States. To understand climate science and determine potential impacts to local hydrology, the water providers of the Front Range urban area of Colorado are collaborating on a cooperative regional study in partnership with the local RISA, the Western Water Assessment, led by the estimable Brad Udall, along with the National Center for Atmospheric Research, Water Research Foundation and the state of Colorado. The participating water providers supply water to nearly two-thirds of the population of the state of Colorado. Working with local researchers and climate change experts, the local RISA helped provide educational sessions, documentation, direction, and access to experts to help the water users understand climate change science and modeling, understand and obtain downscaled global climate model projections, convert the

projections into sets of planning scenarios, and assist with setting up local hydrology models to convert the global climate model projections into projected impacts on local streamflow. Being a regional entity, the local RISA was familiar with the regional climate projections, researchers, water systems, and water utilities. A federal climate agency without that regional connection and approach probably would not have been able or available to support a regional effort like this, making it much more difficult for water utilities to make use of climate science. The Front Range cooperative effort is today leveraging local cooperation with local *service* provided by a locally-based federal climate science boundary organization, the RISA.

The RISA program is not perfect, however, and expanding it exponentially will have to be done with care. For example, each RISA today has a different mission (and even a different name). Greater uniformity and clarity of mission within the program would make sense if the program model were to be expanded – while maintaining the flexibility of each office to respond to differing local and regional conditions.

In addition, expansion of the RISA program alone won't be sufficient. Data management, storage, and access depend significantly on centralized facilities that regional adaptation programs must have the ability to access. In addition, local relationships with regional arms of federal regulatory, land management, and operational agencies such as USGS, EPA, Bureau of Reclamation, USDA, the Fish and Wildlife Service, and the Army Corps will continue, and adaptation efforts must account for the need to work with these agencies both in Washington and in the field and regional offices.

Nonetheless, with an annual budget of the nine RISA programs at a mere $5 million total, their track record argues for inclusion of the model they have field tested in any NCS program. Add a zero (or two) to that budget figure, expand the geographic scope, broaden and rationalize the mission, and you have the basis of a vigorous regional element of a National Climate Service.

Conclusion

To conclude and emphasize my most important points:

- Drinking water utilities will invest hundreds of billions of dollars in the near term in our assets – and those investments must be informed by climate change science and services delivered by an NCS;

- An NCS should have a user-centric mission that emphasizes providing actionable, accessible science to stakeholders;

- An NCS requires sufficient federal funding provided by a lead federal entity with active participation and coordination across the federal enterprise, but its most important work should take place through establishment of a multidisciplinary, geographically distributed presence in the communities in which adaptation must take place;

- The RISA program provides a model to build upon for successful service delivery.

Thank you again for the opportunity to appear today, Mr. Chairman and Members of the Committee, and I would be happy to answer any questions you may have.

APPENDIX

CLIMATE PRODUCTS AND SERVICES

In response to specific questions from the Chairman regarding various products and services utilized by the SFPUC in our operations, the following was prepared by Dr. Bruce McGurk, Operations Manager, Hetch Hetchy Water and Power, San Francisco Public Utilities Commission.

Please discuss the climate services and products the San Francisco Public Utilities Commission utilizes; how this service is delivered; and if there is a price associated with this service. Please also discuss and provide examples of how these climate services and products affect operations and management decisions (and) is there a need for a better organization for how these services are delivered.

The SFPUC's Hetch Hetchy Water and Power division, our upcountry system that provides 85% of total water supply, depends on real-time streamflow and reservoir elevation/storage data from USGS to monitor and operate our project and monitor other river systems around us. We pay 100% for 16 USGS gages (at an annual cost of $320,000) because cooperator co-funding at USGS has been cut drastically. We have re-occupied gages that USGS has cut out (Middle and South Forks Tuolumne River) because we need the data for current operations and future climate change research. The cutbacks that cause these and other high-elevation gages to be discontinued make it much more difficult to monitor runoff timing shifts and quantity, the exact issues that we need to know about to manage our water supply and detect the rate of global warming. An additional 5-8 real-time stream and reservoir gages are operated in the Bay Area and funded exclusively by the SFPUC. They are used for release compliance and system monitoring.

We also use a variety of products from NOAA and the National Weather Service. We routinely use the Climate Prediction Center's 6-10 and 8-14 day forecasts, as well as the one month and 3-month forecasts. NWS forecasters provide valuable advice with the Area Forecast Discussions and Zone forecasts. The NWS California-Nevada River Forecast Center provides invaluable information with their Advanced Hydrologic Prediction Services and their daily modeling of flows into our reservoirs and others across the state. They combine historical and weather forecast data to show likely runoff from our basins for the next week to 10 days, and this is very important for reservoir operations. We cooperate with the CNRFC and supply them with climate and flow data that we collect so that they can do the best job possible with their models.

We use a wide array of other climate and snowpack information presented by the California Data Exchange Center (CDEC) and collected by cooperators all across California. We depend on snow courses, snow sensors, and other climate data that are

hosted by CDEC. Data from the USDA/NRCS SNOTEL sites are also included in our runoff forecast models. We compare our runoff forecasts with NRCS and State-generated forecasts.

We have routine interaction with the NOAA Western Regional Climate Center in Reno, and they operate one of the sites that produces critical data for our runoff forecast system.

The current branches of NOAA/NWS are not focused on providing data to help with climate change inquiries. They are focused on their monitoring and short-term forecasting missions, and as a result it can be hard to find appropriate information that has long enough record, has the necessary metadata, and is searchable. An NCS that worked with NWS in regional centers and provided the data and a focus for climate change analysis would be a big improvement. This new function would address the current difficulty in partitioning the routine monitoring and forecasting from the effort to provide climate scientists and adaptation planners with the specialized products that are needed to build models using the past data and also produce data that are representative of the climate in the future.