John P. Holdren
Remarks for World Water Day – 3/21/2014
US State Department – 1:00 PM

-- AS DELIVERED --

- Thank you, Kerri-Ann, it's a great pleasure to be here with you, Undersecretary Novelli, and Ambassador Hattie Babbitt; and it's a pleasure to bring greetings from President Obama to all of the participants. This is an exciting and important event, and I applaud everyone who came together to make it possible.

- The theme of today's meeting is the global water challenge and the role that innovative technologies can play in addressing water and sanitation issues. I'd like to spend a few minutes on three points that provide some context for these efforts:
    - First - the relationship of water stress and climate change;
    - Second - the water-energy-nexus, which could also be understood more broadly as the water-energy-agriculture-climate nexus; and
    - Third - how sustainable water resource management and innovative science and technology can really make a difference in these areas.

- Climate change is exacerbating many of the challenges related to water, in the United States and around the world, as Undersecretary Novelli noted.

- Here I will mention six specific aspects of climate change that have significant impacts on the natural cycle that governs the global supply of freshwater. These impacts vary by region, of course, but in general, in a warming world, we can expect:
    - Shifting circulation patterns, which together with associated uneven warming and associated uneven evaporation, alter the geographic distribution of precipitation;
    - More moisture in the atmosphere overall, leading to an increase in the fraction of precipitation that occurs in heavy downpours, which increases losses to storm runoff;

- More mountain precipitation falling as rain rather than as snow, reducing snowpack and, thus, runoff through summer and fall;
- Earlier melting of snowpack in the spring, also leading to reduced runoff through summer and fall;
- The temperature-induced shrinkage of the mountain glaciers that feed many of the world's rivers; and, finally
- Increased loss of water to evaporation from soil, lakes, reservoirs, and rivers, as a result of higher temperatures.

- These impacts impose significant stresses on the water system, including slower recharge rates for groundwater tables, reductions in available surface water for human use, increased intensity of flood events in some regions and intensified droughts in others, and reductions in water quality that accompany many of these phenomena.

- In short, climate change impacts are projected to create a "triple-whammy" effect on the water system: first, not enough water, in some regions and some times of the year, even as global-average precipitation increases; second, too much water, in some regions and some times of the year, in the form of increasingly damaging floods; and, third, substantial water-quality and sanitation challenges that further affect freshwater supply.

- And that's just the supply side! Now let's talk about demand.

- As demand for water rises, its major use categories compete for a declining supply within any given water region. The major categories include agricultural uses (mainly irrigation, which is by far the largest user in agricultural regions); industrial uses (such as power-plant cooling); and municipal uses (such as showering, running dishwashers and washing machines, and watering lawns).

- Importantly, these uses need to be balanced with the need to preserve sufficient environmental flows to maintain ecosystem health and the associated ecosystem services.

- In an ideal world, all of these demand-side factors should be considered in an integrated context with supply issues and with sanitation and treatment questions. That is a tall order.

- Let me focus on a cross-cutting piece of the picture—a piece that is illustrative both of the complexity of the matter and of the possibilities for progress—namely the intersection of water and energy.

- One part of that intersection is the fact that emissions from the fossil-fueled energy technologies on which the United States and the world as a whole both depend for more than 80 percent of their energy are the main drivers of global climate change, which is stressing the water cycle in ways I have already described.

- The other two parts of that intersection can be abbreviated as <u>water for energy</u> and <u>energy for water</u>.

- <u>Water for energy</u> includes not only water for hydropower, but also the water requirements of fuel production and reclamation after production, fuel processing, fuel transport (for example in the case of slurry pipelines) power-plant cooling, power-plant maintenance (such as washing the dust off of solar collectors), and, ultimately, CO2 capture and sequestration.

- We need to pay more attention to optimizing the freshwater efficiency of all of these energy-supply processes, taking advantage of new technologies including those that allow for the safe and productive use of non-traditional water sources, such as brackish water and industrial and municipal wastewater.

- <u>Energy for water</u> includes the energy requirements for pumping groundwater to the surface, for long-distance transport of water (including over mountain ranges) in water projects, for treatment of sewage and other forms of waste water, and for desalination of brackish and ocean waters.

- Here, too, we need creative new approaches to increase the efficiency of water treatment and distribution systems and to put to productive use waste water from energy operations and waste heat from power plants and industrial processes.

- Foundational to achieving all of these aims is the need to improve access to and exchange of water data and information, including better modeling of the hydrologic cycle, to include the impact of human-use decisions.
- A coordinated push with the indicated ingredients could halt the vicious cycle of inefficient energy use that exacerbates inefficient water distribution and treatment systems, which in turn requires more energy and places even further demands on declining freshwater.
- In place of that vicious cycle, we can imagine a virtuous one, in which water-efficient energy sources support energy-efficient water delivery and treatment, complemented by innovative techniques for reducing waste-water creation and for matching water quality to the requirements of different uses.
- This of course brings me to the theme of this event, which is all about spurring innovation in science and technology for energy-efficient water sanitation and treatment and safely exploiting non-traditional waters around the world.
- The companies here today are bringing forward ground-breaking techniques for getting the most out of the water we've got, and I couldn't be more enthusiastic about endorsing that idea.
- The challenges in this domain are enormous.
- To use an example from desalination (or desalting), the energy needs of current desalination technology are between 12,000 and 18,000 kilowatt-hours (kWh) of electricity per million gallons of fresh water produced from sea water.
- Today, a sea-water desalination plant is being built in the State of California that will likely operate within that range, with a capacity of about 50 million

gallons per day or 55,000 acre-feet per year. That output corresponds to the urban water needs of about 250,000 Californians.

- No small feat to be sure. But put in the context of California's overall demand, 65 such plants would be needed to meet half of the urban water needs of California, and an additional 2 gigawatts of baseload power plants would be needed to run them.
- This example makes it clear that we need more innovation in the development of desalination techniques, like the exciting brackish water desalination prize I understand Chris Holmes and USAID will unveil later today.
- It also makes clear that we will need additional options and alternatives beyond desalination. Much like our clean energy efforts, an all-of-the-above strategy is required in this case—one that is grounded in integrated sustainable decision making at regional scales, in the context of our changing climate.
- With that, I look forward to learning about the exciting breakthroughs this event will surely generate, and I thank you again for the opportunity to take part.