S. HRG. 111–408

NOMINATIONS TO THE EXECUTIVE OFFICE OF THE PRESIDENT AND THE DEPARTMENT OF COMMERCE

HEARING

BEFORE THE

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION UNITED STATES SENATE

ONE HUNDRED ELEVENTH CONGRESS

FIRST SESSION

FEBRUARY 12, 2009

Printed for the use of the Committee on Commerce, Science, and Transportation

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SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

ONE HUNDRED ELEVENTH CONGRESS

FIRST SESSION

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NOMINATIONS TO THE EXECUTIVE OFFICE OF THE PRESIDENT AND THE DEPARTMENT OF COMMERCE

THURSDAY, FEBRUARY 12, 2009

U.S. SENATE,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
Washington, DC.

The Committee met, pursuant to notice, at 10:20 a.m., in room SR–253, Russell Senate Office Building, Hon. John D. Rockefeller IV, Chairman of the Committee, presiding.

OPENING STATEMENT OF HON. JOHN D. ROCKEFELLER IV, U.S. SENATOR FROM WEST VIRGINIA

The CHAIRMAN. Let us have our witnesses come.

Now, we are doing something a little different today, and that is that we are going to do two witnesses at once. This is not to diminish, obviously, either one of them, because that is an impossibility just by their nature, but it is simply so that we can cross-question if we wish and because it saves time and because we want to get their nominations moving as fast as possible.

Members should also be aware that on February 26 we will have hopefully, if the paperwork is done—and it should be—our Secretary of Commerce before us on February 26. So mark that down and please be sure to be here for that.

Dr. Holdren, you are in the White House, and so why don't you make your opening statement?

STATEMENT OF DR. JOHN P. HOLDREN, DIRECTOR-DESIGNATE, OFFICE OF SCIENCE AND TECHNOLOGY POLICY, EXECUTIVE OFFICE OF THE PRESIDENT

Dr. HOLDREN. Thank you very much, Mr. Chairman, Senator Hutchison, Members of the Committee. It is an honor and a privilege to appear before you as President Obama's nominee for Director of the Office of Science and Technology Policy. That office has two broad areas of responsibility, and if confirmed by the Senate, I will give my enthusiastic attention to both of those.

One of them is policy for science and technology, meaning policies for strengthening the research and development enterprise in the public and private sectors, for science and technology education and training, and for fostering the conditions under which advances in science and technology can be translated into economic, environmental, and security benefits for society at large.

The other side of the office's responsibilities are science and technology for policy, which means ensuring that insights from science

and engineering are available to our elected leaders as they shape economic policy, defense policy, health policy, environmental policy, and so on.

OSTP has the challenge of covering both of those broad and demanding domains in the White House, in interaction with other Executive Branch agencies, and in interaction with the Congress, with a modest staff and budget. And that means we need to recruit very high caliber people both for the professional staff and for the volunteer but senior advisors on the President's Council of Advisors on Science and Technology, and it means that we have to use that in-house talent to reach out to and draw on the advice of the wider science and engineering communities.

I would like now, if I may, to offer a few brief thoughts about the major challenges facing our country at the intersection of science and technology with the economy, the environment, and with national security, and about how the work of OSTP relates to those challenges.

American investments in science and engineering have driven much of the economic growth that our country has enjoyed for the past half century, by most accounts 50 to 85 percent of it. Two-thirds of our productivity gains in the recent decades are directly attributable to scientific and technological advances, and in today's time of economic crisis, we have to resist the temptation to reduce our investments in these foundations of our prosperity.

In this connection, I want to give special mention to the importance of R&D in our space program. Maintaining and expanding our capabilities in space is sometimes regarded as a luxury that we should do less of in the face of more pressing earthbound concerns. I think that would be false economy. Space is crucial to our national defense. It is crucial to civil as well as military communications and geopositioning. It is crucial to weather forecasting and storm monitoring, crucial to observation and scientific study of the condition of our home planet's land, vegetation, oceans, and atmosphere, and it is crucial to scientific study and exploration looking outward. As with the rest of our fundamental and applied research enterprise, investments in space are a bargain.

In concert with helping to nurture the R&D enterprise in general, OSTP has an important function in promoting the translation of the results of R&D into new products and services that benefit Americans through widespread application. This country has long demonstrated a high capacity for turning novel ideas into new businesses and improved services. Fostering this capacity for translating science and technology into widespread benefit is going to be crucial in rebuilding our economy, as well as in addressing our most pressing challenges in energy, environment, health, and national security.

Development of new technologies and providing incentives for their widespread adoption is going to be particularly crucial at the demanding intersection of energy, national security, and climate change. Providing the affordable and reliable energy that our economic well-being requires, while also addressing the dangers of global climate change and over-dependence on imported oil, are challenges demanding the utmost in collaboration among the rel-

ative Executive Branch agencies, the Congress, and the private sector.

Information technology has been a key driver of our productivity growth in recent decades, and it has fundamentally changed the way people worldwide communicate and work. But we have just seen the beginning of what can be achieved. Information technology has vast potential to improve health care, to increase energy efficiency, to monitor climate and other environmental conditions, and to manage the immense amounts of data from scientific efforts from the Human Genome Project to the Large Hadron Collider.

Better use of existing and new information technologies is also going to be a key ingredient to improving K–12, college, and university education in this country and not just to produce the future cohorts of scientists, engineers, and mathematicians that we are going to need. It is also going to be key in upgrading the country's entire workforce and providing Americans with the tools they need to participate successfully in our democracy in an era where science, technology, and information are becoming ever more important.

I want to mention finally the crucial roles that science and technology play in our country's capacity to deal with threats to our security both at home and abroad. Those include the need to address complex new challenges (asymmetric conflicts, urban operations, cyber threats, potential terrorist access to weapons of mass destruction), as well as all the familiar but continuously changing challenges (nuclear and biological weapons, ballistic missile and missile defense technology, scientific intelligence gathering, among others). The superb research done in the Defense Advance Research Projects Agency and other parts of the defense research establishment has contributed to United States security for generations, and I regard it as a continuing obligation of OSTP to help see that this continues.

OSTP's role in the security domain has an international cooperation dimension as well and appropriately so, given the existence of many security problems that can more readily be addressed through multilateral agreements and cooperation rather than unilateral action. Nuclear nonproliferation is a prime example, but arms control agreements and mechanisms more broadly continue to be an important element of our national security portfolio. Science and technology are essential elements of improving our capacity to verify existing arms control agreements, as well as to help decide what additional ones are in our national interest.

In conclusion, while our country clearly faces immense challenges in the economic, environmental, health, and security domains, among others, it is equally clear that science and technology can be key ingredients in turning those challenges into opportunities. But the pace of the advances we need for these purposes cannot be taken for granted. How quickly or slowly we get them is a substantial part a matter of policy. The Office of Science and Technology Policy can play a crucial role, in cooperation with the other Executive Branch agencies and the Congress, in making it possible for us to reap these rewards sooner rather than later.

If the Senate confirms me for the position of Director of OSTP, I would hope to work particularly closely with the members of this

Committee, which has long been a source of bipartisan support for the efforts needed to maintain America's leadership across the frontiers of science, engineering, and innovation.

I thank you for your attention. I will be pleased to try to answer any questions you have.

[The prepared statement and biographical information of Dr. Holdren follows:]

PREPARED STATEMENT OF DR. JOHN P. HOLDREN, DIRECTOR-DESIGNATE, OFFICE OF SCIENCE AND TECHNOLOGY POLICY, EXECUTIVE OFFICE OF THE PRESIDENT

It is a singular honor and privilege to appear before this Committee as President Obama's nominee for Director of the Office of Science and Technology Policy (OSTP) within the Executive Office of the President. I contemplate the opportunity of serving in this capacity, if confirmed by the U.S. Senate, with a mixture of pride and humility.

I am proud to have been nominated by President Obama to work with him and the Congress to sustain and strengthen our world-leading science and engineering enterprises, which are so crucial to our economic prosperity, our security. and the quality of our environment, and to ensure the science and technology advice our policy-makers need is always the best it can be.

But I am also humbled by the magnitude of these tasks, as well as by the responsibility to live up to the standard set by the extraordinary line of distinguished scientists who have served in similar roles under Republican and Democratic Presidents since MIT's Vannevar Bush served as President Roosevelt's science and technology advisor in World War II.

Science and technology policy consists of two major strands: *policy for science and technology*—namely, the policies related to strengthening the research and development enterprise in the public and private sectors, to science and technology education and training, and to fostering the conditions under which advances in science and technology are translated into economic, security, and environmental benefits for society at large; and *science and technology for policy*—meaning the use of insights from science and engineering in the formation of those parts of economic policy, defense policy, space policy, health policy, environmental policy, agricultural policy, and so on, where such insights are needed to help shape sensible policies.

OSTP has the great challenge of covering this wide and critically important terrain in the White House, and in interaction with other Executive Branch agencies and the Congress, with a modest staff and budget. This requires recruiting very high-caliber people both for the professional staff and for the volunteer but very senior advisors on the President's Council of Advisors on Science and Technology (PCAST), and using the connectivity of the staff and PCAST to draw on the advice and analysis of the best of the rest of the science and engineering communities. Making all of this work well is a task that, if confirmed, I would give great attention.

Besides efficiency in the use of the available human resources, a further key challenge for OSTP is carrying out its responsibility to ensure the science and technology advice the President and Congress receives, whether from inside or outside the government, is as objective and accurate as the state of the relevant fields permits, regardless of the political implications. If confirmed, I will consider this one of my highest obligations, which would extend to working with the Federal agencies that generate and process scientific and technological information to be sure the best technical judgments of the scientists and engineers working there are never censored or distorted for ideological reasons.

I would like to briefly offer some thoughts about major challenges facing our country at the intersection between science and technology and the economy, the environment, and national security, and how the work of OSTP relates to addressing these challenges.

American investments in science and engineering have driven most of the innovations that underpin our economy today. A wide variety of studies conclude that between 50 and 85 percent of the growth of the U.S. economy over the past half-century—and two-thirds of our productivity gains in recent decades—are directly attributable to scientific and technological advances. In today's time of economic crisis, we must resist the temptation to reduce our investments in these foundations of our prosperity.

U.S. scientific leadership requires both creating an environment that encourages private investment in research and development while maintaining strong and bal-

anced Federal research programs that support the promising areas of R&D that are too far from obvious application, too uncertain in outcome, too costly, or too related to public as opposed to private goods to attract private funding.

In this connection, I want to give special mention to the importance of R&D in our space program. Maintaining and expanding our capabilities in space is sometimes regarded as a "luxury" we should do less of in the face of more pressing earthbound concerns. But that would be false economy. Space is crucial to our national defense; to civil as well as military communications and geo-positioning; to weather forecasting and storm monitoring; to observation and scientific study of the condition of our home planet's land, vegetation, oceans, and atmosphere; and to scientific study and exploration looking "outward" that is increasing our understanding of the physical universe and our place in it.

I also want to note the importance of the sustainability and predictability of the Federal investment in science and engineering. The "boom and bust" cycles that have characterized much Federal support in these domains over the past forty years are inefficient and disruptive of scientific progress.

In concert with helping to nurture the R&D enterprise in general, OSTP has an important function in promoting the translation of the results of R&D into new products and services that benefit Americans through widespread application. This country has long demonstrated a high capacity for turning novel ideas into new businesses and improved services in domains ranging from medical diagnostics, to instant access to information, to entertainment. Fostering this capacity for translating science and technology into widespread benefit will be crucial in rebuilding our economy as well in addressing our most pressing challenges in energy, environment, health, and national security.

Development of new technologies and providing incentives for their widespread adoption will be particularly crucial at the demanding intersection of energy, national security, and climate change. Providing the affordable and reliable energy that our economic well-being requires while addressing the dangers of global climate change and over-dependence on oil from politically fragile regions are challenges demanding the utmost in collaboration among the relevant Executive Branch agencies, the Congress, and the private sector.

While climate change is the most demanding of all environmental challenges in terms of what will be required of science and technology in order to bring it under control, there are many other environmental problems we dare not neglect: air quality, water quality, toxic substances in our soil and foods, the condition of the forests on our territory and the oceans on our borders, and biodiversity, to mention some of the most important.

I know this Committee is well aware that bringing science and engineering to bear on solving these problems and thereby improving the environmental component of human well-being can also be a boost to the economy, not a drag, by virtue of the jobs and investment associated with these efforts.

Information technology has been a key driver of our productivity growth in recent decades and has fundamentally changed the way people worldwide communicate and work. But we have just seen the beginning of what can be achieved. Information technology has vast potential to improve health care, increase energy efficiency, monitor climate and other environmental conditions, and manage the immense amounts of data from scientific efforts from the Human Genome Project to the Large Hadron Collider.

Additionally, we can and should use existing information technologies—and the better ones yet to come—to bring the U.S. Government into the 21st century by streamlining internal operations, cutting costs, increasing information security, and making Federal agencies more responsive to inputs from outside the government.

Better use of the existing and new information technologies will also be a key ingredient in the improvement of K–12, college, and university education in this country, not only to produce the future cohorts of scientists, engineers, and mathematicians we will need, but also to upgrade the country's entire workforce and provide Americans with the tools they need to participate successfully in our democracy in a milieu where science, technology, and information are becoming ever more important.

Last, but certainly not least, I want to mention the crucial roles that science and technology play in our country's capacity to deal with threats to our security both at home and abroad. These include the need to address complex new challenges—asymmetric conflicts, urban operations, peacekeeping missions, cyber threats, and potential terrorist access to weapons of mass destruction—as well as all of the familiar but continuously changing challenges such as those associated with nuclear and biological weapons, ballistic-missile and missile-defense technology, and scientific intelligence gathering. The superb research done in the Defense Advance Research

Projects Agency and other parts of the defense research establishment has contributed to U.S. security for generations, and I regard it is a continuing obligation of OSTP to help see that this continues.

The "national security" and "international affairs" aspects of OSTP's role in the security domain are, of course, tightly intertwined, not least because there are many security problems that either can only be solved or are most easily solved through multilateral agreements and cooperation rather than unilateral action. Nuclear nonproliferation is a prime example, but arms-control agreements and mechanisms more broadly continue to be an important element of our national-security portfolio. Science and technology are essential elements of improving our capacity to verify existing arms-control agreements, as well as to help decide what additional ones are in our national interest, and OSTP has a role to play in that.

Another aspect of OSTP's responsibilities in the global arena relates to international research partnerships in science and in the technologies needed to address challenges that can only be surmounted by multilateral collaborations, such as climate change, oil-import vulnerabilities, and the condition of the world's oceans. The cost and complexity of cutting-edge accelerators, telescopes, and certain experimental energy technologies (such as the ITER fusion experiment) are good reason in themselves for sharing the costs and risks internationally. I have been involved in international cooperation on fusion and other energy technologies since 1971, and if confirmed by the Senate I will be most eager to put the insights derived from that experience to good use in OSTP.

In conclusion, while our country clearly faces immense challenges in the economic, environmental, health, and security domains, among others, it is equally clear that science and technology can be key ingredients in turning those challenges into opportunities. It is likewise true that in science itself we are on the threshold of remarkable new discoveries about the universe, about how our own planet and its living systems work, and about how we learn, think, and remember. And we are on the verge of huge advances in computing and other information systems, in biotech, in nanotech, in greentech, and in the intersection of these domains.

But the pace of these advances is not automatic. How quickly or slowly we get them is in substantial part a matter of policy. The Office of Science and Technology Policy in the Executive Office of the President can play a crucial role, in cooperation with the other Executive Branch agencies and the Congress, in making it possible for us to reap these rewards sooner rather than later.

If the Senate confirms me for the position of Director of the Office of Science and Technology Policy, I would hope to work particularly closely with the members of this Committee, which has long been a source of steady, bipartisan support for the efforts needed to maintain America's leadership across on the frontiers of science, engineering, and innovation.

I will be pleased to try to answer any questions you may have.

A. BIOGRAPHICAL INFORMATION

1. Name (Include any former names or nicknames used):

John Paul Holdren (John P. Holdren, John Holdren).

2. Position to which nominated: Director, Office of Science and Technology Policy, Executive Office of the President.

3. Date of Nomination: January 20, 2009.

4. Address (List current place of residence and office addresses):

Residence: Information not released to the public.

Office 1: Belfer Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University, 79 JFK Street, Cambridge, MA 02138.

Office 2: Department of Earth and Planetary Sciences, Harvard University, 20 Oxford Street, Cambridge, MA 02138.

Office 3: The Woods Hole Research Center, 149 Woods Hole Road, Falmouth, MA 02540.

5. Date and Place of Birth: March 1, 1944; Sewickley, PA (Allegheny County).

6. Provide the name, position, and place of employment for your spouse (if married) and the names and ages of your children (including stepchildren and children by a previous marriage).

Spouse: Cheryl E. Holdren, self-employed biologist/author and volunteer for various community organizations in Falmouth, MA. She works from a home office at 11 Old Colony Place, Falmouth, MA 02540.

Children: John Craig Holdren, age 42; Jill Virginia Holdren, age 40.

7. List all college and graduate degrees. Provide year and school attended.

SB, Aeronautics and Astronautics, 1965, MIT.

SM, Aeronautics and Astronautics, 1966, MIT.

PhD, Aeronautics and Astronautics/Theoretical Plasma Physics, 1970, Stanford.

8. List all post-undergraduate employment, and highlight all management-level jobs held and any non-managerial jobs that relate to the position for which you are nominated.

Lockheed Missiles and Space Company, Palo Alto, CA.

Associate Engineer, Performance Analysis, summer 1965.

Senior Associate Engineer, Re-Entry Aerodynamics, summer 1966.

Consultant, Re-Entry Physics, 9/66–6/67.

Stanford University

Research Assistant, Institute for Plasma Research, 7/69–6/70.

Lawrence Livermore National Laboratory

Physicist, Theory Group, Magnetic Fusion Energy Division, 7/70–6/73 (on leave 1/72–6/73).

Consultant to the Magnetic Fusion Energy Division and the Laser Division, 6/74–10/94).

California Institute of Technology, Pasadena, CA.

Senior Research Fellow, Division of Humanities and Social Sciences and Environmental Quality Laboratory, 1/72–6/73.

University of California, Berkeley

Assistant Professor of Energy and Resources, 7/73–6/75.

Associate Professor of Energy and Resources, 7/75–6/78.

Professor of Energy and Resources, 7/78–6/96 (and Class of 1935 Professor of Energy, 8/92–6/96).

Management: Vice Chair of the Energy and Resources Group, 1983–96, and *Acting Chair,* 1982–83 and Fall 1990. The Energy and Resources Group was/is a campus-wide, interdisciplinary, graduate-degree-granting program of teaching and research, with 46 full-time equivalent faculty, 50–100 affiliated faculty (salaries paid by other campus units), 3–4 administrative staff, and 50–60 graduate students, and a budget in the range of $3–5 million per year.

Harvard University

Teresa and John Heinz Professor of Environmental Policy, John F. Kennedy School of Government , and Professor of Environmental Science and Public Policy, Department of Earth and Planetary Science, Faculty of Arts and Sciences, 7/76-present (half time 7/05–present).

Management: Director and Faculty Chair, Program on Science, Technology, and Public Policy (STPP), Belfer Center for Science and International Affairs, John F. Kennedy School of Government, 7/76–present. STPP comprises research efforts engaging 4–6 faculty members and senior researchers, 3–6 administrative staff, and 10–20 research fellows and research associates, with a budget of $3–5 million per year.

The Woods Hole Research Center

Management: President and Director of the Center, half—time 7/05–present. The Center is an independent, nonprofit, nonpartisan research and education organization focused on interactions of the land, soil, vegetation, water, and climate of the planet and the relation of these factors to human well-being. The center employs 50 scientists, policy analysts, and support staff and has a budget that has ranged in my tenure from $5.5 million to $8.5 million per year.

The John D. and Catherine T. MacArthur Foundation

Management: Member of the Board of Directors, concurrently with the above positions, 1991–2005. The Board oversees the operation of a charitable foundation with assets in the range of $4–5 billion and annual outlays in the range of $200–250 million. I chaired the Board committee overseeing the Foundation's

Program on Peace and International Cooperation (circa $20 million per year) 1994–96, served on the Budget Committee 2000–2005, and chaired the Institutional Policy Committee 2002–2005.

9. Attach a copy of your resume. Up-to-date CV and separate complete publications list are attached.

10. List any advisory, consultative, honorary, or other part-time service or positions with Federal, State, or local governments, other than those listed above, within the last 5 years.

I have been an informal advisor, in consequence of my roles in the National Academy of Sciences Committee on International Security and Arms Control, the National Commission on Energy Policy, the American Association for the Advancement of Science, and the Aspen Institute, and in connection with government-agency grants to my research and policy-analysis projects at Harvard and the Woods Hole Research Center (for details of all of which see item 11, below), to the following:

U.S. Department of State.

U.S. Department of Defense.

U.S. Department of Energy.

National Nuclear Security Administration.

Central Intelligence Agency.

U.S. Environmental Protection Agency.

Senate Committee on Energy.

numerous individual Members of Congress.

11. List all positions held as an officer, director, trustee, partner, proprietor, agent, representative, or consultant of any corporation, company, firm, partnership, or other business, enterprise, educational, or other institution within the last 5 years.

Harvard University (professors are considered "officers"; see entry under item 8, above).

John D. and Catherine T. MacArthur Foundation (trustee; see entry under item 8, above).

Woods Hole Research Center (the position of President, which I've held since June 2005—see entry under item 8, above—entails membership on the Board of Trustees, of which I was also a member in the period 19942004, serving as Vice Chair).

Tsinghua University (Beijing, China; Guest Professor, a non-resident three-year appointment entailing 1–2 lectures per year; began 5/08).

American Association for the Advancement of Science (AAAS)

President-elect, 2/05–2/06.

President, 2/06–2/07.

Chair of the Board, 2/07–2/08.

Member of the Board, 2/05–2/08.

(A number of projects and offices of the AAAS provide advice to Congress and Executive Branch agencies when requested)

National Commission on Energy Policy

Co-Chair, 2002–present.

(The National Commission on Energy Policy is an independent, foundation-funded, nonprofit, bipartisan organization that develops consensus recommendations on U.S. energy policy and provides them, along with supporting analyses, to relevant committees of the U.S. Congress, Executive Branch agencies, and the public. The other two Co-Chairs, since the Commission's inception, have been John Rowe, CEO of the Exelon Corporation, and William Reilly, EPA Administrator under President George H. W. Bush.)

United Nations Foundation

Consultant on climate-change and energy issues, 11/03–5/07 (This work also entailed advising the Commission on Sustainable Development of the United Nations, the U.N. Secretary General, and the President of the General Assembly).

National Academy of Sciences

Chair, Committee on International Security and Arms Control, 19942004 (The chairmanship of this standing committee is considered an "officer" position in the NAS.)

MIT Press

Chair of the Editorial Advisory Board of the journal *Innovations: Technology, Governance, Globalization,* 2004–present.

U.S. Civilian Research and Development Foundation

Member, Council of Advisors, 2001–present.

China-U.S. Center for Sustainable Development

Member, Board of Councilors, 2002–present.

Princeton University Carbon Management Initiative

Member, Advisory Board, 2002–2007.

Climate Central

Member, Board of the Board, 2008-present (Climate Central is a 501.3.c based in Princeton, NJ and led by distinguished climate scientist Berrien Moore and Weather Channel climatologist Heidi Cullen, focused on developing objective and balanced content on climate change for the electronic media).

Aspen Institute

Participant in a number of Aspen Institute Congressional Seminars and Congressional Breakfasts.

In addition, I have served during the past 5 years as an informal advisor, in connection with grants by the indicated entities to my research and policy-analysis projects at Harvard and the Woods Hole Research Center, to the following:

BP

Shell USA

Goldman Sachs Center for Environmental Markets

Doris Duke Charitable Foundation

The Winslow Foundation

The Heinz Family Philanthropies

The William and Flora Hewlett Foundation

The David and Lucille Packard Foundation

The John D. and Catherine T. MacArthur Foundation

The Rockefeller Foundation

The Rockefeller Brothers Fund

The Energy Foundation

The Nuclear Threat Initiative

I have also served in the last 5 years as an occasional informal advisor (unpaid and in the absence of grants to my projects) to the following:

The Rockefeller Foundation

The Clinton Global Initiative

The Carnegie Corporation of New York

Google.org

The Open Society Institute

Sigma Xi, The Scientific Honorary Society

The Nand and Jeet Khemka Foundation

The World Economic Forum

12.Please list each membership you have had during the past 10 years or currently hold with any civic, social, charitable, educational, political, professional, fraternal, benevolent or religious organization, private club, or other membership organization. Include dates of membership and any positions you have held with any organization. Please note whether any such club or organization restricts membership on the basis of sex, race, color, religion, national origin, age, or handicap.

Besides entities listed above under items 8 and 11, none of which restricts membership, I have been a member during the past 10 years of the following other organizations (also all non-restrictive on the indicated grounds):

National Academy of Sciences, 1991–present.

National Academy of Engineering, 2000–present.

American Academy of Arts and Sciences, 1983–present.

Council on Foreign Relations, 1996–present.

California Academy of Sciences, 1985–present.

American Association for the Advancement of Science, 1971–present (offices held listed under item 11).

The American Physical Society, 1970–present.

Sigma Xi, The Scientific Honorary Society, 1966–present.

The MIT Alumni Association, 1965–present.

The Stanford Alumni Association, 1970–present.

Pugwash Conferences on Science and World Affairs, 1973–present.

Chair of the U.S. Pugwash Committee, 1983–95.

Member of the International Pugwash Council, 1982–97.

Chair of the Executive Committee of the International Pugwash Council, 1987–97.

Federation of American Scientists, 1974?–present.

Union of Concerned Scientists, 1980?–present.

Sierra Club, 1966?–present.

Environmental Defense Fund, 1980?–present.

Natural Resources Defense Council, 1980?–present.

Quissett Yacht Club, 2004–present.

13. Have you ever been a candidate for and/or held a public office (elected, non-elected, or appointed)? If so, indicate whether any campaign has any outstanding debt, the amount, and whether you are personally liable for that debt.

No, nothing in this category.

14. Itemize all political contributions to any individual, campaign organization, political party, political action committee, or similar entity of $500 or more for the past 10 years. Also list all offices you have held with, and services rendered to, a state or national political party or election committee during the same period.

Our political contributions have been modest and we have not kept good records of them. To the best of my recollection, those in the last 10 years have been as follows:

My wife and I made contributions totaling $2,000 to the Presidential campaign of President-elect Barack Obama in 2008.

We contributed (I believe) $1,000 to the Presidential campaign of Senator John Kerry in 2004.

We contributed (I believe) $1,000 to the Presidential campaign of Vice President Gore in 2000.

We contributed (I believe) $500 to one or more of Senator John Kerry's re-election campaigns.

We contributed (I believe) $500 to one or two of Congressman Rush Holt's election campaigns.

I provided modest amounts of advice on climate-change and energy issues to both the Clinton and Obama Presidential campaigns during the primaries, and subsequently to the Obama campaign during the general election. I was designated a surrogate for Senator Obama on energy and climate-change issues during the general election but never performed in this role.

I was a member of Scientists and Engineers for Kerry during the 2004 Presidential campaign and gave a number of speeches in this role in Pennsylvania, Ohio, and New Mexico.

I was a member of Scientists and Engineers for Gore during the 2000 Presidential campaign and participated in some conference-call meetings on strategy for mobilizing support for Vice President Gore in the science and engineering communities.

I have held no other offices or rendered any other services for state or national political parties or action committees in this period.

15.List all scholarships, fellowships, honorary degrees, honorary society memberships, military medals, and any other special recognition for outstanding service or achievements.

In inverse chronological order:

John H. Chafee Memorial Lecture, National Council for Science and the Environment, 2008.

Robert Fletcher Award of the Thayer School of Engineering, Dartmouth College, 2007.

President, American Association for the Advancement of Science, 2006–07.

Jerome Wiesner Lecture, University of Michigan, 2002.

Honorary Sc.D., Clark University, 2002.

Joseph Rotblat Lecturer, Annual Student Pugwash Conference, 2002.

National Associate of the U.S. National Academies (award "for exceptional service"), 2001.

John Heinz Prize in Public Policy, 2001.

Member of the National Academy of Engineering (elected 2000).

Tyler Prize for Environmental Achievement, 2000.

Sidney Drell Lecturer, Stanford University, 2000.

Kaul Foundation Award for Excellence in Science and Environmental Policy, 1999.

Fusion Leadership Award for 1998, Fusion Power Associates.

Honorary D.Eng., Colorado School of Mines, 1997.

Council on Foreign Relations (elected 1996).

Nobel Peace Prize acceptance lecture on behalf of the Pugwash Conferences on Science & World Affairs, 1995.

Forum Award of the American Physical Society, 1995.

Volvo Environment Prize, 1993.

Member of the National Academy of Sciences (elected 1991).

Fellow of the American Physical Society (elected 1988).

Fellow of the American Association for the Advancement of Science (elected 1987).

Fellow of the California Academy of Sciences (elected 1985).

Fellow of the American Academy of Arts and Sciences (elected 1983).

Kistiakowsky Visiting Scholar for the American Academy of Arts and Sciences, 1983–84.

MacArthur Foundation Prize Fellowship, 1981–86.

Federation of American Scientists Public Service Award for 1979.

Gustaysen Memorial Lecturer, University of Chicago, 1978.

Honorary Sc.D., University of Puget Sound, 1975.

Distinguished Teaching Award of the University of California, Berkeley, 1975.

NSF Predoctoral Fellowship, Stanford University, 1967–69.

NSF Graduate Fellowship, MIT, 1965–66.

Lockheed Undergraduate Scholarship, MIT, 1961–65.

16.Please list each book, article, column, or publication you have authored, individually or with others. Also list any speeches that you have given on topics relevant to the position for which you have been nominated. Do not attach copies of these publications unless otherwise instructed.

A complete publication list (395 items) is attached.*

With respect to speeches, I have been giving 20 to 50 speeches per year on topics of energy, environment, climate change, nuclear arms control and nonproliferation, and science and technology policy since the early 1970s. Reconstructing anything even close to a complete list would not be possible. In place of that I am attaching (a) a list of speeches given in the past few years and (b) two files of URLs where PowerPoint, video, or audio from some of the recent speeches can be accessed online.

17. Please identify each instance in which you have testified orally or in writing before Congress in a governmental or non-governmental capacity and specify the date and subject matter of each testimony.

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*This information is retained in the Committee files.

John P. Holdren, "Observations on Technology Assessment", in *Technology Assessment,* Hearings before the Subcommittee on Science, Research, and Development, House Committee on Science and Astronautics, U.S. Government Printing Office, 1970, pp. 604–615.

John P. Holdren, "Adequacy of lithium supplies as a fusion energy source", in *Controlled Thermonuclear Research,* Hearings before the Subcommittee on Research, Development and Radiation of the Joint Committee on Atomic Energy, Part 2, 10–11 November 1971, pp. 656–662.

John P. Holdren, "Research on Electric Energy—Who Should Do It?", Hearings on Amendment 364 to S. 1684, before the Committee on Commerce, U.S. Senate, March 16, 1972, 8 pp.; and Jerome Weingart and John P. Holdren, "A Summary of the Case for Federal Coordination of Research and Development on Electricity", Committee on Commerce, U.S. Senate, March 16, 1972, 8 pp.

John P. Holdren, "Population and Environment—Are We In Trouble", Hearings of the Subcommittee on Population Growth, House Republican Task Force on Population Growth & Ecology, Apr 26, 1972, 18 pp.

John P. Holdren, "Observations on the Energy Dilemma", in *Energy Research and Development,* Hearings before the Subcommittee on Science, Research and Development, House Committee on Science and Astronautics, U.S. Government Printing Office, 1972, pp. 516–517.

John P. Holdren, "Some Observations on Raw Materials and Limits to Growth", Testimony before the Subcommittee on Science and Technology, Committee on Commerce, U.S. Senate, at Hearings in San Francisco, June 17, 1973, 8 pp. [Also presented in revised form as testimony before the California Assembly Committee on Energy and Diminishing Materials, Los Angeles, December 18, 1974.]

John P. Holdren, "Zero-Infinity Dilemmas in Nuclear Power", in *Reactor Safety Study (Rasmussen Report),* Oversight Hearing before the Subcommittee on Energy and the Environment, Committee on Interior and Insular Affairs, U.S. House of Representatives, Serial 94–61, Government Printing Office, Washington, D.C., pp. 357–364. (Adapted from an invited lecture at the 1976 Annual Meeting of the American Association for the Advancement of Science, Boston, 21 February 1976, 8 pp.

John P. Holdren, "Energy Costs as Potential Limits to Growth", in *Middle- and Long-Term Energy Policies and Alternatives,* Supplemental Hearing with Appendix, Subcommittee on Energy and Power of the Committee on Interstate and Foreign Commerce, U.S. House of Representatives, December 16, 1976, Serial 94–157, Government Printing Office; Washington, D.C., pp. 203–214.)

John P. Holdren, "Energy and Global Change", Testimony before the Committee on Science, Technology, and Space of the U.S. House of Representatives, Washington, DC, 17 July 1991, 7 pp.

John P. Holdren, "Some Observations on the Energy Future", Testimony before the Subcommittee on Energy, Committee on Science, Space, and Technology, U.S. House of Representatives, 21 April 1994, 8 pp.

John P. Holdren, "The Threat from Surplus Nuclear-Bomb Materials", Invited testimony before the Subcommittee on Europe, Senate Foreign Relations Committee, and the Permanent Subcommittee on Investigations, Senate Committee on Governmental Affairs, U.S. Congress, 23 August 1995, 6 pp.

John P. Holdren, "U.S. Vulnerability to Oil-Price Shocks and Supply Constrictions . . . And How To Reduce It", Invited Testimony at Oversight Hearings before the Senate Committee on Governmental Affairs on Recent Oil-Price Increases, 24 March 2000.

John P. Holdren, "Improving U.S. Energy Security And Reducing Greenhousegas Emissions: What Role For Nuclear Energy?", Invited Testimony for the Subcommittee on Energy and Environment, Committee on Science, U.S. House of Representatives, 25 July 2000.

John P. Holdren, "Energy Efficiency and Renewable Energy in the U.S. Energy Future", Invited Testimony before for the Committee on Science U.S. House of Representatives on "The Nation's Energy Future: Role of Renewable Energy And Energy Efficiency", 28 February 2001.

John P. Holdren, "Federal Energy R&D for the Challenges of the 21st Century: The 1997 PCAST Report and Its Relevance to S. 597", Invited Testimony before the Committee on Energy and Natural Resources, U.S. Senate, 18 July 2001.

John P. Holdren, "Some Comments On S. 1008: Amendments To The Energy Policy Act of 1992 to Develop the United States Climate Change Response Strategy", John P. Holdren, Statement for the Record, Hearings before the Senate Committee on Governmental Affairs, 18 July 2001:

John P. Holdren, "Beyond the Moscow Treaty", invited testimony for the Committee on Foreign Relations, U.S. Senate, 12 September 2002, 12 pp.

John P. Holdren, "Expanding Coal Use While Protecting the Climate", Statement for Panel I of the Clean Coal Conference, Senate Committee on Energy and Natural Resources, 10 March 2005.

18. Given the current mission, major programs, and major operational objectives of the department/agency to which you have been nominated, what in your background or employment experience do you believe affirmatively qualifies you for appointment to the position for which you have been nominated, and why do you wish to serve in that position?

The Office of Science and Technology Policy (OSTP) in the Executive Office of the President has the responsibility to provide independent advice to the President and Vice President on the science and technology (S&T) aspects of all of the policy issues with which they are concerned, including national and homeland security, energy, environment, health, transportation, information infrastructure, agriculture, and the roles of science and technology in the economy, as well as issues of the S&T workforce and S&T education and training. OSTP also provides input, in coordination with the Office of Management and Budget, on the S&T content of the President's annual budget request to the Congress and carries out a variety of other functions relating to the two-way communications about S&T matters between the Executive Office of the President and the Congress; among the relevant Executive Branch departments, agencies, and offices; and among S&T offices and ministries around the world.

Assets I would bring to the role of OSTP Director in leading these diverse and complex efforts include:

- unusually broad interdisciplinary training and experience across multiple scientific and engineering fields and substantive focuses (aerospace engineering, space science, plasma physics, nuclear weapons, energy technology, climate-change science, technology assessment), plus extensive working collaborations with biologists, economists, and political scientists on the interactions of physical, biological, and socioeconomic dimensions of national and global challenges;
- substantial experience working in and with many of the relevant sectors (universities, national laboratories, corporations, foundations and other NGO's, state and national government, and a wide variety of international S&T agencies and organizations);
- close interactions on S&T issues with Members of Congress on both sides of the aisle (dating back to my first Congressional testimony before the Honorable George Brown, long-time Chair of the House Committee of Science, in 1970) and extending to work with Senators Nunn, Lugar, and Domenici in the 1990s and 2000s on nuclear threat reduction in Russia and with Senators Domenici and Bingaman over the past few years on national energy legislation;
- extensive experience in advising Executive Branch departments and agencies on S&T matters through, *e.g.,* my membership on and chairmanship of many National Academies committees over the years (advising the State Department, Defense Department, Energy Department, and National Nuclear Security Administration, among others), my service on the first Energy Research Advisory Board to the Secretary of Energy (1978–1979) and on subsequent advisory committees to the DOE on fusion energy through 1994;
- my experience on President Clinton's Committee of Advisors on Science and Technology, lodged administratively in OSTP, from its inception in 1994 until the transition of 2001 (during which time I led PCAST studies requested by the President on protecting nuclear-weapon materials against terrorists and proliferators, the U.S. fusion energy research program, U.S. Federal energy R&D for the challenges of the 21st century, and the Federal role in international cooperation on energy-technology innovation, as well as serving as U.S. co-chair of a bilateral U.S.-Russian commission on plutonium management reporting to Presidents Clinton and Yeltsin);
- my experience building bipartisan consensus on energy and climate-change issues through my co-chairmanship of the National Commission on Energy Policy; and

- long and systematic study of the S&T advisory apparatus of the Federal Government, beginning with participation in the hearings and deliberations that led to establishment of the Congressional Office of Technology Assessment in 1972 and including teaching and research leadership on Federal science and technology policy in my role as Director and Faculty Chair of the program on Science, Technology, and Public Policy at Harvard's Kennedy School of Government from 1996.

In the last connection, I want to add that I've had the great privilege of being mentored by and/or working closely with five previous Presidential science advisors—George Kistiakowsky (Eisenhower), Jerome Wiesner (Kennedy, Johnson), Frank Press (Carter), Jack Gibbons (Clinton I), and Neal Lane (Clinton II). I worked very closely with both Dr. Gibbons and Dr. Lane, and with all of their OSTP Associate Directors, during the two Clinton terms. And I am well acquainted with the current OSTP Director, Honorable John H. Marburger, having spent time with him discussing science and technology policy issues before and during his term.

I want to serve in this position because I believe our country faces both immense challenges and immense opportunities across a range of important issues where the wise use of insights from science and applications of technology are going to be crucial in determining the outcomes, and because I believe the OSTP Director can potentially play an important role in helping the administration and the Congress get the outcomes we need.

19. What do you believe are your responsibilities, if confirmed, to ensure that the department/agency has proper management and accounting controls, and what experience do you have in managing a large organization?

Proper management and accounting controls are essential in any governmental organization, as well as in any corporation or nonprofit. The fact that OSTP is a relatively small operation, with about 65 staff and an annual budget of about $6 million, does not alter that reality in any way. And, of course, the Director has the primary responsibility for ensuring that proper management and accounting controls are in place and for overseeing their implementation.

I currently manage an operation of similar size (50 staff, annual budget of about $8.5 million) in my role as President and Director of the Woods Hole Research Center (since June 2005 and member of the Board since 1994). The Center's books are subject to the professional annual audits required of any such organization, as well as to annual audits by the Federal Government because of the grants and contracts we hold from Federal agencies. Those audits have been spotless during my tenure, as they were during the tenure of my predecessor. (I am only the second Director the Center has had since its founding in 1985.)

I have also managed similar sized academic operations at both Harvard and the University of California, Berkeley: As a Trustee of the MacArthur Foundation for 14 years, long-time member of the Budget Committee of that Board, and Chair of its Institutional Policy Committee in 2002–5, I have had shared responsibility for overseeing the finances and management of a much larger organization.

20.What do you believe to be the top three challenges facing the department/agency, and why?

1. In a way, the biggest challenging facing OSTP is and always has been how to meet its very diverse and substantial responsibilities with the small staff and budget at its disposal. This challenge translates into the need to recruit extremely talented, organized, and dedicated staff members—starting with the Associate Directors but extending right down through the administrative staff—who will be both ingenious and hard-working in order to get it all done.

2. Another (and related) top challenge is to develop the needed working relationships—with the President and Vice President, with the OMB and NSC and NEC, with the other S&T-rich Executive Branch departments and agencies, and with the Congress—without which there is no hope of OSTP doing the job that is needed from it. Meeting this challenge is a matter of investing the effort to create and nurture those relationships (an effort that must start with but cannot be limited to the OSTP Director), which means a lot of listening, not just talking.

3. The challenges of process that I mentioned first are large, but not larger than the challenges of substance faced by OSTP in formulating advice—augmenting that of the other relevant departments, agencies and offices and recognizing the prerogatives of the Congress—about S&T and the economy, S&T and national and homeland security, S&T for national and global public health, the role of S&T in addressing the energy/climate-change/oil-dependence challenge, and more. Distilling all this down to one challenge (as required by the question's re-

quest for a total of only three) motivates me to put it as follows. Our society's well-being rests equally on three pillars: economic conditions and processes (jobs, income, wealth, trade . . .), socio-political conditions and processes (national and homeland security, personal safety, justice, equity, access to and quality of health care and education . . .), and environmental conditions and processes (clean air and water, functioning nutrient cycles, a stable and favorable climate . . .). All three pillars are essential, just as a three-legged stool collapses if any single leg fails. The challenge facing OSTP and all other organs of government that deal with science and technology is to help figure out how government, business, academia, and foundations and other NGO's can more effectively collaborate in developing and applying science and technology in ways that strengthen all three legs simultaneously.

B. POTENTIAL CONFLICTS OF INTEREST

1. Describe all financial arrangements, deferred compensation agreements, and other continuing dealings with business associates, clients, or customers. Please include information related to retirement accounts.

I receive a circa 50%-time salary from Harvard University in connection with my professorship in the John F. Kennedy School of government.

I receive a circa 50%-time salary from the Woods Hole Research Center in connection with my position as President and Director there.

This balance shifts to approximately 70%–30% in favor of the Woods Hole Research Center in the summer and semesters when I am carrying a reduced teaching load.

I am vested in the retirement plans at both Harvard and the Woods Hole Research Center. I am also vested in the retirement plan at the University of California, Berkeley, where I was on the faculty from 1993 to 1996, and in the TIAA–CREF retirement program in connection with earlier service at the Lawrence Livermore Laboratory and the California Institute of Technology.

I have no deferred compensation arrangements with any of the institutions where I have been employed, and I have no other continuing business or financial dealings of any kind.

2. Do you have any commitments or agreements, formal or informal, to maintain employment, affiliation, or practice with any business, association or other organization during your appointment? If so, please explain.

If confirmed by the U.S. Senate, I will take a public-service leave of absence from Harvard University, effective immediately upon confirmation. There is no expectation on Harvard's part or mine that I would be carrying on any activity or practice at or for Harvard during the period of my service with the government.

If confirmed by the Senate, I will resign my position at the Woods Hole Research Center, effective immediately upon confirmation. There is no expectation on the Center's part or mine that I would carry on any activity or practice at or for the Woods Hole Research after confirmation to my government position.

I would also resign, effectively immediately upon confirmation, from all boards and other advisory positions in which I currently serve, and I would undertake no other commitments of this type during the period of my service in government.

3. Indicate any investments, obligations, liabilities, or other relationships which could involve potential conflicts of interest in the position to which you have been nominated.

In connection with the nomination process, I have consulted with the Office of Government Ethics and the Executive Office of the President's designated agency ethics official to identify potential conflicts of interest. Any potential conflicts of interest will be resolved in accordance with the terms of an ethics agreement that I have entered into with the EOP's designated agency ethics official.

4. Describe any business relationship, dealing, or financial transaction which you have had during the last 10 years, whether for yourself, on behalf of a client, or acting as an agent, that could in any way constitute or result in a possible conflict of interest in the position to which you have been nominated: None.

5. Describe any activity during the past 10 years in which you have been engaged for the purpose of directly or indirectly influencing the passage, defeat, or modification of any legislation or affecting the administration and execution of law or public policy.

In 1999, in my capacity as a member of President Clinton's Committee of Advisors on Science and Technology, I chaired a PCAST study, at the President's request, of the Federal role in international cooperation on energy-technology innovation. The President's intent was for this study's arguments and recommendations to influence the relevant portions of his FY2001 budget request to the Congress, and it was also

his stated hope that these arguments and recommendations would influence the Congress to approve the relevant items in his request. At his direction, following completion of the report, I met with relevant agency heads and then with some of the Members of Congress most concerned with these matters to explain the recommendations.

From 2000 to 2002, I served as the Chair of a National Academy of Sciences Committee conducting a study originally requested from the Academy by President Clinton on the topic of technical issues relating to ratification of the Comprehensive Nuclear Test Ban Treaty. This followed the Senate's vote in 1999 not to consent to ratification of the indicated treaty. The President's stated intent in requesting the study, which was ultimately delivered to the Bush administration and to the Senate Foreign Relations Committee in 2002, was to assemble authoritative information and analysis on the main technical issues that had been advanced in the Senate debate as question marks about the wisdom of ratifying the treaty. The intent was clearly to contribute to the knowledge base for a yea or nay vote on ratification of the treaty if and when it was re-submitted to the Senate.

From 1996 to the present I have been one of the principal investigators of a project in the Belfer Center for Science and International Affairs at the Kennedy School of Government called "Managing the Atom" and focusing, in part, on the adequacy of the programs of the U.S. Government and other governments to keep nuclear weapons and nuclearweapon-useable materials out of the hands of terrorists and proliferant states. Reports over the years from this project, which has been supported mainly by the Nuclear Threat Initiative (Co-Chaired by Senator Sam Nunn and Ted Turner and led by former Undersecretary of Energy Charles Curtis), have made recommendations on opportunities, priorities, and budgets for the U.S. government's efforts in this domain. These recommendations, some authored and all approved by me, were intended to influence budget requests and appropriations and were regularly briefed to relevant Executive Branch officials and Members of Congress to try to achieve this.

From 2002 to the present, I have served as one of three Co-Chairs of the independent, foundation-funded, bipartisan National Commission on Energy Policy, which consists of prominent experts on energy technology, policy, and regulation from academia, business, labor, and NGO's, as well as individuals with high-level state and Federal Government experience in the energy domain, and which is devoted to developing consensus recommendations on U.S. energy policy that might command bipartisan support in the U.S. Congress. Our December 2004 and April 2007 recommendations (all unanimous) have been briefed to Executive Branch officials and relevant Members of Congress in the hope of constructively influencing U.S. energy policy.

6. Explain how you will resolve any potential conflict of interest, including any that may be disclosed by your responses to the above items.

In connection with the nomination process, I have consulted with the Office of Government Ethics and the Office of Science and Technology Policy's designated agency ethics official to identify potential conflicts of interest. Any potential conflicts of interest will be resolved in accordance with the terms of an ethics agreement that I have entered into with the Office of Science and Technology Policy's designated agency ethics official.

C. LEGAL MATTERS

1. Have you ever been disciplined or cited for a breach of ethics by, or been the subject of a complaint to any court, administrative agency, professional association, disciplinary committee, or other professional group? If so, please explain: No.

2. Have you ever been investigated, arrested, charged, or held by any Federal, State, or other law enforcement authority of any Federal, State, county, or municipal entity, other than for a minor traffic offense? If so, please explain: No.

3. Have you or any business of which you are or were an officer ever been involved as a party in an administrative agency proceeding or civil litigation? If so, please explain: No.

4. Have you ever been convicted (including pleas of guilty or *nolo contendere*) of any criminal violation other than a minor traffic offense? If so, please explain: No.

5. Have you ever been accused, formally or informally, of sexual harassment or discrimination on the basis of sex, race, religion, or any other basis? If so, please explain: No.

6. Please advise the Committee of any additional information, favorable or unfavorable, which you feel should be disclosed in connection with your nomination: I believe that my answers to this questionnaire have disclosed everything of relevance.

D. RELATIONSHIP WITH COMMITTEE

1. Will you ensure that your department/agency complies with deadlines for information set by Congressional committees? Yes.
2. Will you ensure that your department/agency does whatever it can to protect Congressional witnesses and whistle blowers from reprisal for their testimony and disclosures? Yes.
3. Will you cooperate in providing the Committee with requested witnesses, including technical experts and career employees, with firsthand knowledge of matters of interest to the Committee? Yes.
4. Are you willing to appear and testify before any duly constituted committee of the Congress on such occasions as you may be reasonably requested to do so? Yes.

RESUME OF JOHN P. HOLDREN

Employment

Woods Hole Research Center

President and Director (6/05–)

Harvard University

John F. Kennedy School of Government:

Teresa and John Heinz Professor of Environmental Policy and Director, Program in Science, Technology, and Public Policy, Belfer Center for Science and International Affairs (7/96–).

Faculty of Arts and Sciences, Department of Earth and Planetary Sciences:

Professor of Environmental Science and Public Policy (7/96–).

Faculty of Arts and Sciences, Environmental Science and Public Policy Major:

Member of the Board of Tutors (9/96–9/07).

University of California, Berkeley

Professor of Energy and Resources Emeritus (7/96–).

Class of 1935 Professor of Energy (8/91–6/96).

Professor of Energy and Resources (7/78–6/96).

Chair of Graduate Advisors, Energy and Resources Group (1988–96).

Vice Chair, Energy and Resources Group (1983–96, on leave 1987–88).

Acting Chair, Energy and Resources Group (1982–83, Fall 1990).

Associate Professor of Energy and Resources (7/75–6/78).

Assistant Professor of Energy and Resources (7/73–6/75).

California Institute of Technology

Senior Research Fellow, Division of Humanities & Social Sciences and Environmental Quality Laboratory (1/72–9/73).

Lawrence Livermore National Laboratory

Physicist, Theory Group, Magnetic Fusion Energy Division (7/70–6/73, on leave 1/72–6/73).

Stanford University

Research Assistant, Institute for Plasma Research (7/69–6/70).

Lockheed Missiles and Space Company, Sunnyvale, California

Consultant in Re-Entry Physics (9/66–6/67).

Associate Engineer, Senior, Re-Entry Aerodynamics (Summer 1966).

Associate Engineer, Performance Analysis (Summer 1965).

Recent Concurrent and Visiting Appointments

Tsinghua University: Guest Professor (3/08–).

Woods Hole Research Center: Woods Hole, Massachusetts: Visiting Scholar (1/92–7/92, 5/93–5/94); Distinguished Visiting Scientist (5/94–), Vice Chair of the Board of Trustees (5/94–).

Lawrence Livermore National Laboratory: Faculty Consultant, Magnetic Fusion Energy (subsequently Energy) Division (11/73–); Visiting Physicist, Theory

Group, Magnetic Fusion Energy Division (Fall 1986); Faculty Consultant, Laser & Environmental Directorate (7/94–).

Education

Ph.D. (6/70), *Stanford University,* Department of Aeronautics & Astronautics and Institute for Plasma Research (Dissertation: "Collisionless Stability of an Inhomogeneous, Confined, Planar Plasma").

S.M. (6/66), *Massachusetts Institute of Technology,* Department of Aeronautics and Astronautics (Dissertation: "Landau Damping of Plasma Oscillations in a Uniform External Magnetic Field").

S.B. (6/65), *Massachusetts Institute of Technology,* Department of Aeronautics and Astronautics.

Publications

Co-authored books and book-length reports (inverse chronological order)

Confronting Climate Change: Avoiding the Unmanageable and Managing the Unavoidable, Scientific Expert Group on Climate Change & Sustainable Development (Coordinating Lead Authors R Bierbaum, J Holdren, M MacCracken, R Moss, & P Raven), Report to the U.N. Commission on Sustainable Development, United Nations Foundation and Sigma Xi, February 2007, 144 pp.

Monitoring Nuclear Weapons and Nuclear-Explosive Materials: An Assessment of Methods and Capabilities, Committee on International Security and Arms Control (John P. Holdren, Committee Chair, William F. Burns, Study Co-Chair, Steven Fetter, Study Co-Chair, Spurgeon M. Keeny, Study Editor-in-Chief, and 12 others), National Academy of Sciences (National Academy Press, Washington, DC), April 2005, 264 pp.

Ending the Energy Stalemate: A Bipartisan Strategy to Meet America's Energy Challenges, National Commission on Energy Policy (John P. Holdren, Co-Chair, William K. Reilly, Co-Chair, John W. Rowe, Co-Chair, Philip R. Sharp, Congressional Chair, Jason Grumet, Executive Director, and 12 others (NCEP, Washington DC), December 2004, 128 pp.

Controlling Nuclear Warheads and Materials: A Report Card and Action Plan, Matthew Bunn, Anthony Wier, and John P. Holdren, Project on Managing the Atom, Belfer Center for Science and International Affairs, Kennedy School of Government, Harvard University, for the Nuclear Threat Initiative (NTI, Washington, DC), March 2003, 231 pp.

Technical Issues Related to the Comprehensive Test Ban Treaty, Committee on Technical Issues Related to Ratification of the Comprehensive Test Ban Treaty (John P. Holdren, Chair, and 10 others), National Academy of Sciences (National Academy Press, Washington, DC), June 2002, 84 pp.

Securing Nuclear Weapons and Materials: Seven Steps for Immediate Action, Matthew Bunn, John P. Holdren, and Anthony Wier, Project on Managing the Atom, Belfer Center for Science and International Affairs, Kennedy School of Government, Harvard University, and the Nuclear Threat Initiative, May 2002, 78 pp.

Interim Storage of Spent Nuclear Fuel, Matthew Bunn, John P. Holdren, Allison Macfarlane, Susan E. Pickett, Atsuyuki Suzuki, Tatsujiro Suzuki, and Jennifer Weeks, Harvard University Project on Managing the Atom and University of Tokyo Project on Sociotechnics of Nuclear Energy, June 2001, 124 pp.

Powerful Partnerships: The Federal Role in International Cooperation on Energy Innovation, Panel on International Cooperation in Energy Research, Development, Demonstration, and Deployment (John P. Holdren, Chair, Samuel F. Baldwin, Study Executive Director, and 13 others), President's Committee of Advisors on Science and Technology (Executive Office of the President of the United States, Washington, DC), 1999, circa 300 pp.

Federal Energy Research and Development for the Challenges of the Twenty-First Century, Energy Research and Development Panel (John P. Holdren, Chair, Samuel F. Baldwin, Study Executive Director, and 20 others), President's Committee of Advisors on Science and Technology (Executive Office of the President of the United States, Washington, DC), 1997, circa 250 pp.

The Future of U.S. Nuclear Weapons Policy, Committee on International Security and Arms Control (John P. Holdren, Chair, William F. Burns, Study Chair, Jo L. Husbands, Staff Director, and 14 others), National Academy of Sciences (National Academy Press, Washington, DC), 1997, 100 pp.

Reactor-Related Options for the Disposition of Excess Weapons Plutonium, Panel on Reactor-Related Options (John P. Holdren, Chair, Matthew Bunn, Study Executive Director, and 6 others), Committee on International Security and Arms Control, National Academy of Sciences (National Academy Press, Washington, DC), 1995, 418 pp.

Management and Disposition of Excess Weapons Plutonium, Committee on International Security and Arms Control (John P. Holdren, Chair, Wolfgang K.H. Panofsky, Study Chair, Matthew Bunn, Study Executive Director, and 17 others), National Academy of Sciences (National Academy Press, Washington, DC), 1994, 275 pp.

Report of the Senior Advisory Committee to the Department of Energy on Environmental, Safety, and Economic Aspects of Magnetic Fusion Energy, John P. Holdren, Chair, and 9 others, Lawrence Livermore National Laboratory UCRL–53766 (National Technical Information Service, Springfield, VA), 1989, 345 pp.

Energy in Transition 1985–2010, Committee on Nuclear and Alternative Energy Systems (Harvey Brooks and Edward Ginzton, Co-Chairs, and 14 others), National Research Council (W.H. Freeman, San Francisco), 1980, 677.pp.

Ecoscience: Population, Resources, Environment, Paul R. Ehrlich, Anne H. Ehrlich, and John P. Holdren (W.H. Freeman, San Francisco), 1977, 1051 pp.

Fusion and Fast Breeder Reactors, W. Haefele, J. Holdren, G. Kessler, and G. Kulcinski, with contributions by A. Belostotsky, R. Grigoriants, D. Kurbatov, G. Shatalov, M. Styrikovich, and N. Vasiliev (International Institute for Applied Systems Analysis, Vienna, 1977), 506 pp.

Human Ecology: Problems and Solutions, Paul R. Ehrlich, Anne H. Ehrlich, and John P. Holdren (W.H. Freeman, San Francisco), 1973, 304 pp. German edition: *Humanokologie* (Springer Verlag, Berlin/Heidelberg), 1975, 234 pp.

Energy: A Crisis in Power, John Holdren and Phil Herrera

[separately authored halves of the book] (Sierra Club Books, New York), .1971, 252 pp. Japanese edition, Blue Backs, Tokyo, 1977.

Books co-edited

Conversion of Military R&D Judith Reppy, Vsevolod Avduyevsky, John Holdren, and Joseph Rotblat, eds. (MacMillan) 1998, 296 pp; *Building Global Security Through Cooperation,* J. Rotblat and J. P. Holdren, eds. (Springer-Verlag), 1990, 301 pp; *The Cassandra Conference: Resources and the Human Predicament,* P. R. Ehrlich and J. P. Holdren, eds. (Texas A&M University Press), 1988, 330 pp; *Strategic Defences and the Future of the Arms Race,* John P. Holdren and Joseph Rotblat, eds. (MacMillan), 1987, 286 pp; *Earth and the Human Future,* Kirk R. Smith, Fereidun Fesharaki, & John P. Holdren, eds. (Westview), 1986, 258 pp; *Population: Perspective 1973,* Harrison Brown, John Holdren, Alan Sweezy, and Barbara West, eds. (Freeman-Cooper), 1974, 284 pp; *Man and the Ecosphere,* Paul R. Ehrlich, John P. Holdren, and Richard W. Holm, eds. (W.H. Freeman), 1971, 307 pp; *Global Ecology,* John P. Holdren & Paul R. Ehrlich, eds. (Harcourt), 1971, 292 pp;

Other publications (full listing provided separately)

Some 350 other professional and popular publications on plasma physics, energy technology and policy, population-resource-environment interactions, global environmental change, and international security and arms control, including 27 chapters in books edited by others; 51 articles in refereed journals (*e.g., Science, Plasma Physics, Fusion Technology, Nuclear Technology, Energy, Annual Review of Energy and the Environment, Bulletin of Atomic Scientists, Environment, Energy Policy*); 50 research reports; 30 magazine articles (in, *e.g., Saturday Review, Scientific American, Technology Review, Issues in Science and Technology*); and 23 pieces of Congressional testimony.

Honors (inverse chronological order)

John H. Chafee Memorial Lecture, National Council for Science and the Environment, 2008.

Robert Fletcher Award of the Thayer School of Engineering, Dartmouth College, 2007.

President, American Association for the Advancement of Science, 2006–7.

Jerome Wiesner Lecture, University of Michigan, 2002.

Honorary Sc.D., Clark University, 2002.

Joseph Rotblat Lecturer, Annual Student Pugwash Conference, 2002.

National Associate of the U.S. National Academies (award "for exceptional service"), 2001.

John Heinz Prize in Public Policy, 2001.

Member of the National Academy of Engineering (elected 2000).

Tyler Prize for Environmental Achievement, 2000.

Sidney Drell Lecturer, Stanford University, 2000.

Kaul Foundation Award for Excellence in Science and Environmental Policy, 1999.

Fusion Leadership Award for 1998, Fusion Power Associates, Washington, D.C.

Honorary D.Eng., Colorado School of Mines, 1997.

Council on Foreign Relations (elected 1996).

Nobel Peace Prize acceptance lecture for the Pugwash Conferences on Science & World Affairs, 1995.

Forum Award of the American Physical Society, 1995.

Volvo Environment Prize, 1993.

Member of the National Academy of Sciences (elected 1991).

Fellow of the American Physical Society (elected 1988).

Fellow of the American Association for the Advancement of Science (elected 1987).

Fellow of the California Academy of Sciences (elected 1985).

Fellow of the American Academy of Arts and Sciences (elected 1983).

Kistiakowsky Visiting Scholar for the American Academy of Arts and Sciences, 1983–84.

MacArthur Foundation Prize Fellowship, 1981–86.

Federation of American Scientists Public Service Award for 1979.

Gustavsen Memorial Lecturer, University of Chicago, 1978.

Honorary Sc.D., University of Puget Sound, 1975.

Distinguished Teaching Award of the University of California, Berkeley, 1975.

Committees and Boards

UN Foundation/Sigma Xi Scientific Expert Group on Climate Change and Sustainable Development (reporting to the U.N. Secretary-General and Commission on Sustainable Development, Coordinating Lead Author, 2004–2007).

National Commission on Energy Policy (an independent, bi-partisan, multi-sectoral group providing advice to the Congress and the Administration, Co-Chair, 2002–).

President's Committee of Advisors on Science and Technology, Executive Office of the President of the United States (1994–2001).

Chair, Panel on Nuclear Materials Protection, Control, and Accounting, 1994–95.

Chair, Panel on Research on Magnetic Fusion Energy, 1995.

U.S. Chair, U.S.-Russian Scientific Commission on the Disposition of Surplus Plutonium, 1996–98.

Chair, Panel on U.S. Federal Energy R&D for the Challenges of the 21st Century, 1997.

Chair, Panel on International Cooperation in Energy Research, Development, Demonstration, and Deployment, 1998–99).

National Academy of Sciences/National Academy of Engineering

Roundtable on Scientific Communication and National Security, The National Academies (Member, 2003–2006).

Joint Working Group of the U.S. National Academies and the Russian Academy of Sciences on U.S.-Russian Cooperation on Nuclear Non-Proliferation (U.S. Chair, 2002–2005).

Committee on Technical Issues Related to Ratification of the Comprehensive Test-Ban Treaty (Chair, 2000–2002).

Committee on U.S.-India Cooperation on Energy (Chair 1999–2004).

Committee on Balancing Scientific Openness and National Security Controls at the National Weapons Laboratories (Member, 1998–1999).

Committee on U.S.-China Cooperation on Energy (Ex-Officio Member, 1998–2000).

Advisory Board, ISSUES IN SCIENCE AND TECHNOLOGY (1996–).

Committee on International Security and Arms Control (1992–; Chair 1993–; Chair of the Panel on Reactor-Related Options for Disposition of Weapon Plutonium, 1992–95; U.S. Co-Chair of the Working Group of U.S.-China Cooperation on Energy and Security,1995–97; Chair of the Panel to Review the Spent-Fuel Standard for Disposition of Excess Weapons Plutonium, 1999–).

Panel on Human Impacts on Ecosystems (Chair), Board on Biology and Commission on Behaviorial and Social Sciences and Education (1991).

Committee on Nuclear & Alternative Energy Systems (1975–9).

Committee to Survey the Literature of Nuclear Risks (1975–9).

International Environmental Programs Committee (1970–5).

Panel on Environment & Growth, Committee on Research Applied to National Needs (1973).

American Association for the Advancement of Science

Advisory Committee on International Science, 2004–6.

Board of Directors of the AAAS, 2005–8.

President-Elect of the AAAS, 2005–6.

President of the AAAS, 2006–7.

Chairman of the Board, 2007–8.

American Academy of Arts and Sciences

Committee on International Security Studies (1982–99, Vice Chair 1983–99).

U.S. Pugwash Committee (Chair 1983–91, Co-Chair 1992–95).

U.S. Department of Energy Committees

Fusion Energy Advisory Committee (1991–4).

U.S. National Review Committee for the International Thermonuclear Engineering Reactor Conceptual Design Activity (1991).

Senior Committee on Environmental, Safety, and Economic Aspects of Magnetic Fusion Energy (Chair 1985–89).

Energy Research Advisory Board (1978–9).

Pugwash Conferences on Science and World Affairs

Member of the International Council (1982–97).

Member of the Executive Committee of the Council (1982–97, Chair 1987–97).

MacArthur Foundation

Member of the Board of Directors (1991–2005; Chair of the Board Committee for the Program on Peace and International Cooperation, 1994–96; Budget Committee, 2000–2005; Chair of the Committee on Institutional Policy, 2002–2005).

Advisory Panel to the International Security Program (1984–8).

Federation of American Scientists (Council Member, 1974–78, 1979–86; Treasurer, 1979–80; Vice Chairman, 1980–84; Chairman, 1984–86).

Editorial Boards

Innovations: Technology, Governance, Globalization (2005–), Issues in Science and Technology (2000–), International Journal of Global Energy Issues (1989–); Science and Global Security (1987–); Environmental Conservation (1984–2000); Bulletin of the Atomic Scientists (1984–86, Advisory Council 1979–81); Soft Energy Notes (1979–82); Resources and Energy (1978–90); Annual Review of Energy (1975–82).

Other

Executive Committee, Fusion Division, American Nuclear Society (1987–1991); Advisory Council, Aldo Leopold Leadership Program (1995–2001); Jury for the 2000 Blasker Energy Prize; U.S.-China Advisory Council for Sustainable Development (2000–), International Climate Change Task Force (2004–5), Board of

Directors, U.S. Civilian Research and Development Foundation (2001–), Board of Councilors, Chiina-U.S. Center for Sustainable Development (2002–), Board of Directors, Climate Central (2008–).

Harvard Teaching (FAS = Faculty of Arts and Sciences, KSG = Kennedy School of Government)

Junior Seminar in Environmental Science and Public Policy (FAS 1997, 99, 01, 03); Energy Systems (KSG 1996, 97, 98, 99, 00, 01, 03, 05, 06, 07, 08); Interdisciplinary Science and Technology Assessments for Policy (KSG 1997, 98, 99, 00, 01, 02, 04, 05); Introduction to Environmental and Resource Science for Policy (KSG 00, 01, 03, 04, 05, 06, 08); Introduction to Science and Technology Policy (KSG 97, 01, 03, 04, 05, 06).

UC Berkeley Teaching

Energy and Society (1973–95); Critical Issues in Energy Technology (1973–1978); Quantitative Aspects of Global Environmental Problems (1973–2006); Professional Methods for Interdisciplinary Careers (19802004); graduate seminars on diverse topics (1976–2006).

Personal

Born 1 March 1944, Sewickley, Pennsylvania; married Cheryl Lea Edgar (now Dr. Cheryl E. Holdren) February 1966; children John Craig (b. 1966) and Jill Virginia (b. 1968); grandchildren Alexis Ukiah Han Holdren (b. 1991), Laurel Makaira Holdren (b. 2000), Tor Ilan Holdren Hoick (b. 2001), Kalea Tazlena Hoick Holdren (b. 2005), step-grandchild Maya Banks (b. 1992).

The CHAIRMAN. Thank you. We decided that we would actually have both witnesses give testimony back to back, and then that would encourage us to cross-question them and have all kinds of fun.

To introduce Dr. Lubchenco is Senator Ron Wyden, who is from the State of Oregon. So please proceed.

STATEMENT OF HON. RON WYDEN, U.S. SENATOR FROM OREGON

Senator WYDEN. Mr. Chairman, thank you very much. As an alum of this Committee, I know how much you value good science. I have worked with many of you over the years in this very committee room, spent a number of years I think on the perch right next to Senator Nelson. So we appreciate the good work that you all do to promote particularly sensible science and scientific integrity.

And Dr. Jane Lubchenco's career has essentially been built around those kinds of principles. She is a star on our faculty at Oregon State University. But when you look at her extraordinary track record, I think it is fair to say she is the bionic woman of good science.

[Laughter.]

Senator WYDEN. She has managed to do just about everything, winning respect in every quarter.

For example, she has already served as scientific advisor to two different administrations. She served President Clinton, for example, for two terms on the National Science Board, and she was part of the National Academy of Sciences in a climate change report to President George Herbert Walker Bush. So I think all of us who have toiled on this climate change issue understand it is not exactly for the faint-hearted. You are going to have to be bipartisan, and Dr. Lubchenco has already shown with her previous service

and the respect she won in two different administrations that she is a very up to that.

At Oregon State, Dr. Lubchenco has had the opportunity to confront many of the issues that NOAA is going to face on a daily basis. She studied marine ecosystems around the globe. She has worked to bring her conclusions home, again advising policymakers of both political parties.

She was a recipient of the 2002 Heinz Award for the environment. I note Senator Kerry's long history on these issues. And here is what the Heinz Award said in recognizing her. "She has shown that while science should be excellent, pure, and dispassionate, scientists should not sacrifice a right and must not ignore the responsibility to communicate their knowledge about how the earth is changing or to say what they believe will be the likely consequences of different policy options."

So we have in Dr. Lubchenco somebody who has been driven by the effort to dispassionately find the facts. Her scientific contributions are recognized worldwide. She has been named one of the most highly cited ecologists in the world, and as I mentioned, for her great record, she has repeatedly been recognized.

Let me close by saying, Mr. Chairman and colleagues, we so value Dr. Lubchenco in Oregon. We would not give her up under normal circumstances. She is such a valuable asset and has won so much respect from scientists across the philosophical spectrum and policymakers that we would not give her up unless there were a chance to come to the aid of our country at a critical time. Everyone in this room understands that if we are going to make enduring changes in climate change, they are going to have to be bipartisan. They are going to have to be driven by good science and finding the facts. That is what Dr. Lubchenco's career has been all about, and it is why I come before you today to give her a recommendation this morning and look forward to her serving in this critical position.

Thank you very much, Mr. Chairman and colleagues.

The CHAIRMAN. Thank you, Senator Wyden, very much.

Dr. Lubchenco, I look forward to your testimony which is just redolent with enthusiasm and promise.

STATEMENT OF DR. JANE LUBCHENCO, UNDERSECRETARY-DESIGNATE OF COMMERCE FOR OCEANS AND ATMOSPHERE, U.S. DEPARTMENT OF COMMERCE

Dr. LUBCHENCO. Thank you, Mr. Chairman, Senator Hutchison, distinguished members of the Committee. It is a deep honor for me to be here today.

Senator Wyden, I greatly appreciate your very kind remarks, and I value the time that you took to come here today. I know it is a very, very busy day.

I am here with the love and support of a wonderful family, and I wish to thank my 91-year-old mother, a pediatrician, my late father, a surgeon and Army captain for enabling their six daughters to pursue their dreams while instilling in each of us a strong sense of values, family, love, and heritage. I am grateful to my sisters too for teaching me the merits of compromise and balance. I am very pleased that my husband Bruce and my son Duncan are able to be

here today, and I am grateful to them for their continuing love and encouragement. And my thanks to my wonderful staff and colleagues in Oregon and around the country for their overwhelming support.

I first became enamored with the oceans during a college class in Woods Hole, Massachusetts. To a Colorado native, life in the sea seemed exotic and endlessly fascinating. Little did I realize then that life in the oceans is also essential to human well-being and prosperity along the coasts, as well as inland.

I have been a professor of marine biology at Oregon State University since 1977. I lead a large team of scientists studying the marine ecosystems off the coasts of Washington, Oregon, and California. We focus on understanding how the ecosystem is changing and how society might recover and sustain the jobs, recreational opportunities, healthy seafood, and wild beauty that all depend upon healthy ocean ecosystems. I have spent my entire career focused on connections, the connections between land, sea, and air and the connections between people and ecosystems.

I would bring to NOAA a firm belief that science should inform, not dictate decisionmaking, a deep respect for multiple points of view, a wealth of experience leading complex projects and organizations. And I believe that these experiences have prepared me well to serve the Nation by leading NOAA.

NOAA is, indeed, the crown jewel of the Commerce Department. It is an indispensable partner with the private sector in creating jobs along the coasts and inland. NOAA helps protect lives and property in times of natural disaster. It is a trusted steward of a bounty of marine and coastal resources, and it is the premier Government agency for applied science.

Working with you and using the best available science as our guide, here is what I think we could do. We can add hundreds of millions of new dollars to the economy by bringing back fisheries, both commercial and recreational. We can improve fishing and farming, lower insurance rates, and make air travel safer by improving weather forecasting. We can spur the creation of new industries, for example, by improving climate forecasting to enable better decisions about infrastructure, public safety, and consumer needs. And we can protect and recover the bays, beaches, rivers, and oceans that amaze, inspire, and connect us all.

My vision for NOAA is strongly colored by the experiences I had traveling around the country with the Pew Oceans Commission doing public hearings in many coastal communities. The consistent theme that we heard from CEOs to fishermen's wives, from farmers to coastal residents was the same: an intimate connection between people and oceans. 50 percent of Americans live on the coast. Most of the rest love to visit clean beaches and eat healthy seafood. Indeed, 60 percent of the country's GDP comes from coastal communities.

Now our country must rise to a new challenge, dealing with the impacts of a changing climate. I have heard firsthand from business leaders and elected officials about the urgent need for better information about likely local impacts of climate change. From concern about droughts and sea level rise to changes in the chemistry

of the ocean, there is a real hunger for more and better information.

If confirmed, I will work to create a National Climate Service similar to the National Weather Service within NOAA. NOAA is the best agency in the Government to synthesize the scientific data on climate change and create products and services that can be used by the public to guide important decisions such as where to build a road or a wind turbine. This idea has been studied by the agency, by the National Academy of Sciences, and by this committee. It is an idea whose time has come, and I would like to make it happen.

Being the Administrator of NOAA is a big job. Some of the challenges I know well: ending overfishing, anticipating the consequences of climate change, preparing for natural disasters in a time when resources are tight, restoring ecosystems on which we depend for food, water, livelihoods and other challenges I am just learning. Getting the satellite program back on track is chief among them.

If confirmed, I would work hard with Members of this Committee and the Senate and the House in realizing the great potential inherent in NOAA. Together, we can provide America the best climate change science, restore her oceans' vitality, and recharge our economy, putting us on a path to sustainability.

Again, thank you very much for your courtesy, Mr. Chairman and members of this committee. I look forward to your questions.

[The prepared statement and biographical information of Dr. Lubchenco follows:]

PREPARED STATEMENT OF DR. JANE LUBCHENCO, UNDERSECRETARY-DESIGNATE OF COMMERCE FOR OCEANS AND ATMOSPHERE, U.S. DEPARTMENT OF COMMERCE

Mr. Chairman, Senator Hutchison, and distinguished members of the Committee, I am honored to appear before you as President Obama's nominee for Undersecretary of Commerce for Oceans and Atmosphere and Administrator of the National Oceanic and Atmospheric Administration. I am grateful for the courtesy shown to me by the Members of this Committee with whom I have visited over the past several weeks, and I am eager to continue and deepen our dialogue.

I come before you today with the love and support of a wonderful family. I wish to thank my 91-year old mother, a pediatrician, and my late father, a surgeon and Army Captain, for encouraging and enabling their six daughters to pursue their dreams while instilling in each of us a deep sense of values, family, love and heritage. I thank my sisters for teaching me the merits of compromise, humility and balance. I'm pleased that my husband Bruce and son Duncan are able to be here today and I'm grateful to them for their continuing encouragement and love. And I wish to thank my staff and colleagues in Oregon and around the country for all of their support.

I was fortunate to grow up in Colorado where I developed a deep appreciation for the land—hunting and fishing with my father, hiking and camping with family and friends. I also grew to understand the pervasive importance of weather, especially from family stories about the extended droughts in South Carolina in the late 20's that triggered my paternal grandparents' move to Colorado.

I first became enamored with the oceans during a college class in Woods Hole, Massachusetts. To a Colorado native, the life in the sea seemed exotic and endlessly fascinating. Little did I realize then that life in the oceans is also essential to human prosperity and well-being—both along the coasts and inland. My exposure to the oceans was love at first sight and my life's work was set in motion.

I am currently a professor of marine biology and zoology at Oregon State University, where I have taught since 1977. I lead a large interdisciplinary team of scientists studying the large marine ecosystem off the coasts of Washington, Oregon and California. We focus on understanding how the ecosystem is changing and how society might recover and sustain the jobs, recreational opportunities, healthy sea-

food and wild beauty that all depend upon healthy ocean ecosystems. Indeed, I have spent my entire career focused on the connections between the land, sea and air and between people and the land and ocean.

Throughout my teaching, leadership of large organizations, and participation in public service, I have emphasized the important role of clear scientific input in decisionmaking. I have stressed my belief that science should inform, not dictate, decision-making.

I have gained a wealth of experience in leading large, complex projects and organizations and serving on Boards of Directors for major foundations and organizations. These projects, organizations and boards include the American Association for the Advance of Science, the International Council for Science, the Partnership for Interdisciplinary Studies of Coastal Oceans, the National Science Board, the David and Lucile Packard Foundation, the Monterey Bay Aquarium, the Environmental Defense Fund and Oregon Governor Kulongoski's Advisory Group on Global Warming. I believe that these experiences have prepared me well to serve the Nation by leading NOAA.

My students have always been an inspiration. Young minds are adept at challenging one's thinking and introducing novel ideas. If I was talking with them right now about NOAA, and why I'm so excited to have the honor of being nominated to lead the agency, I'd say this.

NOAA is the crown jewel of the Commerce Department. It is an indispensible partner with the private sector in creating jobs and growth all along our coasts. It is also the trusted steward of a bounty of marine resources that belong to all Americans. It helps to protect lives and property in times of natural disaster. And it is the premier government agency for applied science.

I tell my students that science is more than just fascinating knowledge, it is also useful knowledge. I believe passionately that science should inform our decisions. I can think of no better place to use my knowledge and experience than at NOAA. Working with you, and using the best available science as our guide, here is what I think we can do.

- We can add hundreds of millions of new dollars to the economy by bringing back fisheries—both commercial and recreational.
- We can improve farming, lower insurance rates, and make air travel safer by improving weather forecasting.
- We can spur the creation of new industries. Improved climate forecasting, for example, can serve as the backbone of new enterprises helping businessmen and public servants alike make better decisions about infrastructure, public safety, consumer needs and product research and development.
- We can protect and recover bays, beaches, rivers and oceans that amaze, inspire and connect us all.

My love of oceans, scientific knowledge and ability to find common ground among diverse perspectives led to my service on the Pew Oceans Commission and the Joint Ocean Commission Initiative. I have spent a good deal of time thinking about the future of NOAA and its work. My vision for NOAA is strongly colored by the experience of traveling around the country doing public hearings with the Commission. We listened to people from all walks of life—on the coasts and in the heartland. The consistent theme from CEOs to fishermen's wives, from farmers to coastal residents was the same: There is an intimate connection between Americans and our coasts and oceans. Fifty percent of us live in coastal areas; most of the rest love to visit beaches and eat seafood. Sixty percent of the country's GDP is generated in coastal communities. NOAA and Congress have the job of protecting the oceans and Great Lakes. But it is not just protecting nature for its own sake. Jobs and a healthy environment go hand-in-hand—in the ocean as well as on the land.

Now our country must rise to a new challenge—dealing with the impacts of the changing climate. In my work on the Ocean Commissions, I heard firsthand from businesses and state and local governments about the need for better information and predictions about the impacts of climate change in communities all across this country. From concern about droughts and sea level rise to changes in the chemistry of the ocean, there is a real hunger for more and better information. If confirmed, I will work to create a National Climate Service, which would be similar to the National Weather Service, within NOAA. NOAA is the best agency in the government to synthesize the scientific data on climate change and create products and services that can be used by the public to guide important decisions such as where to build a road or wind turbines. This idea has been studied by the agency, the National Academy of Sciences, and by members of this Committee. It is an idea whose time has come, and I would like to make it happen.

Being the Administrator of NOAA is a big job. Some of the challenges I know well from my work: Ending overfishing; anticipating the consequences of climate change; preparing for natural disasters in a time when resources are tight; restoring ecosystems on which we depend for food, water and livelihoods.

Other challenges I'm just learning. Getting the satellite program back on track is chief among them. I look forward to working with you to strengthen NOAA as a partner with business in creating economic growth and as a trusted steward of America's oceans, Great Lakes and coasts.

I have great admiration for the legions of dedicated scientists and other talented professionals at NOAA. I know that this Committee and the Congress has been very supportive of NOAA and its work. I relish the opportunity to lead the team. I pledge to bring transparency, fairness, integrity and accountability to the job, using a consultative and collaborative approach. If confirmed, I will work hard with the Members of this Committee, the Senate, and the House in realizing the great potential inherent in NOAA. Together we can provide America the best climate change science, restore her ocean's vitality and recharge our economy, putting us on a path to sustainability.

Again, thank you very much for your courtesy, Mr. Chairman and Members of this Committee.

A. BIOGRAPHICAL INFORMATION

1. Name (Include any former names or nicknames used):

Jane Lubchenco.

Jane Ann Lubchenco.

Jane Lubchenco Menge.

2. Position to which nominated: Administrator, National Oceanic and Atmospheric Administration (NOAA).

3. Date of Nomination: January 20, 2009.

4. Address (List current place of residence and office addresses):

Residence: Information not released to the public.

Office: Department of Zoology, Oregon State University, 3029 Cordley Hall, Corvallis, OR 97331–2914.

5. Date and Place of Birth: December 4, 1947; Denver, Colorado.

6. Provide the name, position, and place of employment for your spouse (if married) and the names and ages of your children (including stepchildren and children by a previous marriage).

Bruce Menge (Husband), Wayne and Gladys Valley Professor of Marine Biology, and Distinguished Professor of Zoology, Oregon State University; Duncan Nicholas Lubchenco Menge (son) (27).

7. List all college and graduate degrees.. Provide year and school attended.

B.A. 1969, Colorado College (Biology; Ford Foundation Independent Study Program).

M.S. 1971, University of Washington (Zoology).

Ph.D. 1975, Harvard University (Ecology).

8. List all post-undergraduate employment, and highlight all management-level jobs held and any non-managerial jobs that relate to the position for which you are nominated.

All of my employment is related to the position for which I am nominated.

Assistant Professor, Harvard University, 1975–77.

Assistant Professor 1977–1982, *Associate Professor* 1982–88, Oregon State University (OSU).

Research Associate, Smithsonian Institution, 1978–1984.

Professor 1988–; Chair, Department of Zoology 1989–92; *Distinguished Professor* 1993–, OSU.

Wayne and Gladys Valley Professor of Marine Biology 1995–Present, OSU.

Visiting Professor: University of the West Indies, Kingston, Jamaica, 1976; Smithsonian Tropical Research Institute, Panama, 1975–1984; Universidad Catolica, Santiago, Chile, 1986; Institute of Oceanography, Academica Sinica,

Qingdao, P.R. China, 1987; University of Canterbury, Christchurch, New Zealand, 1994–95, 1999–2000, 2002–2003.

National Science Board, member 1996–2000, 2000–2006, twice nominated by President William Jefferson Clinton and twice confirmed by the U.S. Senate.

9. Attach a copy of your resume.*

10. List any advisory, consultative, honorary, or other part-time service or positions with Federal, State, or local governments, other than those listed above, within the last 5 years.

White House Office of Science and Technology Policy, National Science and Technology Council's National Forum on Environment and Natural Resources R&D, Chair, Biodiversity and Ecosystem Dynamics Group, 1994.

Corvallis City Council, Advisory Commission on Open Space, 1995–98.

National Marine Fisheries Service, Ecosystem Principles Advisory Panel, 1997–2000.

President's Council of Advisors on Science and Technology (PCAST), Committee on Biodiversity and Ecosystems, 1997–1998.

Oregon State of the Environment Report, Science Panel, 1998–1999.

Governor of Oregon's Global Warming Advisory Group, Co-Chair, 2003–2005.

Joint Oceans Commission Initiative, Member, 2004 to Present.

National Science Foundation, Search Committee for Assistant Director for Geosciences, Chair, 2007.

11. List all positions held as an officer, director, trustee, partner, proprietor, agent, representative, or consultant of any corporation, company, firm, partnership, or other business, enterprise, educational, or other institution within the last 5 years.

Monterey Bay Aquarium, Trustee, 1995–2007, Program Committee, 1995–2007.

Environmental Defense Fund, Trustee, 1995–2009, Science Advisory Committee, 1995–present; Co-Chair of Oceans Committee, 1997–present; Vice-Chair, 2005–present.

Royal Swedish Academy of Sciences, Beijer Institute for Ecological Economics Director, 1999–2004.

SeaWeb, 2000–2007, Director.

David and Lucile Packard Foundation Trustee, 2001–2004, Trustee Emerita 2004–present.

International Council for Science, 1999–2002, President-Elect; 2002–2005, President; 2005–2007, Past President.

Monterey Bay Aquarium Research Institute, Trustee 2007–present.

Smithsonian Institution's National Museum of Natural History, Director, 2007–present.

Aldo Leopold Leadership Program. Founder and Chair 1993–2002; Co-Chair 2003–2006; Senior Advisor and Chair of Board of Advisors, 2006–present.

Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO). Co-Founder and Lead Principal Investigator of 13 Co-PIs. (1999–present).

Science of Marine Reserves Project of PISCO, Team Leader, 2007–present.

Communication Partnership for Science and the Sea (COMPASS), Co-Founding Principal and Chair (1999–2007).

International Consortium for Research in Upwelling Marine Biogeographic Areas (ICORUMBA), 1 of 8 PIs, 1992–2007.

Climate Central, Co-Founder, Vice Chair and Secretary, 2008.

Aspen Dialogue and Commission on Arctic Climate Change, Commissioner, 2008–2010.

12. Please list each membership you have had during the past 10 years or currently hold with any civic, social, charitable, educational, political, professional, fraternal, benevolent or religious organization, private club, or other membership organization. Include dates of membership and any positions you have held with any organization. Please note whether any such club or organization restricts membership on the basis of sex, race, color, religion, national origin, age, or handicap.

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*This document is retained in Committee files.

National Academies/National Research Council Appointments

NAS, delegate to Class Membership Committee, 1997, 1998; NRC, Ecosystem Panel, 1997–1999; NAS, Robertson Memorial Lecture, Selection Committee, 1998; NAS Committee on Class and Section Structure, 1999–2001; Sub-Committee, Earth, Environment, Agriculture and Resources, 1999–2001; NAS Development Committee, 1999–2002; NAS, Member of Council, 1999–2002; NAS Council Committee on Scientific Programs, 1999–2002; NAS Council Committee on Budget and Internal Affairs, 1999–2002; First Chair of newly created Section of Environmental Sciences and Ecology of NAS, Section 63, 2000–2001; NAS Executive Committee, 2001, 2002; NAS Committee on Sustainability Science, 2002–2003; NRC Committee on International Capacity Building for the Protection and Sustainable Use of Oceans and Coasts, 2006–2007; NAE Blue Ribbon Task Force on Grand Challenges for Engineering, 2006–2007; Section 63 delegate to Council Membership Committee, 2007–2008; NRC Ocean Studies Board Review Team member, 2007–2008; NRC Committee on Ecological Impacts of Climate Change, 2008; NRC Panel on Advancing the Science of Climate Change of the Committee on America's Climate Choices, 2008–2010.

National Science Board Appointments

Member 1996–2006: The NSB provides advice to the President, Congress and the Nation about science and technology and is the Board of Directors of the National Science Foundation. Committee on Education and Human Resources, 1996–1997; Committee on Programs and Plans, 1997–2006; Task Force on the Environment, Chair, 1998–2000; International Task Force, 2000–2002, 2005–2006; Task Force on Science and Engineering Infrastructure, 2001–2003; Committee on Strategy and Budget, 2001–2006; Nominating Committee, 2002; Subcommittee on Polar Issues, 2002–2006; Nominating Committee, 2006.

Other Advisory Boards and Panels

United Nations Environment Programme (UNEP), Scientific and Technical Advisory Panel (STAP), Roster of Experts, 1993–2000; Pew Fellows Program in Conservation and the Environment, Advisory Committee, 1995–98; Corvallis City Council, Advisory Commission on Open Space, 1995–98; Living On Earth, P135 radio show, Scientific Advisory Board, 1997–2000; National Marine Fisheries Service, Ecosystem Principles Advisory Panel, 1997–2000; President's Council of Advisors on Science and Technology (PCAST), Committee on Biodiversity and Ecosystems, 1997–1998; Sea Studios Foundation, The Shape of Life production, Advisory Board, 1997–2001; Oregon State of the Environment Report, Science Panel, 1998–1999; Consultative Group on Biological Diversity, Advisor's Forum, 1998; Pacific Ocean Conservation Network, Scientific Advisory Committee, 1997–98; AAAS, Millennium Symposium, AAAS and the American Bar Association, 1998–2000; Science and Technology News Network, Advisory Board, 1998-present; National Geographic Society's Sustainable Seas Expeditions, Technical Advisory Committee, 1998–2001; World Economic Forum, Davos, Switzerland, 1998–2001, 2004–5; Earth Day 2000 National Council, 1999–2000; Ecotrust Council, 1999–present; Forum on Religion and Ecology, Advisory Board, 1999–present; International Biodiversity Observation Year, Advisor), Board, 2000–2002. Center for Informal Learning and Schools, collaboration among the Exploratorium, University of California Santa Cruz and Kings College London. 2001–2005; Sea Studios Foundation, *Strange Days on Planet Earth* production, Advisory Board, 2001–2006; Doris Duke Charitable Foundation, Advisory Committee 2002; Vulcan (Paul Allen's Organization), Advisor, 2000–2002; University of Washington, Friday Harbor Laboratories, Ten Year Review Committee, 2002; University of Washington, Department of Biology, Board of Visitors, 20022005; University of Washington, Friday Harbor Laboratories Centennial. Symposium Committee (Chair), 2003–2004; Millennium Ecosystem Assessment (MA), Convening Lead Author, (Synthesis Chapter for Business and Industry) and Lead Author (Millennium Development Goals chapter), 2002–2005; Governor of Oregon's Global Warming Advisory Group, Co-Chair, 2003–2005; The Ocean Foundation, Board of Advisors, 2006–present; Duke University Nicholas Institute for Environmental Policy Solutions, Board of Advisors, 2006–present; Stanford University Woods Institute for the Environment, Board of Advisors, 2006–present; World Commission on Protected Areas, Marine, Senior Advisory Panel, 2006–present; Google Ocean Council of Advisors, 2007–present; Sailors for the Sea, Science Advisory Committee, 2008–present; Environmental Law Institute 40th Anniversary Committee, 2008–2009; Aldo

Leopold Foundation, Advisory Council, 2008–present; The Natural History Network, Advisory Council, 2008–present.

Selection Committees

Pew Fellows in Marine Conservation 1995–98; Aldo Leopold Leadership Program 1998–2008; David and Lucile Packard Foundation, Interdisciplinary Science Program, 1998–2001; James S. McDonnell Centennial Fellowships, Selection Committee for Global and Complex Systems Fellows, 1997–99; American Association for the Advancement of Science, Science Editor-in-Chief, 1999–2000; Ecological Society of America, Nominating Committee, 2001–2002; John B. Oakes Award for Distinguished Environmental Journalism, 1999–2004; Smithsonian Institution Natural History Museum Sant Chair in Marine Science, 2005–2006; AAAS Committee on Nominations, 2007, 2008; Chair of Nominating Committee for National Science Foundation's Head of GEO Directorate, 2007.

International Council for Science (ICSU):

U.S. Delegate to First World Conference on Science, Budapest, June-July 1999; U.S. National Academy of Sciences Delegate to International Council for Science, XXVI General Assembly, Cairo, 1999; President Elect 1999–2002; ICSU Committee on Scientific Programs and Review, 2000–2002; ICSU Executive Board 2002–2007; ICSU XXVII General Assembly, as President-Elect and Chair of Forum on Sustainability Science, Rio de Janeiro, 2002; President 2002–2005; Third World Academy of Sciences 20th Anniversary, delivered Opening Remarks, Beijing PRC; Inter-Academy Panel meeting, Mexico City, 2003; U.N. World Summit on the Information Society, address to plenary session, Geneva, Switzerland, 2003; United Nations, Commission on Sustainable Development, testimony to Ministers, New York, 2004; European Science Foundation, plenary address, Strasbourg, France, 2004; Third World Academy of Sciences 15th General Meeting, Trieste, Italy 2004; Keynote Address for Inauguration Ceremony for ICSU's Regional Office for Africa—the first of four Regional Offices in development worldwide, Pretoria, S.A. 2005; Chair of Nominating Committee, 2005; Chair of Executive Board and Strategic Plan for ICSU 2006–2012; Chair of XXVIII General Assembly of ICSU, Shanghai and Suzhou, China, Oct 2005; Past President, 2005–2007; Keynote Speaker for 75th Anniversary Celebration, Paris, 2006; Chair, Press Conference for Global Launch of ICSU's and World Monitoring Organization's International Polar Year, March 2007.

International Committees (separate from ICSU):

Religion, Science and the Environment I: 95–1995: The Meaning of the Apocalypse in Today's World, member of Steering Committee 1994–1995; Religion, Science and the Environment H: The Black Sea as a Paradigm. Executive Chair of Scientific and Religious Steering Committee, 1996–1998; Religion, Science and the Environment III: The Danube, Scientific and Religious Steering Committee, 1998–2000; UNESCO (United Nations Educational, Scientific, and Cultural Organization), Scientific Advisory Board, 1996–1999; OECD Megascience Forum, Biodiversity Working Group, 1998; Royal Swedish Academy of Sciences Beijer Institute, Asko meetings, Valuing Ecosystem Services, 1998; Evolution and Culture 1999; Inclusive Wealth, 2001; Uncertainty in Science 2002; Millennium Ecosystem Assessment Project, Steering Committee, 1998–2000; U.S. delegate to First World Conference on Science, Budapest, June–July 1999; Global Environmental Change/Open Science Conference, Amsterdam, 2001; Religion, Science and the Environment IV: The Adriatic, Honorary Committee, 2001–2003; NSB Review Team, Antarctic Research Program, 2000; Environmental Defense Marine Protected Area visiting committee, Cuba, 2002; Science in Kruger National Park, Synthesis Team, South Africa, 2002; Religion, Science and the Environment V: The Baltic, Honorary Committee 2002–2003; Inter-Academy Panel, *ex officio* member, 2002–2005; Millennium Ecosystem Assessment, Convening Lead Author: Private Sector Synthesis Report; Lead Author: Millennium Development Goals Chapter; Religion, Science and the Environment VI: The Caspian Sea, Honorary Committee, 2004–2005; Religion, Science and the Environment VII: The Amazon Basin, Honorary Committee, 2005–2006; Steering Committee for International Union of Biological Sciences (IUBS)'s 29th Conference and General Assembly, 2007, Washington, D.C.; World Life Sciences Forum BioVision, Science Chair for Environment for March 2007 Forum, 2006–2007; Third World Academy of Sciences Membership Advisory Committee in Systems Biology, 2007–2009; Religion, Science and the Environment VIII: The Arctic, Honorary Committee, 2007; International Marine Conservation Congress

2009, Steering Committee, 2007–2009; European Project on Ocean Acidification, Reference User Group Member, 2008; Arctic TRANSFORM: Transatlantic Policy Options for Supporting Adaptations in the Marine Arctic, expert working group member, European Commission-funded, EU-US transatlantic dialogue, 2008–9.

Professional Memberships: (all memberships for at least the last 10 years: all current unless otherwise indicated)

American Association for the Advancement of Science.

Ecological Society of America.

American Institute of Biological Sciences.

Phycological Society of America (terminated in 2007).

British Ecological Society (honorary member for life).

Western Society of Naturalists.

Association for Women in Science.

Memberships during some of the last 10 years, but not presently:

American Society of Limnology and Oceanography (terminated in 2007).

American Society of Naturalists (terminated in 2007).

To my knowledge these clubs or organizations do not restrict membership on the basis of sex, race, color, religion, national origin, age, or handicap.

13. Have you ever been a candidate for and/or held a public office (elected, non-elected, or appointed)? If so, indicate whether any campaign has any outstanding debt, the amount, and whether you are personally liable for that debt: No.

14. Itemize all political contributions to any individual, campaign organization, political party, political action committee, or similar entity of $500 or more for the past 10 years. Also list all offices you have held with, and services rendered to, a state or national political party or election committee during the same period.

Ocean Champions—$500 (2008); $2,000 (2007); $2000 (2005); $1,000 (2004).

Steve Novick, Democratic primary race for Senate, Oregon—$500 (2007); $500 (2008).

Oregon League of Conservation Voters—$500 (2005).

Democratic National Committee—$500 (2004).

I have not held any offices in a political party.

15. List all scholarships, fellowships, honorary degrees, honorary society memberships, military medals, and any other special recognition for outstanding service or achievements.

Honorary Societies (year elected, leadership responsibilities):

American Academy of Arts and Sciences, 1993; National Academy of Sciences, 1996; elected to Council 1999–2002; Executive Committee 2001–2002; American Philosophical Society, member 1998; European Academy of Sciences, member, 2002; The Royal Society, Foreign Member, 2004; Academy of Sciences for the Developing World (TWAS), Associate Member, 2004; Academia Chilena de Ciencias (Chilean Academy of Sciences), Corresponding Member, 2007.

Honorary Doctoral Degrees:

Drexel University, 1992; Colorado College, 1993; Bates College, 1997; Unity College, 1998; Southampton College, Long Island University, 1999; Princeton University, 2001; Plymouth State College, 2002; Michigan State University, 2003; Georgetown University, May 2008.

Other Honors and Awards:

8 Science Citation Classics or Top 0.25 percent Papers, ISI (Institute for Scientific Information) Current Contents; George Mercer Award, Ecological Society of America, 1979 (co-recipient Bruce A. Menge); Outstanding Teacher Award, OSU Alpha Lambda Delta (freshman honor society), 1986; National Lecturer, Phycological Society of America, 1987–89; American Association for the Advancement of Science Fellow, 1990; Pew Scholar in Conservation and the Environment, Pew Charitable Trusts, 1992–1995; Distinguished Professor, Oregon State University, 1993; MacArthur Fellow, John D. and Catherine T. MacArthur Foundation, 1993–1998; Oregon Scientist of the Year, Oregon Academy of Science, 1994; Golden Eagle Award, Council for International Nontheatrical Events (CINE), Washington, D.C. (for National Geographic film *Diversity of*

Life), 1994, co-recipients James and Elaine Larison; AWIS Fellow, Association for Women in Science, 1997; Distinguished Service Award, Ecological Society of America, 1997; Honorary Member, Golden Key National Honor Society, 1998; National Conservation Award, Daughters of the American Revolution, 1998; Founder's Education Award, Daughters of the American Revolution, 1998; Sustained Achievement Award, Renewable Natural Resources Foundation, 1998; David B. Stone Award, New England Aquarium, 1999; Howard Vollum Award, Reed College, 1999; Honorary Member, British Ecological Society, 2001; Golden Plate Award, The American Academy of Achievement, 2001; Ed Ricketts Memorial Award, Monterey Bay National Marine Sanctuary, 2002; CSSP Leadership Citation, Council for Scientific Society Presidents, 2002; The Heinz Award for the Environment, Heinz Family Foundation, 2002; Outstanding Woman Scientist, 1 of 50 named by Discover Magazine, November, 2002; ISI Highly Cited Researcher in Ecology/Environment, 2002; Distinguished Service Award, Society for Conservation Biology, 2003; Distinguished Alumna Award, College of Arts and Sciences, University of Washington, 2003; Nierenberg Prize for Science in the Public Interest, Scripps Institution of Oceanography, 2003; Distinguished Scientist Award, American Institute of Biological Sciences, 2004; Environmental Law Institute Award, 2004 (the first scientist to receive this honor); Public Understanding of Science and Technology Award, American Association for the Advancement of Science, 2005 (the first woman to receive this award); OSU College of Science Gilfillan Award, 2006; Beijer Fellow, Royal Swedish Academy of Sciences' Beijer Institute of Ecological Economics, 2007-present; The Zayed International Prize for the Environment, for Scientific and Technological Achievements, Dubai, United Arab Emirates, 2008; Edward O. Wilson Biodiversity Technology Pioneer Award, 2009, American Computer Museum.

16. Please list each book, article, column, or publication you have authored, individually or with others. Also list any speeches that you have given on topics relevant to the position for which you have been nominated. Do not attach copies of these publications unless otherwise instructed.

Please see the attached list of all publications.**

The fallowing is a list of all invited presentations for the last 3 years. Earlier years are not listed due to the volume of information, but are available should that he deemed useful.

Invited Presentations (2006–2008)

2008:

Arizona State University, School of Life Sciences Seminar and Wrigley Lectures Series, Invited Speaker, "The Slippery Slope to Slime or A Mutiny for the Bounty? Scientific Knowledge Informing Today's Choices and Tomorrow's Ocean"; Tempe, AZ; California Current Ecosystem-Based Management meeting, Invited Speaker, "Embracing a New Era". Santa Cruz. CA; Harvard University, Biodiversity, Ecology and Global Change Seminar Series, Invited Speaker, "Seas the Day: Science Informing Today's Choices and Tomorrow's Ocean", Boston, MA; American Association for the Advancement of Science Annual Meeting, Speaker in three symposia "Finding Sustainability without stability: New Goals for a World in Flux", "Local and Global Returns on Marine Reserves: Are the Investments Paying Off?", and "Strange Days on Planet Ocean: New Insights on the Effects of Climate Change", Boston, MA; San Diego Natural History Museum, Invited Speaker, "Climate Change and the World's Oceans", San Diego, CA; OSU Society of Women Engineers, Keynote speaker "Grand Challenges for Engineers", Corvallis, OR; Port Orford Ocean Resource Team Water Festival 2008, Keynote Speaker, Port Orford, OR; University of British Columbia Fisheries Seminar Series, Invited Speaker, Vancouver, BC, Canada; Aspen Institute, Aspen Environmental Forum, invited speaker, Aspen, Colorado; University of Washington School of Aquatic & Fishery Science Lecture Series, Invited Speaker, "Oceans, Climate Change and the Pacific Northwest", Seattle, WA; University of Washington, School of Aquatic and Fishery Science inaugural graduate student-invited speaker, "Oceans, Climate Change and the Pacific Northwest" and Forum on Science, Ethics and Policy, Invited Speaker, "Scientists' New Social Contract with Society: Communicating Climate Science and more", Seattle, WA; American Museum of Natural History Spring Environmental Lecture and Luncheon, Panelist on climate change and oceans, New York, NY; NOAA–USDA National Stakeholder Meeting on Alternative Feeds for Aquaculture, Keynote Speaker, Silver Spring, MD; Georgetown University, Graduate School

** This information is retained in the Committee files.

Commencement Speaker, Washington, D.C.; Intergovernmental Oceanographic Commission (IOC)/ICES/PICES, Effects of Climate Change on the World's Oceans International Symposium, Plenary Speaker, Gijon, Spain; UNESCO/ GLOBEC, Eastern Boundary Upwelling Ecosystem Symposium, Workshop Leader, Canary Islands, Spain; National Geographic, Aspen Institute, and Linblad Expeditions Arctic Expedition for Climate Action, speaker and Commissioner, Svalbard, Norway; Google Science Foo Camp, Invited Participant, Mt. View, CA; Oregon Public Broadcasting (OPB) Salon, Guest Speaker, Newport, OR; Hatfield Marine Science Center Marine Science Media Fellowship Program; World Conservation Congress, 2 Plenary Talks (on the 'Value of Marine Reserves', and on the new 'Marine Protected Area layer of Google Earth') and 1 concurrent session (on Lessons for the Arctic from Oceans around the world). Barcelona, Spain.

2007:

University of California, Santa Cruz Fred Keeley Lecture in Environmental, Keynote Speaker, Santa Cruz, CA; University of California, Santa Cruz Panel on Women in the Environmental Sciences, Panelist, Santa Cruz, CA; American Association for the Advancement of Science Annual Meeting, Speaker in four symposia on "Human Psychology and the Science of Climate Change" "West Coast Oceanic Anomalies", "Advocacy in Science and Journalism" and "Science and Ethics of Sustainability", San Francisco, CA; Straub Environmental Lecture, Invited Speaker, "Environmental Changes and Human Well-Being: Information and Hope", Salem, OR; BioVision 2007, Speaker and Chair "Conference on Environment" and Summarizer for Closing Plenary, Lyon, France,; Joint Ocean Commission Initiative Conference on Regional Ocean Governance, Opening and Closing Remarks, Monterey CA,; IUCN Marine Summit, Invited Speaker, "Fisheries, MPAs and human well-being", Washington, D.C.; Cornell University Iscol Lecture, "Seas the Day: Recovering the Diminishing Bounty of Oceans", Ithaca, NY; Crafoord Prize Jubilee Celebration, Royal Swedish Academy of Sciences, Invited Speaker, "Seas the Day: The Slippery Slope to Slime or a Mutiny for the Bounty?", Lund, Sweden,; Joint meeting of the American Philosophical Society, the American Academy of Arts and Sciences and the National Academy of Sciences, Panel on Energy Choices, "Energy Choices, Climate Change and Oceans", Washington, D.C.; International Union of Biological Sciences General Assembly, "Natural Security: Ecosystems and Human Well-Being", Washington, D.C.; Gilfillan Lecture, OSU College of Science, Keynote Speaker, "Recovering the Bounty of the Oceans: Science and Society"; Ecological Society of America symposium "Ecology: the Integrative Science", San Jose, CA; Kristine Bonnevie Lecture, Keynote Speaker, "The Quickening Pace of Environmental Changes in Oceans: Evolutionary, Ecological and Social Implications", University of Oslo, Norway; Religion, Science and The Environment Symposium VII: The Arctic Ocean, "Global Changes for Life in Oceans"; Greenland; Fundacion COPEC Meeting "Global Changes in Ocean Ecosystems and their Implications for Science & Management", Invited Speaker and panelist, Santiago, Chile; Pontificia Universidad Catolica Seminar, Invited Speaker, Santiago, Chile; Commission Permanente del Pacifico Sur, Course on Management of Marine Protected Areas, Invited Speaker, Valparaiso, Chile; Heceta Head Coastal Conference "Oregon's Ocean: Resources and Opportunities", Master of Ceremony, Florence, OR; Linus Pauling and his Era: The Scientist as Public Citizen, Invited Speaker, "A Scientist's Conscience", Corvallis OR.

2006:

American Association for the Advancement of Science Annual Meeting, Symposium Speaker, "Scientists, the Public and Policy-Makers in Dialogue: Principles and Applications"; "Matching Scales: Human-Ecological Interface in the Marine Ecosystem", St. Louis, MO; Oregon Zoo Wildlife Conservation Lecture Series, Invited Speaker, Portland, OR; American Fisheries Society, Oregon Chapter Annual Meeting, Plenary Speaker, Sun River, OR; Douglas County Global Warming Coalition "The Latest Science on Global Warming" Public Lecture, Keynote speaker, Roseburg, OR; City Club of Portland, Invited Speaker, "Climate Change and its Implications for Oregon"; Portland, OR: American Society of Limnology and Oceanography, keynote address: 'Prospects for our Oceans; Sustainability of the Seas', Victoria, BC; The Seminar Group's Global Warming in the Pacific Northwest Conference, Keynote Speaker, 'The Science of Global Warming: What's Likely? What's Possible?' Seattle, WA; Italian Ecological Society National Meeting, Plenary Speaker, "Prospects for the Oceans: Sustainability of the Seas", Civitavecchia, Italy; Italian Ecological Society National

Meeting, Invited Speaker, "PISCO: Harnessing Interdisciplinary Science to Understand a Large Marine Ecosystem", Viterbo, Italy; Portland State University, Environmental Sciences and Resources Group, Annual Keynote Speaker, "The Environment and Human Wellbeing", Portland, OR; Colorado College, Religion and Public Life Issues in Science Symposium, Invited Speaker, "Science, Religion, and the Environment", Colorado Springs, CO; Committee on Data for Science and Technology (CODATA) of the International Council for Science, 40th Anniversary Keynote Speaker, "Science's Sine Qua Non: Making Scientific Knowledge Understandable, Relevant and Useful", Beijing, China.

Service on Editorial Boards:

American Naturalist, 1978–81; *Oecologia,* 1985–88; *Journal of Phycology,* 1987–90; *Ecological Applications,* 1989–93; *The Northwest Environmental Journal,* 1991–93; *Trends in Ecology & Evolution,* 1991–2006; *Conservation Ecology,* 1995–2001; *Issues in Ecology,* 1995–2002, 2003–2007; *Ecosystems,* 1997–99; *Environmental Conservation,* 1998–99: Advisory Editor, *Ecological Studies,* Springer-Verlag, 1993–2000; Associate Editor, *Encyclopedia of Biodiversity,* Academic Press, 1997–2000; International Advisory Board, Encyclopedic: of Global Environmental Change, Wiley, 1998–2001; Editor for Special Issue on Marine Reserves, Ecological Applications, 1999–2002; Ad-hoc editor, Proceedings of the National Academy of Sciences, 1998-present; Frontiers in Ecology, Advisory Board, 2001–2004; Human-Environment Interactions (U. Michigan book series), 2003-present; Faculty of 1000, 1 of 3 Heads of Faculty for Ecology and Evolution, 2003-present; Marine Ecosystems and Management, 2007-present.

Other Appearances Below is a selection of briefings, videos, films, televised or nationally published interviews and articles, not including local and regional media interviews or profiles or public lectures (see next section):

1995—Briefing: Newt Gingrich, Speaker, U.S. House of Representatives, on biodiversity, for 2 hours, in Atlanta, 27 January.

1996—Film: *Keeping the Earth* (produced for the Union of Concerned Scientists by New Wrinkle, Inc., in cooperation with the National Religious Partnership for the Environment); interview of J. Lubchenco in film.

1996—Exhibits and videos: at Hatfield Marine Science Center, Newport, OR, by New England Technology Group; on rocky intertidal research findings, including biodiversity and coastal communities; J. Lubchenco as scientific advisor and interviewee.

1997–98—Film: "*The Shape of Life*", 6 hour-long PBS series on the relationship between shape and function in living organisms; Scientific Advisory Committee, Sea Studios Foundation.

1997—Video: of briefing for President William Jefferson Clinton and Vice President Al Gore on climate change, East Room, White House.

1997—28 Radio and television interviews: public and commercial; local, national and international stations; taped, filmed, and call-in, live; 5 minutes to 1 hour; on climate change and state of the world.

1997—Profile: Christian Science Monitor's Outstanding Americans, 15 August.

1997—Briefings: His All Holiness Bartholomew I, Ecumenical Patriarch of the (Christian) Orthodox Church; status of the world's oceans, climate change and biodiversity; 10 days, September.

1998—Briefing: Newt Gingrich, Speaker of U.S. House of Representatives, on climate change, 2½ hours, Atlanta, GA, 20 April.

1998—Briefing: President William Jefferson Clinton, First Lady Hillary Rodham Clinton and Vice President Al Gore, on ocean issues, 1 hour, Monterey, CA, 12 June.

1998—Video: Interviewed (as Chair of Scientific and Religious Steering Committee) in *Black Sea-Voyage of Healing,* produced by Harvey McKinnon and Peter Davis, Villon Films, Vancouver, BC, 55 min. 1999.

1999—Book Profile: *The Door in the Dream: Conversations with Eminent Women in Science,* Elga Wasserman, Joseph Henry Press, 300 p. (published interview).

1999—Video: Featured in *Generation to Generation: The Story of Climate Change and Oregon,* produced by Odyssey Productions for the Oregon Office of Energy, 8 min.

1999—Popular Article: interview of Lubchenco: by Tont, Sargun A. in GEZI National Geographic Traveler (Turkish), March 2(18): 20–24.

2000—Briefing: Marine Protected Area and Marine Reserves along the West Coast; 2 days, for Academic scientists, government agency and nongovernmental organization staff, Monterey, CA.

2001—Public Community Forum: "Marine Biodiversity in Oregon" for Biodiversity Roundtable, Corvallis, OR; speaker.

2001—Briefing: "The Scientific Consensus on Marine Reserves" to the Oregon Policy Advisory Council, Corvallis, OR; speaker.

2001—Film: IMAX film *Lost Worlds* on Biodiversity; advisory committee.

2001—Film: *Empty Oceans, Empty Nets.* PBS/Habitat Media, Steve Cowan and Barry Schienberg, producers, televised presentation about ocean fisheries, interviewee.

2002—Oral Presentation: "Environment and Human Health" to the Consultative Group on Biological Diversity, Washington, D.C.

2002—Briefing: "The Science or Marine Protected Areas and Marine Reserves", 2 days, Monterey, CA, for high-level decisionmakers in state and Federal Government agencies, organized by COMPASS.

2002—Roundtable: between NAS Scientists, and White House and Federal Agency Staff on Sustainability Science.

2002—Profile: Jane Lubchenco named "1 of 50 Most Important Women in Science": *Discover* Magazine, November, Vol, 23, No. 11: 52–57.

2002—Profile: Interview with Jane Lubchenco. "Ocean Advocate" by Monica Michael Willis, *Country Living* Magazine: July, Vol. 25, No. 7:30.

2002—Popular Article: Interview with Jane Lubchenco. "State of the Planet: A Global Report Card" by Mike Klesius, in *National Geographic* Magazine: September, pp: 104–115.

2002—Briefing: "The Science of Marine Reserves" for Oregon media. Corvallis, OR.

2002—Inaugural Guest Lecture: to News Staff, Oregonian Newspaper, Portland, OR.

2002—Profile: *Career World* Magazine for students 7–12. 31(3).

2002—Press Conference: As new President of ICSU, results of scientific input into and follow-up actions to World Summit on Sustainability Development.

2002—Oral Presentation: "The Science of Marine Reserves" to Board of Directors of Conservation International, Seattle, WA.

2003—Radio Interview: "*Voice of America*" on PISCO new research, 30 minutes.

2003—Press Briefing: To 30 national and international reporters at the annual AAAS meeting, on new discoveries about coastal oceans.

2003—Seminar: Norm Thompson Outfitters, on climate change and sustainability.

2003—Seminar: Nike, Inc., on climate change.

2003—TV, Radio and Print Interviews: >30 on Pew Oceans Commission report.

2004—National Press Conference, Pew Oceans Commission Report to the Nation, National Press Club, Washington, D.C., televised nationally.

2003—National Press Conference, U.S. Capitol, Members of Congress commenting on the Pew Oceans Commission report.

2003—TV Special: *Oregon Field Guide,* Oregon Public Broadcasting, features natural history of Oregon's rocky shores.

2003—Oral Presentation: Capitol Hill Oceans Week, Washington, D.C., for panel on Marine Protected Areas and Marine Reserves.

2003—Profile: Portland *Oregonian,* Sunday paper, pages 1, 8, and 9.

2003—Opening Remarks: Third World Academy of Sciences 20th Anniversary Celebration, Beijing, with the President of the People's Republic of China, Hu Jintao.

2003—Interview—NPR Radio: The Steve Scher Show, 1 hour, call-in; Seattle; with William Ruckelshaus on the Pew Oceans Commission and the U.S. National Oceans Commission reports.

2003—Interview: KING TV: Seattle, WA, on Puget Sound as a microcosm of global ocean challenges.

2004—Address to U.N. World Summit on the Information Society: plenary session, Geneva, on the role of science in the information society.

2004—TV Film: *National Geographic's Strange Days on Planet Earth,* a 4-part PBS, NGS special feature; partnership between Sea Studios, PBS/National Geographic Society and Vulcan; scientific advisory board; aired on PBS in 2005.

2004—TV Film: *Farming the Seas,* PBS/Habitat Media Documentary Film, Steve Cowan producer; interviewee.

2004—Oral Presentation: Rotary Club of Corvallis, April; sustainability.

2004—Address to the United Nations Commission on Sustainable Development–12, High Level Ministerial Segment, on the role of science in enhancing sustainable development with particular attention to freshwater, sanitation and human settlements; New York, April.

2005—Written Evaluation of U.S. Commission on Ocean Policy draft report prepared for the Governor of Oregon, from the Marine Scientific Advisory Panel.

2004—Environmental Grant-Makers Association, keynote speaker, Kaua'i, Hawai'i.

2005—Interview: *Common Ground: Oregon's Ocean,* 30 min film produced by Green Fire Productions on the state of the ocean ecosystem off Oregon and the merits of establishing a network of marine reserves to protect them.

2005—Interview: National Academies InterViews Project. Distinguished scientists talk about their research, why they became scientists and other aspects of their careers.
http://www.nationalacademies.org/interviews/people/lubchenco.html.

2005—Testimony: Oregon State Senate Land Use and Environment Committee concerning recommendations from the OR Governor's Advisory Group on Global Warming. March 25.

2005—Press Briefing: Millennium Ecosystem Assessment, launch of the MA for North American audiences. Washington, D.C.

2005—Testimony: Portland City Council, on climate change, invited, June 8.

2005—Interviews: *Los Angeles Times, New York Times,* National Public Radio, etc. on aquaculture, May and June.

2005—Interviews on oceans and climate change: Print: *GeoTimes; LA Times; New York Times; National Geographic;* Broadcast: KPSA, San Francisco; Premier Radio.

2005—Interview: *National Geographic* Magazine. Field interviews and photo shoot for June 2006 article on state of the oceans, July 20–23.

2005—Interviews on science and society: national and international press at the International Council for Science's General Assembly, extensive coverage in China, Asia and international press.

2005—Radio Broadcast: Eugene City Club talk 'The Environment and Human Well-Being', broadcast on Oregon Public Broadcasting Radio.

2005—Forum on Climate Change: organized for community leaders of mid-Willamette Valley by PISCO and COMPASS.

2006—Interviews on global warming: Print media: *The Astorian, Oregonian;* broadcast: KPOJ Radio, KPNW Radio.

2006—Interviews on aquaculture: Print media: *Delicious Living* Magazine.

2006—Interviews on ecosystem services and the Millennium Ecosystem Assessment.

2006—Interviews on state of the oceans, marine reserves, ocean policy or Oregon's ocean, print: *The New Scientist;* OSU's *Terra* magazine; broadcast: OPB's *Oregon Territory.*

2006—Booklet: PISCO's Coastal Connections, Volume 5, highlighting new scientific findings from the PISCO team.

2006—Radio Broadcast: Oregon Public Broadcasting of Portland City Club talk "Climate Change and its implications for Oregonians."

2006—Training: Trained 18 new Aldo Leopold Leadership Fellows to be effective communicators of their scientific information (1 of 2 weeks).

2006—Interview on Maintaining the Integrity of Science: Print media: *The Scientist,* October.

2006—Interviews on the low-oxygen zone off the west coast (Print: New York Times, Oregonian, AP, and others; TV: ABC network news; NBC Portland news; Eugene KVAL news.

2006—Radio Interview on *Oregon Territory,* Oregon Public Broadcasting, on Oregon's intertidal zone, climate change, and more. The reporter and producer, Christy George received a 2007 Gracie Award from the American Women in Radio and Television for the 20 minute show.

2007—Testimony to Joint Committee on Emergency Preparedness and Ocean Policy, Oregon Legislature on "The Science of Marine Reserves" 6 March.

2007—Interview by Claudia Dreifus for *OnEarth* Magazine on climate and oceans.

2007—Interview for *Pink* Magazine on changes in oceans.

2007—Interviews on climate change and oceans for *New Scientist.*

2007—TV Interview: OPB TV for 1-hour special show on climate change in Oregon; aired 25 October; rebroadcast 30 October.

2007—TV and press interviews (*El Mercurio, La Tercera*) on climate change and Nobel Peace Prize, Santiago Chile.

2008—Testimony to Oregon Senate Environment Committee, invited, on marine reserves, 16 January.

2008—Interview: *Common Ground 2: Oregon's Ocean Legacy,* film produced by Green Fire Productions on the sustainable use of Oregon's ocean.

2008—Testimony to U.S. House of Representatives—Select Committee on Energy Independence and Global Warming, invited, "Climate and Oceans; Impacts and Implications".

2008—Training: Trained 19 new Aldo Leopold Leadership Fellows to be effective communicators of their scientific information (1 of 2 weeks).

2008—Interviewed and Quoted in *Parade Magazine* on ocean health. Chen, Daryl. 2008. "Can Our Oceans Survive?" July 27, page 6.

2008—Interviewed and Quoted in article for *Society of Women Engineers Magazine* on NAE Grand Challenges Project. Thomas, Charlotte, "Engineering's Grand Challenges—What's Your Pick?" SWE Magazine 54(5): 36–44.

2008—Interviewed and quoted in Scientific American Magazine on Hypoxia research.

2008—Content provided for new layer of Google Earth on Marine Protected Areas (MPA) and for new MPA portal ProtectPlanetOcean.org; based on PISCO's Science of Marine Reserves booklets.

2008—Profiled by Associated Press (AP) in their "Newsmakers" series.

17. Please identify each instance in which you have testified orally or in writing before Congress in a governmental or non-governmental capacity and specify the date and subject matter of each testimony.

1995—Invited testimony to the U.S. Senate Environment and Public Works Committee, on reauthorization of the Endangered Species Act. U.S. Congressional Record. 13 July.

1997—Invited testimony to the U.S. House of Representatives Subcommittee on Fisheries Conservation, Wildlife and Oceans, on upcoming International Year of the Ocean. U.S. Congressional Record. 30 October.

1997—Invited Briefing to President William Jefferson Clinton and Vice-President Al Gore on climate change, East Room, White House.

1998—Invited Briefing to Newt Gingrich, Speaker of U.S. House of Representatives, at his request, on climate change, 2½ hours, in his Atlanta, GA office, 20 April.

1998—Invited Briefing to President William Jefferson Clinton, First Lady Hillary Rodham Clinton and Vice President Al Gore, on ocean issues, 1 hour, Monterey, CA, to summarize deliberations of the National Oceans Conference, 12 June.

1999—Invited Testimony to the U.S. House of Representatives Subcommittee on Fisheries Conservation, Wildlife and Oceans, on the National Marine Sanctuaries Enhancement Act. U.S. Congressional Record.

2008—Invited Testimony to U.S. House of Representatives—Select Committee on Energy Independence and Global Warming, "Climate and Oceans; Impacts and Implications". U.S. Congressional Record.

18. Given the current mission, major programs, and major operational objectives of the department/agency to which you have been nominated, what in your background or employment experience do you believe affirmatively qualifies you for ap-

pointment to the position for which you have been nominated, and why do you wish to serve in that position?

NOAA is the Nation's premier science agency focusing on exploring, understanding, explaining and managing our oceans and atmosphere. My scientific career has been spent at exactly this nexus. My research has focused on the oceans and on the connections between the land, sea and air. Through my teaching and participation in public service, I have emphasized the role of clear and current scientific input in decision-making. I have also always stressed my belief that science should inform decision-making. It should not dictate decisions. I have led large, complex projects and organizations and served on Boards of Directors for major foundations and non-governmental organizations. These projects, organizations and boards include the American Association for the Advancement of Science, the International Council for Science, the Partnership for Interdisciplinary Studies of Coastal Oceans, the National Science Board, the David and Lucile Packard Foundation, the Monterey Bay Aquarium, and the Environmental Defense Fund. I believe that I can utilize my knowledge, skills and experience to serve the Nation by leading NOAA.

19. What do you believe are your responsibilities, if confirmed, to ensure that the department/agency has proper management and accounting controls, and what experience do you have in managing a large organization?

As the top executive in NOAA, it will be my responsibility, if confirmed, to make sure that the agency has proper management systems and accounting controls in place and working, and I take that responsibility very seriously. I will personally devote time, resources and attention to making sure that the proper internal controls are in place and that there is oversight of the "business" of NOAA. In my more than thirty-year career as a scientist, simultaneously managing multiple ongoing research projects, and other scientific, academic, and policy endeavors, I have gained a wealth of experience in running an enterprise. I understand firsthand how to manage budgets, build a management team, maximize human resources, and solve problems to deliver tangible results.

20. What do you believe to be the top three challenges facing the department/agency, and why?

I believe the top three challenges facing NOAA are the satellite program, fisheries management, and ensuring that the Nation is prepared to deal with the impacts of climate change, including changes in weather patterns and disasters. Fixing the satellite program is key to NOAA's ability to forecast accurately extreme weather events. The current problems must be solved. The cost overruns are a serious drain on the NOAA and Federal budgets and they reflect poorly on the agency. Ending overfishing by 2011 is required by the newly amended Magnuson-Stevens Act, and will require making difficult choices involving fishing jobs and fishing communities. It will require time, attention and an ability to balance competing interests. Climate change is one of the greatest challenges facing our nation; NOAA can play a key role in helping us to forecast likely changes and adapt to the inevitable impacts of climate change that we will face in the years ahead. I look forward to working with the Committee on all of these challenges, if I am confirmed.

B. POTENTIAL CONFLICTS OF INTEREST

1. Describe all financial arrangements, deferred compensation agreements, and other continuing dealings with business associates, clients, or customers. Please include information related to retirement accounts.

Oregon Public Employees Retirement System. As an Oregon State University (OSU) employee, I have been a participant in the state of Oregon's employee pension plan. I will work with OSU, the State of Oregon Public Employees Retirement System and the Office of Government Ethics to identify the proper steps to recuse myself from any related matter, if necessary, for the duration of my government service.

Variable Annuity Life Insurance Company. I have also been a participant in an IRA through this company. Twill work with the Office of Government Ethics to identify the proper steps to recuse myself from any related matter, if necessary, for the duration of my government service.

SEP IRA. I participate in a SEP IRA. I will work with the Office of Government Ethics to identify the proper steps to recuse myself from any related matter, if necessary, for the duration of my government service.

Northwestern Mutual Fund Life Insurance. I have universal life insurance through this company. I will work with the Office of Government Ethics to identify, the proper steps to recuse myself from any related matter, if necessary, for the duration of my government service.

2. Do you have any commitments or agreements, formal or informal, to maintain employment, affiliation, or practice with any business, association or other organization during your appointment? If so, please explain.

Oregon State University (OSU). If confirmed, I will go on leave of absence without pay from my faculty position at Oregon State University.

I will continue to participate in the State of Oregon Employees Retirement System. No further contributions will be made by Oregon State University during my leave of absence.

3. Indicate any investments, obligations, liabilities, or other relationships which could involve potential conflicts of interest in the position to which you have been nominated.

I have worked with the Office of Government Ethics to develop an agreement on avoiding potential and actual conflicts of interest.

4. Describe any business relationship, dealing, or financial transaction which you have had during the last 10 years, whether for yourself, on behalf of a client, or acting as an agent, that could in any way constitute or result in a possible conflict of interest in the position to which you have been nominated.

I have worked with the Office of Government Ethics to develop an agreement on avoiding potential and actual conflicts of interest.

5. Describe any activity during the past 10 years in which you have been engaged for the purpose of directly or indirectly influencing the passage, defeat, or modification of any legislation or affecting the administration and execution of law or public policy.

I have never been a registered lobbyist. I believe that it is important to provide scientific information to policymakers in order to help inform their decisions. For example, I have testified before Congress on numerous occasions, briefed the President and Vice President, served on The National Science Board and Committees of the National Academy of Sciences and the National Academy of Engineering, and participated in nongovernmental activities providing input to governmental bodies or individuals, such as the Aspen Institute Congressional Program. These activities have all been listed in answers to earlier questions.

6. Explain how you will resolve any potential conflict of interest, including any that may be disclosed by your responses to the above items.

I have worked with the Office of Government Ethics to develop an agreement on avoiding potential and actual conflicts of interest. Should other issues arise, I will seek the counsel of the Office of Government Ethics and where appropriate, would recuse myself from a decision or take any other steps necessary to in order to avoid an actual or appearance of a conflict of interest.

C. LEGAL MATTERS

1. Have you ever been disciplined or cited for a breach of ethics by, or been the subject of a complaint to any court, administrative agency, professional association, disciplinary committee, or other professional group? If so, please explain.

Our neighborhood association was involved in a water dispute in which a subset of households filed suit against the rest of the group. My husband and I were named in the group that was sued. It was resolved out of court.

2. Have you ever been investigated, arrested, charged, or held by any Federal, State, or other law enforcement authority of any Federal, State, county, or municipal entity, other than for a minor traffic offense? If so, please explain: No.

3. Have you or any business of which you are or were an officer ever been involved as a party in an administrative agency proceeding or civil litigation? If so, please explain: Please see C.1 above.

4. Have you ever been convicted (including pleas of guilty or *nolo contendere*) of any criminal violation other than a minor traffic offense? If so, please explain: No.

5. Have you ever been accused, formally or informally, of sexual harassment or discrimination on the basis of sex, race, religion, or any other basis? If so, please explain: No.

6. Please advise the Committee of any additional information, favorable or unfavorable, which you feel should be disclosed in connection with your nomination: I do not know of any.

D. RELATIONSHIP WITH COMMITTEE

1. Will you ensure that your department/agency complies with deadlines for information set by Congressional committees? Yes.

2. Will you ensure that your department/agency does whatever it can to protect Congressional witnesses and whistle blowers from reprisal for their testimony and disclosures? Yes.

3. Will you cooperate in providing the Committee with requested witnesses, including technical experts and career employees, with firsthand knowledge of matters of interest to the Committee? Yes.

4. Are you willing to appear and testify before any duly constituted committee of the Congress on such occasions as you may be reasonably requested to do so? Yes.

The CHAIRMAN. Thank you very much. Thank you for your statement.

You have talked about the importance of the integrity of science, and I mentioned the Johns Hopkins/Isaac Newton approach. You follow the truth wherever it is. I am not a scientist. If I were trained as a scientist, I think I would rigidly and forever believe what you both said.

It gets difficult in government because there are a lot of other points of view. Take climate change. I support that. There are a lot of people who produce coal in my State who are maybe less enthusiastic about it, but so be it.

How do you protect the integrity—this is for each of you—of science? Because science is something which, through your work, has led you to a conclusion—perhaps two, but at least, let us say, a conclusion: this is a better way to go than this way. How do you protect that when you are being buffeted by a variety of other interests within government?

Dr. LUBCHENCO. Mr. Chairman, if I might begin and I will let my colleague continue. I believe very firmly that the role of science is to inform our understanding and inform our decisions. The science does not tell us what to do. It helps us understand what is happening, how things are changing, and what the likely consequences of different policy choices might be. It is one of a number of factors that I believe should be taken into account in making political decisions. Those decisions will also include values, economics, politics, and other kinds of information. My hope is that the scientific information would be available in relevant and understandable ways to help inform those decisions but not necessarily to dictate any particular outcome. The choices that you make are often social decisions that should rely on the science.

Dr. HOLDREN. Let me just add to what my colleague has said, with which I fully agree. I often say to my students in the first lecture in a course I have taught for many years about environmental and resource science for policy that the scientific facts are never everything in decision-making and policymaking, but they are usually something. They are relevant in various ways to the policy decisions that are being made. And I think it is always important, therefore, to distinguish between the best assessment scientists can offer of our current understanding of situations that bear on policy versus, on the other hand, the range of policy preferences which will ultimately enter the debate based on the diverse kinds of factors that Dr. Lubchenco has mentioned.

The America COMPETES Act, signed into law in August 2007, actually requires the Director of the Office of Science and Technology Policy to develop and issue an overarching set of principles to ensure the open communication of data and results from Federal scientists and to prevent the intentional or unintentional suppression or distortion of such research findings. That is actually a big challenge in thinking about scientific integrity in the Federal Gov-

ernment. I think getting it done is going to require clarifying policies for disseminating research results, developing processes for appealing those dissemination decisions, and providing training to inform, reinforce and update managers, researchers, and the public information staffs on those policies. It is a big challenge, but we are going to get it right.

The CHAIRMAN. Dr. Holdren, there are many scientists out there. Just take climate change. I mean, there are some scientists—I mean, there are some sort of bogus papers put out and conclusions reached, but there are many scientists who have very, very different views about what the irreversible date might be, for example, on climate change; or how serious is climate change; or what do we have to do to measure its seriousness. And there are remarkable differences from scientists on that subject. Yet they are all scientists. How do you resolve that?

Dr. HOLDREN. Well, let me say, first of all, that there has always been, always will be diversity of opinion among scientists about any complicated issue. Scientists are as diverse a group as any other you will find, and people come to different conclusions about how to interpret the same data. This is routine.

My position would be that in matters of public policy, policymakers should bet with the odds. You look at the range of scientific opinion. You look at the center of gravity of that scientific opinion. You look at what the bodies that have accumulated the most expert knowledge and brought it to bear on the question have to say. You can never conclude that any particular interpretation in science is final. All science is contingent; it could change with new information, new data, new observations, new analysis. But if you are making policy, it is wise in my judgment to go with the opinion of the bulk of the part of the scientific community that has studied that particular question.

In the case of climate change, immense effort has been devoted to determining what that center of gravity of scientific opinion is. It is available to us in the reports of the National Academy of Sciences, in the reports of the Intergovernmental Panel on Climate Change, in the reports of distinguished bodies all around the world who have focused the relevant expertise available to them on this question. And the basic conclusions of all of those groups are the same. Climate change is real. It is accelerating. It is caused, in substantial part, by human activity. It is dangerous and it is getting more so.

There are lots of details on which you can find lots of difference of opinion, but the mainstream view is the one I have just stated. And if I were a policymaker betting the public's welfare on an interpretation of science, I would go with the mainstream.

The CHAIRMAN. All right. My time is up. Senator Hutchison, the Ranking Member.

STATEMENT OF HON. KAY BAILEY HUTCHISON, U.S. SENATOR FROM TEXAS

Senator HUTCHISON. Thank you, Mr. Chairman.

My first question is administrative basically, but I think it was said by Senator Wyden—and I think all of us who have served on this committee agree that we have been bipartisan and we have

been very strong for science and technology and research. My question to both of you is, will our Committee, every member of our Committee, minority as well as majority, be able to call your offices for help within your agencies with data that we might need? In other words, will you answer questions and give the same type of help to every member of our Committee?

Dr. LUBCHENCO. Absolutely, Senator.

Dr. HOLDREN. The same. I have always worked with members on both sides of the aisle in both the House and the Senate. I do not even ask my potential employees what their political affiliation is. I look forward to working with all of you.

Senator HUTCHISON. Thank you very much.

Let me just say a couple of things that are very important to me in the experience that I have had on this committee. Number one is the great need that was shown in the report, "Rising Above the Gathering Storm," for more research into the basic sciences to stay on top of the fields of the hard sciences and, second, the encouragement of teaching and recruiting young people to be interested in taking the courses in middle and high school so that they will take the courses in college, which I think you addressed somewhat.

But in the National Science Foundation, for instance, the social sciences have become I think a fairly large part, sometimes taking away from the hard sciences. And I hope that we can know where our needs are and our priorities right now, and that is to stay on top of the innovation and technological advances that have kept our economy strong through the years. So that is one area that I would like to discuss.

Second, my colleague, Senator Nelson, and I have been very interested in NASA and space, and the fact that we are going to have a gap of 5 or 6 years when Americans will not be able to fly into space is not acceptable to us. And I would like to ask Dr. Holdren if you are committed in your position in the White House to perhaps having the National Space Council revived where there is a policy focus on the concerns that we have about our space flight gap, as well as the ability to use the Space Station for basic research, which was a function of Senator Nelson's and my authorization of NASA that we did designate a part of the Space Station as a national laboratory so that there could be more research influx from outside agencies, which has begun to occur. But if we cannot get there, it is going to be hard to fulfill those missions.

Dr. Holdren, will you make NASA and science in space a priority, and do you have any thoughts about the National Space Council being a part of the White House to look at the overall focus of NASA?

Dr. HOLDREN. Thank you very much. The short answer to the second question is yes. It is a priority, and we have been looking at what the best way to resurrect the National Space Council in the White House would be. I think that is going to happen.

And there is no question that the gap in our capacity to put people in space is a matter of great concern with the Shuttle program coming to an end and its successor program not yet ready. We are looking at that very carefully, and I would look forward to working with you and Senator Nelson and the other members of this committee on how we can shrink that gap. It is going to be a great

challenge, of course, particularly in these difficult budget times, but we are committed to figuring that problem out because it is very important.

On your first question about fundamental research, again I completely agree that we need to pay very careful attention to the adequacy of our support for fundamental research in this country. That fundamental research is primarily the responsibility of Government simply because when you are talking about high-risk, high-pay-off, long-term kinds of investigations where the immediate benefits are not so obvious, nobody but the Government is going to invest the sums of money needed to get that done. And at the same time, it is relatively cheap compared to many other things that we do.

The America COMPETES Act, which really emerged in part from the report you mentioned, "Rising Above the Gathering Storm," embodied the recommendation of that report that research at the NSF, at the National Institute of Standards and Technology, and in the DOE Office of Science should be ramped up at a rate that would double it in 7 years. And that was authorized in the America COMPETES Act. I think it is a good idea. I think we will pursue very vigorously every way at our disposal to try to see that that happens, although again it will be a huge challenge in the current budget environment.

Senator HUTCHISON. Let me just say—and I do have a question for Dr. Lubchenco—that I would add NASA in there as well for the capabilities to use the Space Station and other areas of basic scientific research that can be done best in space, as you are prioritizing.

The other issue that I have—for the past two Congresses, I have introduced legislation to increase weather modification and mitigation research. My original bill was to put it in NOAA because I thought that would be the better place for it. I did not get anywhere, and it was suggested that perhaps we should put it in the White House to be in the science office, the OSTP. And it died there as well.

My question to you is—I really think it should be in NOAA with support from OSTP, but here is my question. You talk about climate change research. There are today 14 agencies of the Federal Government overlooking, overseeing, and promoting research into climate change, which clearly means there is no focus and no strategy that has really brought us into what I think is a cohesive policy.

But mitigation and modification has really not come to the forefront, and with the violence in weather that we see, which has certainly hit my State, has hit Senator Martinez and Senator Nelson's State very hard—we just saw it in Oklahoma last week—I believe it is time for us to step back and say is there something that we are doing that is making a difference in this violence of weather or is there something we could do that would affect it, either pro or con.

For instance, is there something that could be done to lessen the impact of a hurricane when it is still out in the far miles of the ocean away from land, or is there something that could be done in tornadoes, or is there something that is happening when we actu-

ally do weather modification in cloud seeding in one area that makes an avalanche occur in another area?

I do not know the answers, and I do not know if it is positive or negative. But it seems to me that if we are going to look at climate change, weather mitigation and/or modification should also be something that we try to do research on to determine if there is something that can be done or if something is done in one place, would it affect another place.

And I would ask both of you to address if you think this is worthy, where you think it would most likely reside, and would either of you be willing to help work on something that would move this priority up in the climate change arena as well.

Dr. HOLDREN. Let me take a first crack at that, and then I will turn it over to my colleague.

People have for years been studying the possibilities for weather modification, not just rain enhancement, but trying to ameliorate the power of the most powerful storms. It is an immense challenge because the power of nature manifested in these ways is enormous and it is difficult to influence or steer it. But I believe that such work needs to continue. It would need to continue even if we did not have reason to be concerned about human influences on large and powerful storms because even before human influences, we all know those storms can do tremendous damage.

So I think it is a worthy area of further research. I think it should be expanded, along with many other things that need to be expanded in our study of weather and climate.

You mentioned 14 agencies. We have in the Global Change Research Program, authorized in the Global Change Research Act of 1990, a framework for integrating the efforts in those 14 agencies and to making sure that important issues do not fall between the chairs and that, at the same time, unnecessary duplication is eliminated. I think that Act is in need of updating and expansion by the Congress, and there have been bills in both the Senate and the House that contain a lot of the needed ingredients, and I would very much want to work with this committee and others to make sure that that gets done.

I think that the weather modification issue that you are interested in would be something that could well be pursued in NOAA. There may be other agencies that are interested in it. From OSTP's standpoint, I would certainly want to be involved in the coordination that makes sure that the important research that needs to be done gets done in the place best suited to do it.

Dr. LUBCHENCO. Senator, part of your question alluded to the importance of weather forecasting, and I would note that fully a third of the U.S. GDP is dependent on accurate weather forecasting and that our ability to do that is, in fact, the product of lots of research in the past and ongoing research to make it even better and better.

I agree with you completely that it is appropriate to go beyond simple forecasting and to do the fundamental research that is appropriate to help us understand if it is possible and, if so, how to modify the impact of some of these weather-related disasters but also to guide our understanding of mitigation and adaptation efforts. I am a strong believer in the importance of fundamental research to help do the kinds of things that are needed by society.

As to where it best fits, I cannot give you that answer now, but I would be willing to work with you, if I am confirmed, and with my colleague, Dr. Holdren, and try to figure this out.

Senator HUTCHISON. Thank you very much.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you very much to the Ranking Member.

Senator Isakson will be followed by Senator Nelson, Senator Martinez, and Senator Begich. Senator Isakson?

STATEMENT OF HON. JOHNNY ISAKSON,
U.S. SENATOR FROM GEORGIA

Senator ISAKSON. Thank you very much, Mr. Chairman.

I have to say of all the nominees by the President for his Cabinet or for White House appointments that I have interviewed, Dr. Lubchenco is the most engaging and qualified. And I had a delightful meeting with her, and I have absolutely no questions of her because with all the ones I asked her yesterday she was spot-on.

But Dr. Holdren, who I am sorry I did not get the chance to meet with, in your opening statement made a statement that hits at the heart of the discussion we had yesterday, Dr. Lubchenco.

In fact, Dr. Lubchenco and I are going to do a scuba diving trip in the spring. We both share that affinity, among other things.

Dr. Holdren, when you were talking about the two strands that dictate policy and science and technology, you said the following: "meaning the use of insights from science and engineering in the formation of those parts of economic, defense, space, health, environmental policy, agricultural policy, and so on, where such insights are needed to help shape sensible policies."

My question yesterday of Dr. Lubchenco was: in the Savannah River basin between Georgia and South Carolina, we are in a category 4 drought, as are we in the ACT and the ACF. In the ACT and the ACF, there is litigation that is dictating water flows, but in the Savannah River basin, it is being done by the Corps of Engineers outside of litigation.

Recently the cfs flow was increased by 500 cfs out of Lakes Hardwell and Thurmond into the Savannah River in order to raise the level so as to protect a sturgeon. And this is not an endangered species suit. NOAA was asked to opine as to what the release should be and they did, and in reading it, it appeared to fit more of an insight than evidence.

So my question to you is this. Given that water is so essential to the life of human beings and so essential to our well-being and given that there are many policies agriculturally, environmentally, and otherwise, where NOAA or scientists are asked to opine to determine what those releases are, should that not be best based on scientific evidence rather than insight?

Dr. HOLDREN. I guess that is a question to me or to both of us?

Senator ISAKSON. It is kind of a speech. I am sorry about that. But it is really important because we are so concerned that opinions overtake facts, and the next thing you know you are making decisions based on an insight but not really sound scientific evidence.

Dr. HOLDREN. Well, again I would say the short answer is yes. We, of course, would want to base policies where science is ger-

mane on the best scientific understanding that can be brought to bear, and in circumstances where that does not happen because of lack of coordination among different agencies, because perhaps one has gotten advice from a place that did not have the best current understanding, we need to work on fixing that. But there is no question, I think, that everybody who pays attention to the intersection of science and public policy wants that communication between science and policy to be communicating the best understandings that we have.

Senator ISAKSON. Well, I appreciate that answer, which is very much similar to the answer that Dr. Lubchenco gave me yesterday. And I look forward to working with you and with NOAA when we deal with these issues that affect my State or really our region, because most all these are interstate issues not intrastate issues, to make sure we are always getting the best scientific evidence we can to dictate the right policy that affects the people we represent.

But I wish you the best and I look forward to our scuba diving trip, Dr. Lubchenco.

Dr. LUBCHENCO. Thank you, Senator.

Senator ISAKSON. Thank you, Mr. Chairman.

The CHAIRMAN. Thank you, Senator Isakson.

Senator Nelson?

STATEMENT OF HON. BILL NELSON,
U.S. SENATOR FROM FLORIDA

Senator NELSON. Picking up on the Ranking Member's questions—and by the way, Mr. Chairman, I am really excited to be the chairman of the Science and Space Subcommittee. I am going to try to do you a good job.

I am really very excited about the quality of nominees that we have in front of us, and I am very heartened by their answers.

Now, just following up on Senator Hutchison's comments about changing weather, we might not be able to change weather, but we can sure try to track weather and more accurately measure it.

Dr. Lubchenco, you and I have talked about the need for enhanced cooperation between NASA and NOAA, the earth-observing satellites, NPOES and GOES–R. And that is a big order because those two agencies have not necessarily cooperated in the past. Do you want to comment for the record on that?

Dr. LUBCHENCO. Senator, I believe that both NOAA and NASA intend to have the best possible relationships. I think we can always improve on relationships. As you are aware, there is a third entity involved in these satellites, and that is the Department of Defense. It is my opinion that some of the difficulties that we have gotten into, in terms of the two satellite programs you mentioned, are partly a reflection of the tripartite arrangement among those three agencies that has not worked to the extent that it needs to. I think that is an embarrassment. I think it needs to be fixed, and one of my highest priorities is to work with my colleagues, if I am confirmed, in those agencies, and with the Office of Science and Technology Policy, and with you to fix this problem and put it behind us.

Senator NELSON. I have the privilege of chairing that Subcommittee in the Armed Services Committee as well, and I want to work with you on that to see if we can smooth this out.

Now, Dr. Holdren, I was really very heartened to hear your response to Senator Hutchison about the National Space Council. Just for the record, I want it established that then-candidate Obama clearly came out and stated that he wanted to reactivate the National Space Council within the White House. Do you want to say any more for the record here about that in addition to what you have said to Senator Hutchison?

Dr. HOLDREN. Well, I am certainly happy to reiterate that the President remains committed to that pledge. And as I mentioned before, we are in discussion about the best way to do it, but I have no doubt that it is going to happen.

Senator NELSON. Well, that is great because one of the failings in the past—and not just with this immediate past Administration, but previous ones—is that NASA becomes the handmaiden of the Office of Management and Budget. And that is not the way to set policy by having some green eyeshade person over there determining what the policy is, whether we are talking about NASA or NOAA or whatever it is. But that is the way it has been in the past and, therefore, another reason at the high councils of high Government policymaking to have such a council right within the White House.

You are going to have four associate directors. Do you want to tell us quickly what those are going to be?

Dr. HOLDREN. Certainly, Senator. The four will be the same four Senate-confirmed associate director positions that existed in the Clinton administration. There will be an associate director for science, an associate director for technology, an associate director for environment, and an associate director for national security and international affairs.

Senator NELSON. And how are you going to coordinate with others that get into energy and climate change policies, such as Carol Browner, Dr. Chu, Nancy Sutley, as well as the NOAA Administrator?

Dr. HOLDREN. The first thing I would say about that is that the job of OSTP has always been about coordination. All of these issues are issues that get pursued in multiple agencies inside and outside the White House and are dealt with by multiple Congressional committees. So I regard one of the primary challenges and one of the primary functions of OSTP to be building the relationships that enable those interactions to work in a collaborative and efficient way. I think the people who have been named to the other positions you have mentioned in the energy domain are people of very high caliber. They are also people that I happen to have known and worked with for a long time. I have known and worked with Dr. Lubchenco for a long time. And I think as a result, in part, of the long-standing collegial relationships which we have in this set of people, we are actually going to be able to work this very well.

Senator NELSON. By the way, Dr. Lubchenco, also in accurately measuring the weather: that also directly affects NOAA in having the assets that it needs in space to measure the weather and preventing a potential problem of the increased accuracy. This is a

problem that we now have on the paths of hurricanes on that single-point failure: if the G–4 airplane is down for maintenance or because of an accident, there is an issue of having some backup there.

I want to ask you. You said at the end of your statement, Dr. Lubchenco, that you want to create a National Climate Service within NOAA. How is that organization going to interact and affect NASA's earth science programs?

Dr. LUBCHENCO. Senator, the vision for the National Climate Service would be a collaboration across a number of relevant agencies. NOAA currently has a wealth of climate data. It has deep experience in assembling those data and putting them into models that help us understand how the climate system works. And we are at a point now where we are able to do short-term forecasting of climate-related events like El Niños, for example, that have huge consequences for weather patterns around the world. The concept is to build on the very successful model of the National Weather Service and to do the same for climate services, but it clearly is an operation that would interact, in a very collaborative, collegial fashion, with a number of other agencies that have information or need of those kinds of data.

Senator NELSON. Thank you, Mr. Chairman.

The CHAIRMAN. Thank you, Senator Nelson.

Senator Martinez?

STATEMENT OF HON. MEL MARTINEZ, U.S. SENATOR FROM FLORIDA

Senator MARTINEZ. Mr. Chairman, thank you very much, and let me tell you it is a real pleasure to join the Committee and I look forward to working with you and the other members of the Committee on issues that are vitally important to our Nation and the world.

The CHAIRMAN. We are glad you are here.

Senator MARTINEZ. Thank you.

I wanted to offer to Dr. Lubchenco and Senator Isakson the opportunity to do their scuba diving trip in the Florida Keys where I think you will find an incredible natural resource in our marine sanctuary, as well as at the Dry Tortugas where the NOAA people do a fantastic job of keeping an eye on that valuable resource as well. So anyway, come down to Florida. I will be glad to host you. I am sure Senator Nelson would join me in that.

For the last two Congresses, I have been working with others in trying to advance legislation that would promote a national hurricane research initiative to improve the understanding of hurricanes, as well as the forecasting and preparedness. This came from a recommendation, a report by the National Science Board, which I would commend to your reading. It would marshal the resources of various Government agencies and research universities and private sector partners to improve knowledge of hurricane intensity, storm surges, and observation.

The whole concept is that if we know better not only that it is coming next Tuesday but how strong it is going to be or what the surge with it is going to be, because oftentimes we find that much of the damage, as we know in my colleague, Senator Vitter's State

in New Orleans, is the sea surge that sometimes does the greater damage, not the wind damage.

Would you commit to improving, Dr. Lubchenco, our ability to do the research and perhaps to encourage this type of legislation that would give you the ability to do better forecasting on hurricanes?

Dr. LUBCHENCO. Senator, first of all, thank you for mentioning the wonderful work that NOAA scientists and employees have been doing in the Florida Keys National Marine Sanctuary, and the Dry Tortugas, in particular. It is a remarkable accomplishment. And a real credit to everyone who has been involved. So thank you for recognizing their hard work and their wonderful accomplishments.

I think that we have seen the benefits of research into hurricane forecasting, and I note the remarkable improvements that have been accomplished over the last couple of decades in terms of our ability to predict hurricanes and thereby save many thousands of lives, as well as avoided evacuations. We have seen the power of investment in fundamental research that has brought about those increases. I believe there is more benefit to come from that, and I would agree with you wholeheartedly that additional research into improved forecasting, not just for the path of hurricanes, but for storm surge and the other consequences that can be very damaging would be a smart investment.

Senator MARTINEZ. We need to work on mitigation efforts as it relates to hurricanes because I think the damage could be greatly reduced if we do the right preparation.

And while passing accolades, I think the National Hurricane Center in Miami, by the way—those folks do a tremendous job. They are very dedicated people. There are certain times of the year when those of us who live in vulnerable areas like Florida stay pretty much glued to what they have to say. So it is very, very important work as well.

We have had some issues in Florida relating to fishing quotas, and it is an area where sometimes a lot of controversy arises because sometimes the research does not match up with what the experience seems to be on the field, if you will. It is an area where I hope perhaps you will attempt to put some common sense into the science to ensure that we are doing what is really best.

We want to protect our fisheries. We want to protect the resources. We want to protect the different species, but at the same time, a lot of people depend on fishing for a livelihood whether it is related to commercial fishing or simply tourism and enjoyment. And we have run into some conflict there over the recent days, and I wanted to highlight that to you and commend it for some analysis and study on your part.

I do not know that I want to take sides on that because I am not a scientist, and I know I want the resources there for my grandchildren, but I also want to make sure that when I hear complaints that sometimes seem to be based on common sense that we are not putting the practical aspects of this ahead of what might be on a scientific notional basis wrong. So I am not so sure that is a question, more of a comment.

With respect to the National Climate Service, having been in the Executive Branch, there is a certain reality, and I do not know how one frees themselves from the clutches of OMB. If you can pull it

off in this Administration, you have my congratulations. I never could manage that at HUD during the time that I was there, but I wish you well in that to both of you.

But the reality is that when you look at initiating something like a national climate service, what is going to suffer or what is going to be—in other words, how do we make that work? I can understand that, but I do not want it to be at the expense of the other work that is so very important that we are doing with weather today. So can you maybe comment on that and how you intend to approach it?

Dr. LUBCHENCO. Senator, I have not yet had an opportunity to dig deeply into all of the thinking that has been done about the National Climate Service. I think that it is a very compelling concept. The information that I have seen is, I think, suggestive that there is real opportunity here. What the trade-offs would be and exactly how it would organized is yet to be defined. I would look forward to working with the other relevant agencies and with this committee in helping to outline what that looks like.

Senator MARTINEZ. And Dr. Holdren, in the moment I have remaining, I just wanted to tell you that I worked with a number of other colleagues here on the America COMPETES Act, and I think it is a terribly important initiative. I hope that you will give it the necessary passion and interest. I believe that our competitiveness vis-à-vis the world is one of our real upcoming challenges which goes beyond climate and other issues, but it really has to do with human capital.

I have been involved also on the issues relating to immigration, and I think as we look forward to some sort of sensible immigration policy for the future of this country, that we also should look to human capital and how we can utilize the immigration laws—sensible immigration reform that our country so desperately needs—to ensure that we are not just utilizing it as a means of promoting family reunification, but we also view it as a way of improving our competitiveness in the world and as a natural resource in terms of human capital.

Dr. HOLDREN. Well, I agree with all of that, Senator, and I would certainly, if confirmed by the Senate, be giving a lot of attention to making sure that the America COMPETES Act is appropriately pursued across the many agencies that it affects.

Senator MARTINEZ. Thank you very much, both of you, and thank you for serving and thank you to your families.

The CHAIRMAN. Thank you, Senator Martinez.

Senator Begich?

STATEMENT OF HON. MARK BEGICH,
U.S. SENATOR FROM ALASKA

Senator BEGICH. Thank you, Mr. Chairman, and thank you for allowing me to shift up here. I appreciate it. I do not know if, because I had no microphones there, there was a purpose.

[Laughter.]

Senator BEGICH. After 8 weeks, they have figured it out that they do not want me to say too much. But no, Mr. Chairman, thank you. It is great to be on this committee.

And we have two very good nominees here, based on the information I have read. I have some very parochial questions. Of course, from Alaska, we would. And then I have some general questions based on your testimony, which I want to follow up.

Dr. Lubchenco, we had a great conversation. I think it was yesterday. I have lost track of time here. No day is the same anymore here. But I want to get specific on a couple things, and a couple of the issues are, again, very parochial.

But in regards to fish farming, Alaska has banned fish farming. We now produce—about 62 percent of the landed seafood stock in this country comes from Alaska. And I think we have probably the best managed fisheries in this country just by the way we do it and it is solely—or I should say, probably 95 percent based on science. Sometimes other issues get connected to it, and I think that is what has made us successful in how we have managed the efforts of Alaska's seafood that feeds this world in a lot of ways.

Can you give me your thoughts and opinions in regards to support or, I would hope the next statement would be the more logical one, no support of aquaculture in Federal waters? Farming.

Dr. LUBCHENCO. Senator, I understand that there are very real and legitimate questions that have been raised about offshore aquaculture. It is my view that aquaculture, wherever it is practiced, is a very key element of our food production systems and that certain types of aquaculture are much more benign in terms of their potential impact on the environment. I believe that there needs to be scientifically grounded information about how to achieve aquaculture that is sustainable, in other words, without adversely impacting the local or regional environment and without having negative consequences on wild-caught fisheries.

I do not believe that we have identified the right conditions under which aquaculture is sustainable. I would make that a priority if I were confirmed. Those statements pertain to aquaculture in general, and as you are well aware, there are more than 220 species that are farmed by aquaculture and each one has different issues and where it happens is critically important.

So I am not prepared to put offshore aquaculture off the table at this point. I do believe that we should not move ahead in doing that at scale until we are convinced that, in fact, it can be done in a way that is not damaging.

Senator BEGICH. Let me do additional follow up to that with respect to specifically Alaska, where the Alaska community has made a position to ban it. With waters off the shores of Alaska, with respect and understanding to where Alaska is and the communities—and there is no question in my mind we have the most sustainable fisheries in this country. So how would you look at Alaska and their aspects of what they have done in making that determination or that decision?

Dr. LUBCHENCO. Senator, I have great respect for the positions that Alaska has taken on this issue, and I believe that this is actually an opportunity to have a productive Federal-State dialogue about practices in either State waters that affect Federal waters or Federal waters that affect State waters and to come to an agreement about what actually is going to work for all of the species that, in fact, go back and forth across State and Federal waters.

We need to think about this more holistically and this is a prime opportunity to do that.

Senator BEGICH. Excellent.

One other question. I think in the past you have been on record at least with previous administrations utilizing the Antiquities Act to close large areas in the Pacific area. And it is not required that there be a NEPA or that even stakeholders are part of the process.

How do you see your role here now? Because when you are on this side of the equation, it is a little different. And how do you see ensuring that there is a process clearly with stakeholders and a NEPA-like or a NEPA process to ensure that there is a good scientific evidence that is on the table?

Dr. LUBCHENCO. Thank you for that question, Senator. I have seen firsthand scientific information that suggests that marine protected areas and no-take marine reserves can, in fact, bring huge benefit both in terms of protecting natural resources and in some cases in helping to restore depleted fisheries.

More to the point, though, is the process by which decisions are made to utilize this particular tool. It is my belief that the best processes and ones for which decisions will be respected and endure are processes that involve strong stakeholder input, public participation, and open and transparent decisionmaking, much as what is embodied in the National Marine Sanctuaries Act. So my commitment, should I be confirmed as Administrator of NOAA, would be to ensure that we do have an adequate public process that is open and transparent.

Senator BEGICH. Thank you very much, Doctor.

I have just a couple seconds. Dr. Holdren, I did not want to feel like you were left out. So I am going to give you some questions in writing. I do not know if there will be a second round or not, but I will do that.

The CHAIRMAN. There will be a second round.

Senator BEGICH. Then I will hold my question for you. Thank you.

The CHAIRMAN. I should announce, incidentally, before I call on Senator Snowe, that both Senator Hutchison and I read the FBI checks on these two distinguished folks, and it is some of the easiest reading I have ever been through.

[Laughter.]

The CHAIRMAN. Senator Snowe?

STATEMENT OF HON. OLYMPIA J. SNOWE,
U.S. SENATOR FROM MAINE

Senator SNOWE. Thank you, Mr. Chairman. And I want to welcome our two distinguished witnesses, both of whom are steeped in peer-based, sound science which we certainly welcome because so much of the credible science is going to dictate some crucial policies in your respective fields and jointly when it comes to climate change. So the expertise and experience and background and qualifications that you both bring to that endeavor is certainly going to be helpful to those of us as policymakers and especially in some very contentious debates.

Dr. Holdren, I have worked with you on the International Panel on Climate Change, which I co-chaired with the Honorable Stephen

Byers, a member of Parliament in the United Kingdom, and you contributed so much and worked so hard on the 10 recommendations that were provided back in 2005 that actually are more relevant than ever at a time when we are trying to establish, I think, some advisory guidelines for the developed and the developing countries, especially those countries like the United States and China and India outside the Kyoto Protocol.

Obviously, in considering the debate on climate change and determining what is going to be our policy, what is going to dictate the level of emissions reductions in climate change legislation that will be debated before the Congress obviously is to avert the tipping point of raising the earth's temperature. And we are about what? 350 parts per million at this point. What are you going to be advising the President in this regard? Because, obviously, it can make a difference by 2050 whether we are reducing carbon dioxide emissions by 50 percent, 65 percent, 70 or 80 percent.

Dr. HOLDREN. Well, thank you, Senator. We are at about 385 parts per million of carbon dioxide today in the atmosphere. There is, as you know, a complicated relationship between what the emissions are and what the concentrations ultimately become.

The President has taken the position—took the position very strongly in the campaign—that the United States should be aiming to reduce its emissions by something like 80 percent by 2050. That would be compatible with a global strategy that would have a reasonable chance of confining the global average surface temperature increase to about 2 degrees Celsius, or 3.6 degrees Fahrenheit. And that, in turn, I think would give us a reasonable chance of avoiding some of the worst possible outcomes from climate change. I believe the President remains committed to that goal.

Obviously, it will be a great challenge to get there, but I will point out that there will also be tremendous opportunities associated with getting there in terms of the kinds of innovation in clean energy and increased energy efficiency that will create jobs and enable this country to maintain and improve its competitive position.

The issue, of course, as you have mentioned, does involve other countries as well. It is not possible for the United States to address this question by itself. We will need to bring China and India and the other major developing countries, as well as the other industrialized countries, along in this process of reducing emissions. I am actually quite optimistic about that, and I know the President is, in part because the major developing country emitters like China and India have recognized that climate change is already harming them and it cannot be fixed without them. So I think we are going to see a process of engagement with those big emitters in the developing world, as well as with our industrial country partners.

Senator SNOWE. So you do not see any need at this point to make any adjustments on that recommendation.

Dr. HOLDREN. The whole question of exactly how to construct our intersecting energy and climate policies going forward is, obviously, going to be a question intensely discussed and interacted about between the Administration and the Congress. You know, I think at this point the President has laid out his general aims, and he will be interested in pursuing those.

But there is no question that this is a complicated domain in which there is going to be a lot of discussion. A lot of different provisions, a lot of different approaches will be discussed. The Congress is clearly going to have a tremendous role to play in this, and of course, we are looking forward to your leadership, among others, because you have been a leader in this domain in the Senate and in the world.

But it is going be a long slog. I do not want to kid anybody. This is going to be tough to fashion the policies that will get us and the rest of the world to where we should want to be in order to minimize the risks of climate change of a magnitude that we would have difficulty dealing with.

Senator SNOWE. I appreciate that.

Dr. Lubchenco, we talked in our office the other day on a number of issues and most notably as well on the fisheries. And I expressed to you at the time my deep concern about the tremendous divide and polarization that exists between our fishing communities and the men and women in the fishing industry in New England and certainly in the State of Maine and the administrators and regulators. I have never seen it more polarized in my 13 years that I have served in a leadership capacity on the Subcommittee on Oceans and Fisheries, both as Chair and as Ranking Member.

And most recently with the groundfish industry and the interim rule that was just recently announced that essentially reduces the days at sea by 60 percent to 20 days, that is about 3 weeks to make a living in the groundfishing industry. It is devastating, obviously, as I have indicated to you, particularly because the New England Fisheries Council in a 15 to 1 decision favored an alternative, and it totally dismissed the decisions made by all 15, and the 1 was, of course, the Regional Administrator who dismissed the recommendation. So here we are with 20 days at sea.

What bold steps will you take to repair this relationship? Because it clearly needs to be repaired. There is a lack of trust, rightfully so, given the arbitrariness of the regulatory process and regulators that have totally ignored and dismissed and overridden the concerns of the fishing community. They are going to be devastated. We need to preserve the fish and the fishing stock and we also need to preserve the communities.

Dr. LUBCHENCO. Senator, I believe it is time to create a new climate of trust—to have trust in the data, to have trust in the process, and to have trust in the diverse points of view. I agree with you completely that the polarization has really permeated and poisoned all of the discussions. It appears to be a seriously dysfunctional relationship.

I would pledge to make every attempt to try to begin to rebuild the trust. I have seen a number of programs where scientists and fishermen together are taking the data that they can both believe in and both rely upon to serve as a basis for having a reasonable discussion about making what are inevitably some very tough choices. There are not easy choices here. And it is often a choice between today and tomorrow.

We have seen the strong benefit of rebuilding stocks. The 12 stocks that have been rebuilt since 2001 now bring in over $2 bil-

lion into our economy. Yet jobs today are critically important, even more so than they might have been even just a few years ago.

So there are, indeed, difficult decisions and difficult choices. Those choices will be no less difficult but more acceptable if there is a better climate of trust, and I would pledge to work with you to try to begin to build that and change the tenor of the discussion and the responses to the decisions.

Senator SNOWE. I very much appreciate that, and I thank you both. Thank you.

The CHAIRMAN. Thank you, Senator Snowe.

Senator Klobuchar?

STATEMENT OF HON. AMY KLOBUCHAR,
U.S. SENATOR FROM MINNESOTA

Senator KLOBUCHAR. Thank you very much, Mr. Chairman, and I look forward to working hard on the issues before this committee facing this Congress. I want to thank you for your leadership. I know there is a lot to do from the reauthorization of the FAA to the digital TV transition, to helping our captive shippers, something that I know you care a lot about. And I am very much looking forward to it.

I want to thank you also for the Subcommittee Chairmanship. I look forward to chairing the Subcommittee on Competitiveness, Innovation, and Export Promotion. We are going to have a busy agenda.

And I also welcome our two nominees here. I note, Dr. Lubchenco, that everyone keeps inviting you to go scuba diving off the coast of Florida and other places. I could only invite you to go scuba diving in Lake Superior, which would be slightly chilly.

In fact, you may have heard I, for 2 years, served on the Oceans Subcommittee being the only non-ocean Senator on there, but Lake Superior is very important, and the Great Lakes, to that Subcommittee as well. And the economic and environmental challenges to our Great Lakes continue to mount on a daily basis, from the depletion of commercial fishing, something Senator Snowe mentioned off the coast of Maine, to health concerns posed by contaminated seafood, to the local effects of global climate change.

We have issues with Lake Superior. We have had some decreasing water levels that many believe may be due to climate change. They got up slightly last year, but overall they have been at an all-time low and it is believed that is because the ice has melted more quickly. So the water levels have gone down and our barges are having trouble getting in and it is less economical for commerce.

Up in Duluth, we have had many invasive species that are decimating the lake's ecosystems and damaging with both commercial and recreational activities. And the harbor and open water infrastructure that used to manage these problems continues to deteriorate with age, something I am sure you will hear about as well from Congressman Oberstar over on the House side.

I believe the work of NOAA's Great Lakes Environmental Research Laboratory is essential to properly sustain the Great Lakes' ecosystems. And I wondered your views about addressing the ongoing environmental initiatives being handled by the Great Lakes laboratory.

Dr. LUBCHENCO. Thank you, Senator. I embrace the challenge of coming up to speed on many of the issues in the Great Lakes because, of course, I am less familiar with those. Because I have not been at NOAA, I have not had an opportunity to be briefed on all of the work of that laboratory. I am aware of a number of colleagues who work in that laboratory and have great respect for the work that they do, but I do not pretend to know it in any great depth. I would, if confirmed, look forward to learning a lot more about it and working closely with you to make it be the best it can be.

Senator KLOBUCHAR. Well, thank you.

And you also indicated your support for the creation of a National Climate Service within NOAA. And I also hope that you will consider the Great Lakes as part of that as well.

Dr. LUBCHENCO. Absolutely, Senator.

Senator KLOBUCHAR. OK, very good. As I noted, we really have seen a lot of changes because of the climate change issue, and they are very different than the sea levels rising. We have seen the waters going down.

The invasive species issue is something this Committee has grappled with, and we would really like to do more on that. And many of these species enter our waters through the ballast water discharged by ocean-faring vessels as they enter U.S. ports. Could you talk about that issue and if you have considered that? We have had some disputes about getting this done, and I really believe we need to be pragmatic and get something done on the ballast water issue.

Dr. LUBCHENCO. Senator, we have seen huge increases in the number of invasive species around the United States and, indeed, globally. As you are well aware, there is strong evidence that many of those species are introduced through ballast water being transported from one country to another or one part of a country to another part.

This is an area where I believe there are opportunities for research to help understand how to better treat ballast water. There are existing techniques that involve exchange of ballast water mid-ocean, so if a vessel is coming from, let us say, Europe over to the Great Lakes, to discharge its ballast in the middle of the Atlantic and take in oceanic water that is less likely to have invasive species for coastal areas, Great Lakes areas. Those techniques incur some cost and under bad weather conditions can, in fact, be a risk in terms of safety. So they are not perfect.

I believe that there is ample opportunity to do a better job of recognizing the destabilizing impact of these invasive species and the economic consequences of them much more broadly than is currently appreciated and make better progress in figuring out how to prevent them from becoming established to begin with. This is partly an area of research and partly an area where it is a matter of policy—just deciding how important it is to actually have the kinds of regulations that would make a difference in this area.

Senator KLOBUCHAR. Very good. Thank you. And I know with Senator Cantwell's leadership with the work that she has done with oceans, and the Chairman's leadership here, I am hopeful we will be able to get something done. As you know, there has been some pending legislation about ballast waters that has been sitting

around for a while. I have only been here 2 years, but it seems like 2 years too long. So we hope to get something done.

Dr. LUBCHENCO. Thank you.

Senator KLOBUCHAR. Thank you to both of you. Congratulations, Dr. Holdren. I hope with our Subcommittee on Innovation and Competitiveness, we will be able to work with you in the future as well. Thank you.

The CHAIRMAN. Thank you, Senator Klobuchar.

Senator Vitter?

STATEMENT OF HON. DAVID VITTER,
U.S. SENATOR FROM LOUISIANA

Senator VITTER. Thank you, Mr. Chairman. Thanks to both of you for being here.

Dr. Holdren, one of the lines from the President's inaugural address, which I most appreciated, was his comment about science and honoring that and not having it overtaken by ideology. My concern is that as one of his top science advisors, many statements you have made in the past do not meet that test, and so I wanted to explore that.

One is from a 1971 article with Paul Ehrlich titled "Global Ecology" in which you predicted that "some form of eco-catastrophe, if not thermonuclear war, seems almost certain to overtake us before the end of the century." Do you think that was a responsible prediction?

Dr. HOLDREN. Well, thank you, Senator, for that question.

First of all, I guess I would say that one of the things I have learned in the intervening nearly 4 decades is that predictions about the future are difficult. That was a statement which at least at the age of 26 I had the good sense to hedge by saying "almost certain."

The trends at the time were not positive either with respect to the dangers of thermonuclear war or with respect to ecological dangers of a wide variety of sorts. A lot of things were getting worse.

I would argue that the motivation for looking at the downside possibilities, the possibilities that can go wrong if things continue in a bad direction, is to motivate people to change direction. That was my intention at the time. In many respects, there were changes in direction which reduced both the probability of nuclear war, in part through arms control agreements, and there were changes in direction in national and international policy with respect to environmental problems, including a good many laws passed by this Congress.

Senator VITTER. Given all of that context, do you think that was a responsible prediction at the time?

Dr. HOLDREN. Senator, with respect, I would want to distinguish between predictions and description of possibilities which we would like to avert, and I think it is responsible to call attention to the dangers that society faces so we will make the investments and make the changes needed to reduce those dangers.

Senator VITTER. Well, I would call "seems almost certain" a prediction, but that is just a difference of opinion.

Specifically, what science was that prediction based on?

Dr. HOLDREN. Well, it was based in the ecological domain on a lot of science, on the evidence of the accumulation of persistent toxic substances in the body fat of organisms all around the planet, on the rise of the atmospheric concentrations of carbon dioxide, of sulfur oxides, of particulate matter, on trace metals accumulating in various parts of the environment in large quantities, the destruction of tropical forests at a great rate——

Senator VITTER. Has all of that dramatically reversed so that this almost certainty has, obviously, been averted?

Dr. HOLDREN. Some of it has reversed, and I am grateful for that. Again, I think it has been reversed in part because of sensible laws passed by the U.S. Congress signed by various Presidents.

Some of it has not reversed. We continue to be on a perilous path with respect to climate change, and I think we need to do more work to get that one reversed as well.

Senator VITTER. OK.

Another statement. In 1986, you predicted that global warming could cause the deaths of 1 billion people by 2020. Would you stick to that statement today?

Dr. HOLDREN. Well, again, I would not have called it a prediction then and I would not call it a prediction now. I think it is unlikely to happen, but it is——

Senator VITTER. Do you think it could happen?

Dr. HOLDREN. I think it could happen, and the way it could happen is climate crosses a tipping point in which a catastrophic degree of climate change has severe impacts on global agriculture. A lot of people depend on that.

Senator VITTER. So you would stick to that statement?

Dr. HOLDREN. I do not think it is likely. I think we should invest effort, considerable effort, to reduce the likelihood further.

Senator VITTER. But you would stick to the statement that it could happen——

Dr. HOLDREN. It could happen.

Senator VITTER. One billion by 2020. OK.

Dr. HOLDREN. It could.

Senator VITTER. In 1973, you encouraged a "decline in fertility to well below replacement" in the United States because "280 million in 2040 is likely to be too many." What would your number for the right population in the U.S. be today?

Dr. HOLDREN. I no longer think it is productive, Senator, to focus on the optimum population for the United States. I do not think any of us know what the right answer is. When I wrote those lines in 1973, I was preoccupied with the fact that many problems the United States faced appeared to be being made more difficult by the rate of population growth that then prevailed. I think everyone who studies these matters understands that population growth brings some benefits and some liabilities. It is a tough question to determine which will prevail in a given time period.

But I think the key thing today is that we need to work to improve the conditions that all of our citizens face economically, environmentally, and in other respects, and we need to aim for something that I have for years been calling sustainable prosperity.

Senator VITTER. Well, since we are at 304 million, I am certainly heartened that you are not sticking to the 280 million figure.

But much more recently, namely a couple weeks ago in response to my written questions, you did say on this matter "balancing costs and benefits of population growth is a complex business, of course, and reasonable people can disagree about where it comes out." I will be quite honest with you. I am not concerned about where you or I might come out. I am scared to death that you think this is a proper function of Government, which is what that sentence clearly implies. Do you think determining optimal population is a proper role of Government?

Dr. HOLDREN. No, Senator, I do not and I certainly did not intend that to be the implication of that sentence. The sentence means only what it says, which is that people who have thought about these matters come out in different places.

I think the proper role of Government is to develop and deploy the policies with respect to economy, environment, and security that will ensure the well-being of the citizens we have. I also believe that many of those policies will have the effect and have had the effect in the past of lowering birth rates, because when you provide health care for women, opportunities for women, and education, people tend to have smaller families on average. And it ends up being easier to solve some of our other problems when that occurs.

Senator VITTER. Final question. In 2006, obviously pretty recently, in an article, The War on Hot Air, you suggested that global sea levels could rise by 13 feet by the end of this century. Now, in contrast to that, the IPCC's 2007 report put their estimate at between 7 and 25 inches. So their top line was 25 inches, about 2 feet. What explains the disparity? Why is the IPCC 600 percent off in their top level assessment?

Dr. HOLDREN. The disparity, Senator, is that the IPCC chose not to include in that numerical estimate the mechanisms by which the great ice sheets on Antarctica and Greenland could disintegrate very rapidly in a warming world. What they considered is the effect of——

Senator VITTER. Do you think it was a mistake?

Dr. HOLDREN. No, I do not say it was a mistake. In the IPCC's report, it says we are not going to include those rapid mechanisms because our models are not yet good enough to represent them quantitatively in terms of how much they could do by a particular year.

My statement was based on articles in the journals of *Science* and *Nature*—peer-reviewed publications by some of the world's leading specialists in studying ice, who had concluded that twice in the last 19,000 years in natural warming periods of similar pace to the warming period that we are experiencing now in large part because of human activities, sea level went up by as much as 2 to 5 meters per century.

The 2006 quote was not from an article I wrote. It was from an interview in which I was quoted, where I had mentioned that research which had indicated that those high rates were possible. And the IPCC did not refute that. It simply said our models cannot represent the phenomena that produce these high rates in the past, so we have produced an estimate that only includes some of the——

Senator VITTER. So bottom line, do you think the better worst case estimate is 25 inches or 13 feet?

Dr. HOLDREN. The newer analyses that have been done since the IPCC report came out indicate that the upper limit for the year 2100 is probably between 1 and 2 meters, and those are the numbers that I now quote because they are the latest science.

Senator VITTER. So you would no longer quote 13 feet.

Dr. HOLDREN. I would no longer quote 13 feet because newer science indicates that the upper limit is only about 6.5 feet.

Senator VITTER. But going back to my first question.

The CHAIRMAN. The Senator is almost at 10 minutes.

Senator VITTER. Just a final followup. You would still say—I think you did—that 1 billion people lost by 2020 is still a possibility?

Dr. HOLDREN. It is a possibility and one we should work energetically to avoid.

Senator VITTER. Thank you, Mr. Chairman.

The CHAIRMAN. Senator Cantwell, followed by Senator Warner.

STATEMENT OF HON. MARIA CANTWELL,
U.S. SENATOR FROM WASHINGTON

Senator CANTWELL. Thank you, Mr. Chairman. I too look forward to working with you in your capacity as Chairman of this Committee and working with you on the Oceans, Atmosphere, and Coast Guard Committee.

And thank you to both of the nominees before us today. We appreciate your willingness to serve.

I am sure my questions may be seen as a little more specific to the Pacific Northwest region, but I hope you will indulge me because I have many. And I will start with you, Dr. Lubchenco.

Obviously, the Columbia River salmon biological opinion has come a long way, but not without a lot of court intervention. So I guess I would like to start with: do you think that poor management within the Government led to those court interventions and decisions? And what would you do to avoid that same—what would you change under NOAA to make sure that we do not end up in the courts again?

Dr. LUBCHENCO. Senator, I think this has been one of the most challenging issues for the Pacific Northwest. I think the situation that we are in now is a result of a long history of finger-pointing at other drivers of change, both on the land side and the ocean side, and that there was a significant amount of time lost to denial of a problem and trying to blame it on someone else instead of moving on with achieving solutions.

I have not had the benefit of briefings from NOAA's staff about the current state of play and would pledge to you to come up to speed on that, if I am confirmed, as soon as possible and to work with you to try to identify the ways that we can resolve these issues. I simply do not have enough information.

Senator CANTWELL. How confident are you, though, that you can keep us out of the courts by having a strong management response, as opposed to punting and then having the courts decide?

Dr. LUBCHENCO. Obviously, it would be much better not to have to have it go to the courts, and I would make every effort to do

that. I do not have enough information right now to know how possible that is.

Senator CANTWELL. I think what we will do is follow up with some specific questions on that then. So maybe it will give you a chance to become a little more familiar with it.

A second issue which you and I have had a chance to talk about in my office is obviously the impact of hurricane-force winds off the coast of Washington, and we have had quite a bit of damage from this in the last couple of seasons. Obviously, we have a huge Doppler radar gap there. Do you agree that we need to solve this problem?

Dr. LUBCHENCO. Absolutely, Senator, and it seems like it is one that is solvable.

Senator CANTWELL. So would you say that this would be solved under your tenure time?

Dr. LUBCHENCO. I would anticipate working with you to solve that.

Senator CANTWELL. Do you think we can solve it within the next few years?

Dr. LUBCHENCO. Senator, you are probably a better judge of that than I am, but I would——

Senator CANTWELL. I would hope your tenure time would be more than a few years.

Dr. LUBCHENCO. I would like to solve this, and I would work with you to try to do that. I do not know how long it is going to take.

Senator CANTWELL. The Puget Sound Partnership is an innovative collaborative effort in the Northwest I think you are familiar with. It is an eco-based management approach to our fisheries and ecosystem and ocean governance. If confirmed, would you put resources toward this kind of effort in helping Puget Sound on its recovery plans?

Dr. LUBCHENCO. Senator, I agree with you completely that this is a model partnership in part because it acknowledges the deep interactions between a variety of different sectors on the land side and how those activities affect the health and well-being of Puget Sound and, therefore, the people in the Puget Sound area. I think it is a model that is eminently worthy of supporting and of emulating. I think it is a really nice partnership.

The extent to which I would have resources available to contribute significantly I cannot judge at this time. Part of my challenge is that because I have only been a nominee, I have not been able to be at NOAA. I have not had briefings on issues in depth, including the budget. So I need to come up to speed on that before giving you a more definitive answer on that. But I do believe the partnership is extremely important and I would hope there would be opportunity to support it financially as well as verbally.

Senator CANTWELL. Let us try the southern resident orca population. Obviously, NOAA has already—basically it said that it believes that it can take this from an endangered species to a delisting of the species back to levels, they think, from maybe 28 years ago. So if confirmed, under your leadership, what kind of resources do you see dedicated to delisting that population?

Dr. LUBCHENCO. Senator, I cannot answer the resources question. I can tell you that I think that this is something that is extremely important and I would make it a priority.

Senator CANTWELL. Do you think 28 years is a reasonable recovery time?

Dr. LUBCHENCO. Senator, I assume that those numbers are partly a function of analyses based on the growth rates of the populations and the extent to which they are currently under stress. I have not looked at those analyses in depth but I would anticipate doing so and would be eager to do so.

Senator CANTWELL. I do not want to ignore Dr. Holdren. Maybe we can get him in on this question.

Last year the Coast Guard Commandant testified before our Subcommittee that as far as resources, he thought that we had inadequate resources to respond to oil spills in the Arctic. And I want to know if either of you believe that our Government has the capability to effectively respond in the Arctic Ocean and what the Administration can promise us that we will be doing to better protect that area.

Dr. HOLDREN. Well, Senator, I do think that we have been devoting inadequate resources to our ability to operate in the Arctic. I think we are down to two heavy icebreakers in the Coast Guard, both near the end of their operational life. That is a particularly serious problem for our capacity to operate in the Arctic in an era when other countries are expanding their activities there. The capacity to respond to oil spills is, in my judgment, also not adequate, and I think we are going to have to take a careful look at how to increase the resources available to the Coast Guard and the other relevant agencies so that we can do a better job in that important region. That is, again, something else that, if confirmed, I would certainly expect to be working with members of this Committee about.

Senator CANTWELL. Thank you very much. I see my time has expired, Mr. Chairman.

The CHAIRMAN. Thank you, Senator Cantwell.

Senator Warner?

STATEMENT OF HON. MARK WARNER,
U.S. SENATOR FROM VIRGINIA

Senator WARNER. Thank you, Mr. Chairman. I appreciate the opportunity to be here and welcome the nominees.

One of the things I am still mastering—Dr. Holdren, maybe you can help me on a technology piece here—is as a freshman Senator how you appear at three different hearings that are scheduled simultaneously. I have not mastered that yet. So my apologies about missing the front part of the hearing.

I do want to start with you, Dr. Holdren, though. One of the areas that I am very interested in that the President has proposed is the creation of a chief technology officer that I believe will be reporting to you. This is something we have done in the Commonwealth of Virginia. We elevated technology to a cabinet level position. We created a CIO. I think it was one of the things that led us to being named the best-managed State in the country.

As you look at the CTO position, do you see it more as an internal function working with the CIO at OMB to bring about greater technology and efficiency inside the Federal Government, or do you see this as another kind of outreach officer to spur innovation across the broader technology community?

Dr. HOLDREN. Well, thank you for that question. Because no CTO has been announced yet and certainly is not on board yet, it is a little difficult to talk in detail about the division of responsibilities. But I think the concept has been that the CIO in the Office of Management and Budget is basically a position focused on the use of information technology within the Government to improve the operations of the Government, to improve transparency, openness, efficiency, and so on, and the CTO position has been seen primarily as an outward-reaching position whose primary responsibilities are to see that we do a better job of exploiting not only information technology but opportunities in other domains of technology to feed into the economic recovery that we so badly need and to address the other major challenges that the country faces. I think the reason the President committed so early to creating a new CTO position, which the Government has never had, was to be able to better bring technology to bear on these big challenges for the whole society.

Senator WARNER. So you would envision this individual's scope being broader than IT and outward-looking.

Dr. HOLDREN. Yes, absolutely.

Senator WARNER. How about, though, the role—I understand the CIO role, the CIO role mostly focusing on the IT space, but as you think beyond IT, how you bring technology functionality to internal workings of Government, would that be CTO or CIO?

Dr. HOLDREN. Again, it is a little difficult to speculate in great detail because some of what these positions will be will depend on the characteristics of the people who occupy them, and that is, obviously, not yet settled. But I think across the domain of technology—information technology, communications technology, biotechnology, nanotechnology—obviously there are opportunities both inside and outside the Government. There are opportunities to bring additional insights about technology to bear on questions of national security, for example, inside the Government.

But again, I believe that the President's primary intention and primary aim with the CTO position, which has been on his policy agenda since early in the campaign, is to address more effectively the opportunities for advanced technology to be brought to bear in society as a whole, not just in the Government. That does not exclude doing so in the Government.

Senator WARNER. I would hope as this role is fleshed out—and recognizing it is a new position and it could have quite a large brief—I would hope that you would look at those States who have maybe gone before. And we have made mistakes. I think actually Senator Cantwell's State, Washington State, has been active in this area, but there may be lessons learned.

Dr. HOLDREN. We will certainly be doing that.

Senator WARNER. Dr. Lubchenco, let me welcome you as well. I may be somewhat following Senator Cantwell on a more region-specific item and recognize that you may not be fully briefed up on

this. But what is critically important to Virginia and the surrounding States is the health of the Chesapeake Bay, and NOAA has played an important role in that. It seems like over the last 25 years, we have been partners with NOAA and we oftentimes have not even met the thresholds that we would have hoped to have met. I would argue that at least in recent years, the District, Virginia, Maryland, and States in the bay watershed have actually stepped up with financial resources in fairly substantial amounts.

I guess what I would ask is, recognizing you are not even confirmed yet, but do you have a sense of what additional authorities beyond just funding that NOAA might need to be a better partner with the States on restoration of the Chesapeake Bay? For example, I know there is a bay monitoring program involving a series of buoys out throughout the bay that seems a little undermanned at this point. But if you could just speak to that specifically, if you have any knowledge, and then generally about the bay.

Dr. LUBCHENCO. Senator, I do not know the answer to your question about relevant authority, and I would pledge to find out about that at the earliest possible moment.

What I do think the Chesapeake Bay situation brings to the fore, though, are the challenges inherent in managing activities that cross not only the land and in this case the estuary, the bay, but also that cross multiple jurisdictions, local, State, multiple States, as well as different State and Federal agencies. And that has been a challenge. I think the model of working across those and setting up a multistate process is a good model. I think we have seen that some parts of that worked better than others, and having adequate funding was certainly one of the challenges.

But Chesapeake Bay really is a microcosm of a lot of the larger ocean issues, coastal issues in particular, where there are activities on land that impact the quality, the health of the ecosystems and therefore the resources and the jobs that are available, and figuring out the right mechanisms to do that integration is a huge challenge.

One of my goals at NOAA is to bring a more holistic understanding of these interactions across different sectors and to think about marine spatial planning in a comprehensive sense with all appropriate parties and to do a better job of resolving issues before they get to be so incredibly challenging that it is very, very difficult to do something about them.

Senator WARNER. Well, thank you. I would simply add that as the Nation's largest estuary and one that still remains in great jeopardy, I do believe the States in the state compact have stepped up their game over the last 4 or 5 years, both in terms of water standards, in terms of runoff, in terms of funding. But we have not had a collaborative partner at the Federal level, and we look forward to having that kind of collaboration going forward. So thank you.

Dr. LUBCHENCO. Great. I look forward to that, Senator.

Senator WARNER. Thank you, Mr. Chairman.

The CHAIRMAN. Thank you, Senator Warner.

I will just conclude my part. Senator Begich then has a follow-up question, and then I will have a statement to make before we conclude.

This is not part of your responsibility, Dr. Holdren, but I judge you to be of such a high caliber that I know that you will accept this responsibility.

I think one of the greatest embarrassments in the United States of America is the fact that we have an air traffic control system which is analog. We are the only country in the western world. In fact, Mongolia is ahead of us. They are building a digital GPS air traffic control system. The consequences of this are overwhelming because if it were to be solved, it might clear up delays by 30 percent or more.

What I am saying to you is that we have a President now who seems to be enormously interested in technology and efficiency and doing things in the right way. You will have the opportunity, because of your position, of being face to face with him. We have tried in our committee to do this, and we can never get the money because of various reasons. I do not know if the President is aware of this or not because I have not talked with him about it, but I just hope very much that you will. I think it is a supremely important national requirement. It does fit into science and technology. The science and the technology are all solved and they are available. It is the fact that we will not put them to work. And I hope that you will agree to do that.

Dr. HOLDREN. Well, Senator, you were generous saying it is not my responsibility because, in fact, it is my responsibility anyplace that science and technology are not being put to the appropriate and needed uses across all the domains of the Federal agencies. I am supposed to look for the gaps and help see that the holes are filled. And this is a gap. It is an important one. The President actually has recognized it. It is certainly, if you will forgive this particular metaphor, on the radar screen of the administration, and I am determined to fix it and I know the President is determined to fix it.

The CHAIRMAN. My day is brighter.

[Laughter.]

The CHAIRMAN. Thank you, sir.

Dr. Lubchenco, I would like you to do something for me, when confirmed. The National Weather Service provides the Federal Aviation Administration with weather forecasting services, and there is this rather large controversy that is going on right now because the suggestion is because—as you know, if you take off from Dulles, you get passed on from what they call TRACON to TRACON. And there are now 21 of them across the country, and there is a suggestion that it be reduced to two. That would be highly efficient. That is met with some resistance, obviously, from some of the employees. And then there are some who say that it could involve safety issues.

But I think it is one of those things that—because it does involve weather, the National Weather Service, I think it is something that you could help in trying to resolve. It is not so much a study or a commission I am looking for. It is a bringing together of the parties so that we can quickly proceed one way or another.

Would you put your attention to that?

Dr. LUBCHENCO. I certainly would, Mr. Chairman. I do not know the details of this issue. I appreciate that it is an important one, and I would look into it.

The CHAIRMAN. Thank you.

Senator Begich?

Senator BEGICH. Thank you, Mr. Chairman.

Dr. Holdren, I am going to kind of read the question here. I have a question then, for both of you I just have a request.

First off, I appreciate both of you talking about the Arctic policy and how important that is, and I think that is a huge, evolving issue that the administration and the Congress will continue to deal with.

The Arctic Research and Policy Act of 1984 created the U.S. Arctic Research Commission as an independent agency that provides goals for Arctic research, and created the interagency Arctic Research and Policy Committee which implements these goals. The Commission, the Committee, your office, and the Office of Management and Budget have specific responsibilities outlined in the act. Yet, to be very frank with you, these entities have never really worked together, never presented a combined budget for this effort.

Will you use your office to lead this effort, once and for all, to get a combined effort from a budgetary standpoint and from reaching the policy goals?

Dr. HOLDREN. Yes, Senator. That is an easy one. The OMB and the OSTP are supposed to work together on discharging those kinds of responsibilities, making sure that interdisciplinary cross-agency efforts and new initiatives of this sort are included in the science and technology funding priorities going forward. I am not familiar with all the details of this case and how it has been handled in the past, but I can certainly promise you——

Senator BEGICH. We will provide you with some material.

Dr. HOLDREN. And I can certainly promise you that, if confirmed, I will take that up with the OMB Director as part of our mandate to get these science and technology priorities right in the budget going forward.

Senator BEGICH. Excellent.

And just one request for both of you, not for today. But as I sat here listening to all the questions, most of them relevant to your positions and the issues of what you are talking about, Arctic policy is going to be huge. And I would just be interested from your perspective—I am a very visual person, and I am afraid to ask this question because I am afraid of what the outcome will look like. But how you see and whom you see will be involved in the decisions of Arctic policy into the future by agency, so a very visual chart for me would be very helpful. I am afraid to ask for this because I am afraid that every Department division of the Federal Government now believes they have a role in it, which is great, except it will be probably the most disorganized effort. So I would be curious at some point if you could provide to me, whichever one of you that would be the most appropriate, a chart of how you see and what agencies you see—because I know there are jurisdiction issues. I know in Congress there are jurisdiction issues. But if we do not figure that out, we are never going to get to a comprehensive policy. So I will just leave that request with you.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you.

Senator Cantwell?

Senator CANTWELL. Thank you, Mr. Chairman.

This for Dr. Holdren or Dr. Lubchenco. How do you intend to make sure that agencies like NOAA have adequate say in our Government's policy choices, especially as it relates to offshore drilling? And the reason I bring this up—and I know my colleague from Alaska might be leaving. Maybe he will stay. Yes, have a seat.

[Laughter.]

Senator CANTWELL. In a letter commenting on the EIS for the Chukchi Sea oil and gas drilling plan, the National Marine Fisheries Service wrote the Minerals Management Service analysis did not present a strong enough case to NMFS that the marine resources would be adequately protected. Yet, this advice, along with similar advice from EPA and Fish and Wildlife Service, was ignored by the Minerals Management Service. So what do you intend to do to make sure that these agencies who are in charge of protecting these resources are heard on these important issues as it relates to offshore drilling?

Dr. LUBCHENCO. Senator, you have highlighted what I believe is one of the real challenges of different agencies, different jurisdictions having different kinds of responsibilities, all of which overlap in the same place. I believe that the sectoral management of different activities in oceans does not serve us well and needs to be converted into a more thoughtful mechanism for doing more holistic planning of which activities' and which sectors' uses are compatible with one another in a particular place. And this inevitably, as you have highlighted, entails interagency not only coordination and cooperation, but a mechanism for——

Senator CANTWELL. Well, I mean, to be blunt, it sounds like the Minerals Management agency blew off NMFS. So what are you going to do to make sure that that does not happen again?

Dr. LUBCHENCO. I anticipate working directly through the Secretary of Commerce and with the other relevant Secretaries, for example, the Secretary of the Interior, but also utilizing the Council on Environmental Quality and the Office of Science and Technology Policy to help establish from the outset a mechanism for not letting that happen.

Senator CANTWELL. Dr. Holdren?

Dr. HOLDREN. If I can add one thing to that. There is an entity called the National Science and Technology Council which has existed in the White House, organized by the Office of Science and Technology Policy, but bringing together all of the Executive Branch agencies typically at the deputy level that have roles in science and technology. And this is a place where in the past one has been able to address crosscutting and overlapping jurisdiction issues effectively. In the last 8 years, it has languished. It was not really fully utilized in the last administration, but our intention—certainly my intention, if confirmed, would be to revive it and utilize it fully to try to reduce the sorts of problems that you point to here.

The other thing I would mention again is I think we have in prospect a set of people across the relevant agencies who are un-

commonly experienced at communicating with each other, and beyond the structural approaches to this through the NSTC, for example, I think we are going to have some success in avoiding these problems that come from crosscutting issues and overlapping jurisdictions just because we are going to talk to each other more.

Senator CANTWELL. Well, one area in which I think we need to better understand the response is on the Office of Response and Restoration for oil spills, and we certainly have not funded that program at the level of the President's request. What do you think the impact of that is on cutting back on our Nation's oil spill response capabilities?

Dr. LUBCHENCO. I think it puts us at risk that is not really acceptable, Senator.

Senator CANTWELL. Dr. Holdren?

Dr. HOLDREN. I agree. We need to fix it.

Senator CANTWELL. Thank you.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you, Senator Cantwell.

Dr. HOLDREN. Mr. Chairman, I realize I am in danger of failing to introduce my family and friends who have accompanied me here and have supported me in this hearing. I do want to mention that my wife of 43 years, Dr. Cheryl Holdren, is right behind me, and that some of our dearest friends from Woods Hole, Bill and Pi Smith, have come to lend their moral support as well. So I wanted to thank them for that before we go any further.

The CHAIRMAN. Yes. I think thanking your wife for being here is probably pretty important.

[Laughter.]

The CHAIRMAN. I would like to conclude this with the following comments.

Number one, this is what you hope for in Government. Dr. Holdren, you are happily ensconced exactly where you are. I can even give you your address. But it is a very good life that you are leading. The same with you, Dr. Lubchenco. And yet you are giving that up for the purpose of coming to serve your Government. And I think you do that, one, because you suspect that this is an administration which really cares about what you do. It is going to respond to what you do.

But more importantly, I think that you are both very worried about the future of the planet and the oceans and the earth and the people thereon and the wildlife thereon and the fish life therein. So it is a noble service that you do, and I do not think it should be left unthanked, even before you are confirmed, for your willingness to do this. They talk about a new generation of concern about Americans, but mostly at that level they are talking about the younger people who came up through various campaigns, et cetera. And you are both very young, and I understand that. It is a magnificent service that you do our country and we are very, very lucky that you are doing it.

With that in mind, before Senator Hutchison left, we agreed that we would try to move your nominations by unanimous consent on the floor of the Senate. Now, that means that we do not do it within the Committee. But speed is very important here, for you to get

on the job as quickly as possible. So we are going to try and do that, and I want you to know that.

This hearing is adjourned.

[Whereupon, at 12:25 p.m., the hearing was adjourned.]

A P P E N D I X

PREPARED STATEMENT OF HON. JOHN F. KERRY,
U.S. SENATOR FROM MASSACHUSETTS

I am pleased to welcome Jane Lubchenco and my good friend John Holdren, two of the most powerful voices in the scientific community on the issue of global climate change. The only downside that I can think of with respect to John's nomination is that I won't get to visit him in Falmouth anymore. John has been an incredible resource to the Woods Hole Institute and to the Kennedy School at Harvard University. More importantly, he has been a tremendous voice on the critical challenge of global climate change, and we are very fortunate that he will bring that voice to this Administration.

We are facing a true crisis, and we need leaders who understand the scope and urgency of the problem and are committed to taking action to both reduce our domestic greenhouse gas emissions and actively reengage with the international process. The reality is that today, the most critical trends and facts all point in the wrong direction. CO_2 emissions grew four times faster during the last 8 years than they did in the 1990s. Two years ago the Intergovernmental Panel on Climate Change issued a series of projections for global emissions, based on likely energy and land use patterns. Well, today emissions have actually moved beyond the worst case scenarios predicted by all of the IPCC's models! Our oceans and forests are losing their natural ability soak up and store greenhouse gases. This is a stronger climate forcing signal than expected, arriving sooner than expected.

NOAA has a particularly important role in designing our Nation's climate change research, assessment and response program, which frankly has been shamefully neglected over the past 8 years. Dr. Lubchenco, I am encouraged by the work that has already been done to design a National Climate Service, a concept that Senator Snowe and I first advanced last year in the Global Change Research Improvement Act. I look forward to working together to ensure that the National Climate Service serves an important function in providing key climate information to mayors, Governors, natural resource managers, and other experts working on the ground to respond to the ongoing impacts of global climate change.

Dr. Holdren, as Director of the Office of Science and Technology Policy, you will serve as a trusted voice at the center of the President's approach to climate policy. I look forward to working with you to guide an agenda that focuses on clean energy and climate technology. As the President continues to build his budget request, I also trust that you will serve as a forceful voice within the Administration for full funding of the America COMPETES Act. In 2004, China graduated six-hundred thousand engineers. The United States graduated just seventy-thousand. We cannot continue to ignore the fact that our fiercest competitors on the global stage are out performing us in the classroom and in the laboratory.

Finally, yesterday the House of Representatives passed H.R. 554, the National Nanotechnology Initiative Amendments Act of 2009. In the coming weeks, I'll be reintroducing companion legislation in the Senate, and I look forward to working with you to ensure that the U.S. is in position to drive innovation in the field of Nanotechnology while also taking the necessary steps to ensure that nanotechnology is safe for consumers, for workers, and for the environment.

PREPARED STATEMENT OF HON. BARBARA BOXER, U.S. SENATOR FROM CALIFORNIA

Mr. Chairman: I am pleased today to express my support for the confirmation of Dr. John Holdren as the Director of the Office of Science and Technology Policy and Dr. Jane Lubchenco as the Administrator of the National Oceanic and Atmospheric Administration. Both of these individuals are renowned scientists with a deep understanding of the environmental challenges we currently face—particularly with respect to climate change. These nominations reflect the Obama Administration's

strong commitment to restoring the prominence of science to our Nation and truly represent the change we have all been anticipating.

I am confident that Dr. Holdren's experience both as a scientist as well as a long-time advisor on science and technology policy will provide a strong foundation for his work leading and coordinating our Nation's many research and development priorities.

Dr. Holdren's work on the causes and consequences of global environmental change and analysis of energy technologies and policies is well known. As Chair of the Environment and Public Works Committee, developing a comprehensive policy to mitigate and respond to climate change is one of my greatest priorities. As Congress moves forward with a climate change bill this year, I look forward to working with Dr. Holdren to address the many environmental problems that our communities, our Nation and our planet are facing.

I am also pleased that Dr. Holdren is committed to help coordinating a comprehensive Federal effort to bolster America's competitiveness in science and technology, and meeting the goals set in the America COMPETES Act passed in 2007.

Dr. Lubchenco's broad expertise as a marine scientist and experience formulating recommendations on ocean policymake her exceptionally well qualified to lead the National Oceanic and Atmospheric Administration, the agency responsible for coordinating our Nation's ocean research and policy programs.

Dr. Lubchenco is a well-known research scientist whose expertise bridges a wide range of issues under NOAA's jurisdiction, including the impacts of climate change on ocean ecosystems.

Dr. Lubchenco's work to promote the communication of science to policymakers makes her a particularly ideal choice for this position. As Founder of the Aldo Leopold Leadership Program and a Founding Principal of the Communication Partnership for Science and the Sea, she has shown a strong commitment to improving the integration of science and policy.

I am confident that Dr. Lubchenco has a deep understanding of the myriad threats facing our oceans and effective strategies for addressing them. As a Commissioner for the Pew Oceans Commission and Joint Oceans Commission Initiative, Dr. Lubchenco worked to identify priorities for improving management of our oceans. My National Oceans Protection Act, which I introduced in the 109th and 110th Congresses and plan to reintroduce again soon, would implement the recommendations of these Commissions as well as the U.S. Commission on Ocean Policy. I look forward to working with Dr. Lubchenco to advance these priorities in this Congress.

I am truly inspired by the nomination of these two distinguished individuals and look forward to working with them to promote the scientific innovation that will foster our economy and provide us with the tools necessary to protect our communities from environmental degradation.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. JOHN D. ROCKEFELLER IV TO DR. JANE LUBCHENCO

Question 1. As Administrator, your Federal fishery management responsibility will be substantial. Our fisheries are not only in need of strong conservation management, but also are a central component to our economy. How do you intend to make our fisheries sustainable and profitable, while meeting the requirements of the recently reauthorized Magnuson-Stevens Fishery Conservation and Management Act?

Answer. I support the goal of ending overfishing but also recognize this will be a difficult task, one that will require the cooperation and commitment of the fishing industry to rebuild these resources. The Act is clear that annual catch limits must be in place by 2010 that prevent overfishing. I understand that the regional fishery management councils are working hard with NOAA to meet this goal. The health of our marine fish stocks is directly linked to the health of many coastal communities. I will work with the councils and all stakeholders to ensure that overfishing is ended by the statutory deadline of 2010, based on the best science available, while carefully considering the economic consequences of our actions.

Question 1a. Are there any new approaches you intend to consider for improving the performance of fishery management, particularly regarding strengthening our Nation's regulatory enforcement capabilities?

Answer. Providing the funding needed to fully implement the Magnuson-Stevens Act is not only critical to an industry that contributes over $30 billion to the U.S. Gross National Product, but also to ensuring recreational fishing opportunities and a nutritious source of food for Americans. I understand NOAA has carefully reviewed the requirements associated with the new Magnuson-Stevens Act, and has

requested some significant increases to meet the statutory requirements in the last 2 years. I believe it is time to fully fund implementation of the Magnuson Act and to provide sufficient funding for enforcement. I also believe we need to look at what has worked in some fisheries, such as a system of catch-shares as opposed to stringent "command and control" type regulation, and see if we have sufficient data to make that system work in other fisheries.

I also understand that NOAA just provided Congress a list of the worst offending countries with respect to IUU fishing—and that it included such countries as China and Italy. It is not fair to our fishermen to hold them to a higher standard than we are willing to require of the rest of world's fish products that are sold in the United States. It is imperative that we work internationally to end the overfishing crisis and soon. If confirmed, I will take hard look at the problem of how to stop illegal fish from coming into the U.S.

Question 2. Dr. Lubchenco, many of the issues within the National Oceanic and Atmospheric Administration are new to me and I am looking forward to learning more about ocean and coastal management. Two topics that you have written extensively about are ecosystem-based management and marine protected areas. Could you tell me a bit more about your philosophy on using these two approaches as management tools for our oceans?

As Administrator, what steps would you take to move toward a more ecosystem view of ocean conservation and management, including improving resilience of coastal communities and marine ecosystems and resources given the expected impacts of global warming and ocean acidification?

Answer. Ecosystem-based management is far superior to managing ocean resources on a sector-by-sector basis and I would like to see states and local governments working toward using this approach. NOAA should lead by example—NOAA should look at its own management decisions on a more ecosystem basis rather than by sector or statute. I hope to implement greater regional governance within NOAA across its programs. My predecessor, Admiral Lautenbacher, began the difficult process of breaking down the "silos" within NOAA. If confirmed, I would like to continue and increase those efforts.

Marine protected areas are one tool that can be used to rebuild fisheries, safeguard ocean resources before they become depleted, and help ensure healthy oceans. Marine Protected Areas can be used in combination with other tools. However, each area in the ocean is unique, and regulatory options should be evaluated on a case-by-case basis to determine which combination of tools is most appropriate to meet the stated goals and objectives of the region. When declaring sanctuaries or marine protected areas, I believe we must ensure an open and inclusive process that provides all stakeholders an opportunity to participate as described in both the National Marine Sanctuaries Act and the Magnuson-Stevens Act.

Question 3. Given that piecemeal efforts to advance offshore aquaculture are occurring, what is your position on the need for or your support of creating a national framework for aquaculture in the United States? What environmental controls are needed to support the industry without impacting wild fish stocks and their ecosystems? What do you see as the largest barriers to a healthy U.S. aquaculture industry?

Answer. Offshore aquaculture may be an important part of our future food supply. We need to put our best scientists to work to figure out if it is possible to raise fish in the open ocean in a manner that produces safe seafood and does not cause lasting harm to the marine environment. We are not there yet. Moreover, there are no permits yet available for open ocean aquaculture in Federal waters. NOAA does not have a fully implemented national aquaculture program, or even authority to issue these permits—it is still in the research and development phase. I will take a hard look at what is being considered in the Gulf of Mexico to determine if it is within the Department's authority to allow aquaculture there. Regardless, we must begin to develop the technology and the permitting process to be prepared. I will work with Congress to do just that.

Question 4. Dr. Lubchenco, in December of last year, the Government Accountability Office released a report on the National Marine Fisheries Service and marine mammal protection. The report concluded that the National Marine Fisheries Service relies on incomplete, outdated, or imprecise information about human-caused mortality for many marine mammals stocks. Are you aware of this issue within the National Marine Fisheries Service?

Answer. I was not aware of this issue. Thank you for bringing it to my attention.

Question 4a. What steps do you plan on taking to address this issue?

Answer. I will re-double the agency's effort to conserve marine mammals in the face of increasing threats from humans, including requesting additional funding if

it is needed to meet the agency's statutory obligations under the Marine Mammal Protection Act and Endangered Species Act.

Question 4b. I know there are a multitude of issues that need your immediate attention once you are confirmed as the next Administrator of NOAA, will marine mammals be one of the issues on your radar screen?

Answer. Absolutely, yes.

Question 5. Dr. Lubchenco, I am concerned with the status of the International Whaling Commission. If confirmed for Administrator of the National Oceanic and Atmospheric Administration what steps do you plan to take to try and strengthen the International Whaling Commission and reduce the number of whales that are still killed each year?

Answer. Unfortunately, despite the International Whaling Commission (IWC) moratorium on commercial whaling, there are thousands of whales killed each year and their meat ends up being sold in markets in Japan, Iceland and Norway. I will work to see that the scientific whaling loophole, and others like it that allow commercial whaling to continue, are closed.

Question 5a. Do you believe an essential role for the United States is to ensure whale conservation becomes and remains the IWC's focus?

Answer. Yes. I believe that the IWC must re-focus itself on conservation and dealing with the many threats to whales that exist today—including climate change, marine pollution, and ocean noise.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARK BEGICH TO DR. JANE LUBCHENCO

Question 1. Some 62 percent of the Nation's seafood is landed in Alaska, none of its fish stocks are considered overfished and wide areas of ocean have been proactively closed to fishing to protect subsea habitat. As managed by the North Pacific Fishery Management Council, Alaska is generally considered to have one of the best managed fisheries in the world yet some have proposed changes in the regional fishery management council structure to address overfishing and other issues apparent elsewhere in the Nation. What changes do you propose in the regional council process and how might that affect the regulatory process in Alaska?

Answer. I wish to commend the North Pacific Fishery Management Council for its recent decision to study fishing in the Arctic before beginning to permit fishing at industrial levels. I applaud their taking the long-term view. I do not currently envision changing the council process.

Question 2. Catch share systems have been proposed as a way to advance conservation, safety and market-focused fishery management goals. Many Alaska fisheries—pollock, halibut and crab—already operate under such systems. Critics have criticized privatizing a public resource. Do you support implementation of catch-share programs?

Answer. Yes. Recent scientific studies—and the performance of many of Alaska's fisheries—show that those fisheries operated with catch share management have better environmental and economic records than other fisheries managed without them. On the topic of privatization, fisheries are a public trust resource, meaning they belong to all Americans. The law and court decisions make it clear that catch shares are a privilege not a right. They do not change the fact that fisheries are a public trust resource. Most management without catch shares has been proven to be inadequate to meet NOAA's public trust responsibilities. One of the best ways to ensure the public will benefit from healthy, profitable fisheries into the future is to add catch shares to our management tool box.

Question 2a. If so, would you support initial quota allocations that respect the historical participation of crewmembers, as well as skippers and owners?

Answer. Yes. Catch share systems are flexible and can accommodate share allocations to skippers, crew, communities, sectors, and others. I look forward to working with the Fishery Management Councils on a wide variety of catch share designs that will ensure we have healthy marine ecosystems and healthy fishing economies.

Question 2b. Given the variability in fisheries, do you see a need for national standards for such programs?

Answer. The Magnuson-Stevens Act has standards and guidelines to assist in the implementation of catch shares. I believe we need more expertise on these programs but one thing emerging from the research is that there is no one type of catch share program that works for every fishery. Catch shares designs need to be tailored to the individual fishery and marine ecosystem.

Question 3. Will you have a deputy in your office that focuses solely on oceans and fisheries issues?

Answer. Yes, I intend to appoint an Assistant Secretary for Oceans.

Question 4. Alaska coastal communities that depend on ocean resources for subsistence, commercial and recreational uses are often faced with critical resource related issues. The Sea Grant program, funded in part by NOAA, works to bridge science and technological information with coastal residents to help them make informed decisions. In Alaska there are 10 extension agents spread throughout the state. Nationally Sea Grant is affiliated with 32 top universities across the Atlantic, Pacific and Gulf coasts and the Great Lakes conducting scientific research, education, training, and extension projects designed to foster science-based decisions about the use and conservation of our aquatic resources. Regrettably, Sea Grant's funding has stagnated over the last 6 years.

As NOAA Administrator, will you support the Sea Grant program and help it to grow so that, as these big issues come before us—notably climate change and its impact on our marine resources, our coastal residents can adapt at the most local of levels?

Answer. Yes. I am a strong supporter of the Sea Grant program.

Question 5. Scientists and Alaska coastal communities are becoming more and more concerned about the effects of ocean acidification on our marine life. It is predicted that the average acidity of the oceans could triple by the end of this century, which could have a devastating effect on marine life. How should the Nation best approach the issue of ocean acidification?

Answer. The problem of ocean acidification is quite alarming. The most obvious way we can address it is by reducing our carbon emissions.

Question 6. NOAA currently conducts significant research in Alaska. Unfortunately, most of the research vessels doing Alaska research are home-ported outside of the state, either in Oregon, Washington or California. Will you work with the Alaska delegation so more research vessels conducting Alaska research are based in Alaska?

Answer. I am not yet deeply familiar with the specific issues regarding home porting of NOAA research vessels. But if confirmed, I will study these issues and look forward to working with the Alaska delegation on this issue.

Question 7. Icebreakers are a critical need in Arctic research and our Nation's two polar-class icebreakers, operated by the Coast Guard, are more than 30 years old, far beyond their service lives. A recent National Academy of Sciences report concluded that "U.S. icebreaking capability is at risk of being unable to support national interests in the north and the south." Will you commit to supporting re-investment in such infrastructure, critical to the conduct of scientific research?

Answer. Yes. I believe these are critically important for our Nation.

Question 8. NOAA is responsible for mapping and surveying our coasts, which is critical data for marine transportation, resource development, environmental protection and recreation but some critical shortfalls are apparent across the Nation and in Alaska, especially due to Arctic warming and erosion. How will you address this survey shortfall and will you continue to use private contractors to assist in this effort?

Answer. I will work to obtain the funding necessary for survey work, particularly in Alaska, where I understand there have been minimal surveys. This survey work is critical to navigation safety there, particularly as shipping traffic is expected to increase in the Arctic.

Question 9. NOAA listed beluga whales as an endangered species last October. The listing means any Federal agency that funds or authorizes activities that may affect the whales in the area must first consult with the National Marine Fisheries Service to determine the potential effects on the whales. This ruling could affect fishing and oil and gas development in Cook Inlet, expansion of the Port of Anchorage, a vital lifeline for most Alaskans and the U.S. military presence there, and could necessitate expensive modifications to Anchorage's wastewater treatment facility, which the EPA has determined does not affect belugas. I am not aware of any scientific information showing that either of these activities have any effect on beluga populations. As NOAA Administrator, how will you deal with agencies regulating these industries and activities as it relates to the beluga listing? Will you assure Alaskans that all decisions will be based on the best available science?

Answer. I will always work to ensure that the agency's decisions are based on the best available scientific information. I pledge to look into this situation, recognizing that the listing decision is already made. I will review implementation of the decision, particularly what mitigation measures are required to try to ensure that

Beluga whales can be protected without causing unnecessary economic impacts on Anchorage and the surrounding areas.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. BARBARA BOXER TO DR. JANE LUBCHENCO

Question 1. As a Commissioner for the Pew Oceans Commission and Joint Oceans Commission Initiative, you worked to identify priority actions for addressing the challenges facing our oceans. Some of the recommendations highlighted by these Commissions included the need for a national ocean policy and national and regional ocean governance reform. What role do you see for NOAA in implementing these reforms, and what challenges does the agency face in doing so?

Answer. I support a NOAA organic act. As a member of the Pew and the Joint Ocean Commissions, I have studied this issue. This is another good idea whose time has come. Ocean issues will not get the attention and focus they deserve in the government without a NOAA organic act. Currently NOAA's organization and authorities are a patchwork quilt of overlapping jurisdictions with other agencies, that can hinder efficient decision-making on issues concerning the ocean and its resources.

Question 2. As you know, the oceans play a tremendous role in controlling Earth's climate and are being severely impacted by climate change. As the NOAA Administrator, how will you work with other agencies such as NASA and the EPA to provide the tools necessary for understanding and responding to climate change? What do you see as some of the top priorities for NOAA, both in terms of research and management, on this issue?

Answer. I believe we need a National Climate Service to meet the needs of our Nation to better understand climate impacts and deliver information critical to adaptation, mitigation, and management planning. Climate change is and will continue to be one of the most important challenges facing our Nation. Working with many other agencies, including the EPA, Department of Interior, Department of Energy and Department of Agriculture, the White House, NOAA should lead a National Climate Service based on its existing statutory mandates to provide climate information and services and experience managing end to end climate operations. NOAA can build upon its strong climate monitoring, research, and assessment capabilities, and translate climate data and research into information and services that address the needs of stakeholders at the local, state, regional, and national level.

Question 3. The number of commercial and industrial uses in Federal waters has been growing and will likely continue to grow in the future. Proposals for new offshore activities such as oil, gas, and renewable energy production, aquaculture, or military exercises have often been controversial due to their potential impacts on marine ecosystem health and existing uses of marine resources. For some of these activities, NOAA is not the lead Federal agency of jurisdiction. As Administrator, how will you work to promote NOAA's coordination with other agencies in evaluating and managing these activities? Will you involve states in decisions about the use of Federal waters off their coasts?

Answer. NOAA should lead the Federal Government's efforts to coordinate the development of our offshore resources. Our nation needs an integrated ocean plan so that we can ensure the most efficient and environmentally sound development and use of these important ocean resources. I believe states must be our partners in this endeavor. I will use NOAA's existing authorities to accomplish this planning and where appropriate permitting.

Question 4. When the Magnuson-Stevens Fishery Conservation and Management Act was reauthorized in 2006, Congress reaffirmed its commitment to rebuild stocks in as short a time as possible, not to exceed 10 years in most cases. The reauthorization strengthened existing mandates to prevent and end overfishing through a system of science-based catch limits and accountability measures. The National Marine Fisheries Service published a final rule on January 16, 2009 containing the guidelines necessary to implement these requirements. Would you be willing to provide some additional technical guidance and policy directives to avoid the misinterpretation of some potentially unclear provisions in the rule? Also, more broadly, how will you ensure that the proper guidance and tools are in place to end overfishing by 2011 and rebuild depleted stocks in as short a time-frame as possible?

Answer. I understand the concern about the guidelines but I have not reviewed them in detail yet. If confirmed, I will give them a hard look and look forward to working with you on implementation. It is important that this rule on setting catch limits be done right. If it is not, then we won't be able to end overfishing by 2011.

Question 5. I am personally very interested in marine mammal conservation, particularly since over 1/3 of the world's whale and dolphin species, including 6 threatened or endangered whale species, spend part of the year in California's waters. Since many of these species are highly migratory, their protection hinges on our collaboration with other nations. Two issues that particularly concern me right now are the future of the United States' dolphin-safe tuna label, which I worked along with the current Vice President to establish, as well as the potential resumption of commercial whaling. What role do you see for NOAA in formulating a United States position on these issues and working with international governments and organizations to advance that position?

Answer. I believe NOAA should take the lead in formulating U.S. positions on these important issues. I look forward to working with other governments and non-governmental organizations to ensure even greater protections for whales and other marine mammals and to promote seafood integrity and safety.

Question 6. As a widely respected research scientist who has worked to promote greater communication of science to policymakers, you obviously understand the importance of scientific integrity and transparency. I appreciate your affirmation of this philosophy in your testimony. Under the Bush Administration, there were serious concerns about political suppression and manipulation of scientific work at agencies. As Administrator of NOAA, how will you work to promote scientific integrity at NOAA and elevate the role of science in policy decisions regarding our oceans and atmosphere?

Answer. I believe that unbiased and authoritative science is the bedrock upon which sound environmental decisions are made. A resilient society and economy depend on informed decisions regarding environmental challenges and resource management issues. If confirmed, I will ensure that NOAA will provide the Nation with scientifically rigorous, unbiased assessments of the often difficult and controversial environmental challenges and opportunities facing us.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARIA CANTWELL TO DR. JANE LUBCHENCO

Question 1. As you know, salmon recovery is a shared effort of numerous entities at many levels. For example, the Washington Department of Fish and Wildlife is responsible for a great deal of scientific monitoring of ESA-listed stocks in the Columbia River. While I'm sure that as a scientist you're dedicated to ensuring NOAA uses the best available science for managing these stocks, a major limiting factor is the availability of the data and monitoring we need to understand them. How do you plan to address current shortfalls in our data and monitoring of ESA-listed Columbia River stocks (such as lower Columbia Coho)? What is NOAA's role in ensuring that data collection and monitoring is increased and improved—particularly when many of NOAA's partners like state resource agencies are faced with enormous budget cuts? Does this mean NOAA will devote the resources needed to fill in those gaps?

Answer. NOAA cannot do its job without sufficient funding. NOAA needs more funding and I will work with OMB and the Congress to get it. NOAA's FY 2009 budget request is $4.1 billion. NOAA's appropriation has been flat at $3.9 billion since FY 2005, while its mandates and the demand for its services have grown. With sufficient funding I believe we can improve the agency's data collection and monitoring. .

Question 1a. What linkage do you see between harvest and hatcheries? Should salmon and steelhead stocks listed for protection under the Endangered Species Act—for which Northwest ratepayers are paying approximately $900 million a year—be subject to such robust harvest levels? How do you balance these two responsibilities to achieve recovery? Since NOAA is endorsing many of the proposed hatchery reforms, what is NOAA's role in helping to provide the resources needed to actually make those reforms happen?

Answer. I am not familiar with the specific issues regarding harvest levels and hatchery reforms in Washington, but if confirmed I will study this issue closely and look forward to working with you on a balanced approach. In general, I believe that the science does not dictate policy decisions but should inform them.

Question 2. Individual quota share programs have been implemented, or are in development, in a number of fisheries important to Washington state fishers and processors, including fisheries for Alaska pollock, Pacific whiting, Alaska flatfish and North Pacific crab. What is your view on Limited Access Privilege Programs (LAPPs)?

In the 2006 Magnuson Act reauthorization process, many cited Federal fisheries management off Alaska as a model for management of U.S. fisheries and proposed amendments to incorporate Alaska groundfish management requirements, including catch limits and catch accounting, into the Act. Do you agree that the North Pacific Council has a good record in managing groundfish stocks and do you support the council process going forward?

Answer. In general, I support catch share programs, but recognize the challenges of design and implementation. There is no one-size-fits-all solution when it comes to fisheries management. In addition, I want to restate my support for the recent decision by the North Pacific Fishery Management Council to study fishing in the Arctic before beginning to permit fishing at industrial levels

Question 2a. Some advocate shutting down commercial and recreational fisheries in some Federal waters using the Antiquities Act, the National Marine Sanctuaries Act, a new Marine Protected Areas regime, a national network of Ocean Heritage Areas, and other processes. What is your view on using these processes as opposed to continuing to use the regional fishery management council process for making policy decisions of this nature?

Answer. I firmly believe that the designation and ongoing management of marine protected areas should involve a highly collaborative public process, as exemplified by the authority provided under NOAA's National Marine Sanctuaries Act and the Magnuson-Stevens Act. I feel strongly and will work to ensure that any marine national monument—or portion thereof—for which NOAA has been or will be delegated management responsibilities should have the same protections, management tools, and robust public involvement that are available for national marine sanctuaries.

Question 3. Are you acquainted with NOAA's efforts—through a formal procurement process—to find a new homeport for its Marine Operations Center-Pacific, now in Seattle? Will you affirm that the final decisionmaker in the procurement process for relocating MOC–P will afford a full and fair opportunity to all who submit an offer for a new location for the MOC–P?

Answer. Absolutely, yes.

Question 3a. I understand that the competitive process for deciding the new location for the MOC–P will be decided on a "best value" basis. While that is a good basis on which to make a final decision, it is somewhat subjective. Will you commit to having the definition of "best value" include a location's comprehensive total cost to the government (not only for the real estate lease, but for cost of ship operations and costs borne by the NOAA workforce subject to this relocation)?

Answer. I am not familiar with the specific issues regarding what constitutes the best value in determining the home port of a fleet, but if confirmed I will study them and will work with you on this issue

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Response to Written Questions Submitted by Hon. Daniel K. Inouye to Dr. Jane Lubchenco

Question 1. Dr. Lubchenco, you are a world-renowned scientist and have taken great strides toward integrating ecological systems and human health, the economy, social justice and national security issues. Given NOAA's responsibility to balance resource conservation with fisheries regulations, and a mandate to also ensure economic viability where possible, how will you seek to move forward with an integrated approach to the implementation of Magnuson-Stevens? For example how will you balance the multiple interests for an integrated approach to management in areas such as turtle protection, marine mammals, and depleted stocks? How will novel technology or non-traditional elements (such as local knowledge as observation, aquaculture technology advances, or on-the-ground partnerships with non-NOAA entities) contribute to your overall integrated management plan?

Answer. Throughout my teaching, leadership of large organizations, and participation in public service, I have emphasized the important role of clear scientific input in decisionmaking. I have stressed my belief that science should inform, not dictate, decision-making. Decisions should be based on a range of factors including values, economics, politics, and science. In other words, scientific information alone should not drive decisions, but it should be available in an understandable, relevant, salient, and credible fashion so that it can be taken into consideration. Scientific information should clearly articulate what is known and what is not known about a particular topic, and with what degree of certainty. It should describe what is known about how systems work, how they are changing and the likely consequences of different policy choices. Policy decisions on marine fisheries and endangered species

are made by government leaders who attempt to balance various concerns, but these decisions should be informed by the best scientific information available, in consultation with all interested parties.

Question 2. In recent years, NOAA has moved toward a regional approach for providing products and services to the public. One key element of a successful regional effort is the ability to provide national leadership and direction, regional priority setting, and the ability to address local issues of need. Will you plan to continue NOAA's efforts in regionalization? If so, how will the regional concept be integrated with other on-the-ground engagement efforts, including communications, education, extension and training? Given that Hawaii is unique in its geographic isolation and given that many local issues are in fact regional issues in Hawaii, how might Hawaii move forward with regionalization in a manner that serves as an example for the agency?

Answer. I believe that ecosystem-based management is far superior to managing ocean resources on a sector-by-sector basis. This is particularly true because each geographic region is unique. I would like to see states and local governments working toward using this approach. NOAA should lead by example—NOAA should look at its own management decisions on a more ecosystem basis rather than by sector or statute. I hope to implement greater regional governance within NOAA across its programs. My predecessor, Admiral Lautenbacher, began the difficult process of breaking down the "silos" within NOAA. If confirmed, I would like to continue and increase those efforts. I would welcome the opportunity to work with you on this effort.

Question 3. NOAA's portfolio covers a diverse spectrum of responsibilities and assets, ranging from individual on-the-ground researchers to large-scale satellite acquisition and operations. Arguably, NOAA's satellite program expenditure is on a dramatically different scale than most of NOAA's other programs. As you seek to ensure that NOAA's satellite program remains on track, how will you address the issue of scale? What is your plan going forward to ensure that NOAA's satellite program will be able to deliver the data required by researchers while still remaining cost-effective and efficient in its use of resources?

Answer. The cost overruns and delays in the NOAA satellite program are a huge problem that impacts the entire agency. We must ensure that the cost overruns end so that other programs do not have to continue to shrink in order to pay for the satellite program at NOAA. I will make this a priority. Indeed I would like to convert a staff level political appointee position at NOAA into an Assistant Secretary position to oversee on a daily basis the weather and satellite programs. In addition, the continuity of climate data is critical to our understanding of the impacts of climate change in society, and will be a priority under my leadership given the policy efforts this data will support. NOAA must have an additional $74 million included in its FY09 budget to develop and reinstall key climate sensors back onto the NPOESS program. The continuation of this funding will be crucial to continuing this effort to ensure the future of the climate record. I believe this funding may have been included in the stimulus legislation recently passed by Congress. If not, I will work with the Appropriations Committee to see that this funding is included in the 2009 final spending bill.

Question 4. My constituency and that of my colleagues in the House are small island arcs in the Pacific. Fish and sustainable fishing are an intimate part of the culture of my region and help define us as Pacific Islanders.

Fishing methods have changed over the centuries but it is important that Pacific Island fishing cultures be sustained and that the economic development of the indigenous people includes greater participation in sustainable fisheries.

The importance of fishing to the region as a whole is exemplified by the attention devoted to fisheries in the Pacific Islands Regional Organizations, The Pacific Community (22 independent Pacific Island Nations and Territories) and the Pacific Forum (14 independent Pacific Island Nations plus Australia and New Zealand).

The Pacific Community's largest program is fisheries and fisheries development.

The Pacific Forum established its own fishery management organization, the Forum Fisheries Agency to ensure that Pacific Islanders obtain the maximum benefit from the fishery resources in their EEZs.

Will you be supportive of mechanisms in the MSA such as the Alaska-Western Pacific Community Development Programs, which are intended to foster greater participation and benefits from fishing for native peoples?

Answer. I am generally supportive of the rights of native peoples to fish. I am not familiar with the specific programs you describe, but I look forward to learning more about them if confirmed.

Question 5. As a legislator I am aware of the many statutes with which fisheries managers must comply when developing fishery management measures.

These include the Endangered Species Act, Marine Mammal Protection Act, National Environmental Policy Act and Small Business Regulatory Enforcement Fairness Act among many others, as well, of course, as the Magnuson-Stevens Act.

U.S. fisheries are among some of the most stringently managed fisheries globally, and a major benefit of this management has been a steady decline in the number of stocks that are overfished and subject to overfishing.

However, U.S. fishery management continues to be undermined by misinformation campaigns which distort the excellent science conducted by NOAA Fisheries. A recent publication, Ocean Conservation and the End of Overfishing, mistakenly reports Hawaii's bottomfish as being subject to overfishing, which is contrary to the 2008 NOAA stock assessment. Second, this publication reports that decline of monk seals in Hawaii is due to overfishing of their food species, which is contrary to the information contained in the NOAA monk seal recovery plan and at odds with the deliberations of the monk seal recovery team.

Can you please outline how you will defend NOAA's fisheries science and the Regional Fishery Management Councils' management record from being undermined by such campaigns?

Answer. I am not familiar with the situation surrounding Hawaii's groundfish or the monk seal recovery plan proposed by NOAA. If confirmed, I will look into this issue. In general, I support the goal of ending overfishing but I also recognize this will be a difficult task and will require the cooperation and commitment of the fishing industry to rebuild these resources. The health of our marine fish stocks is directly linked to the health of many coastal communities. I will work with the councils and all stakeholders to ensure that overfishing is ended by the statutory deadline of 2010, based on the best science available, while carefully considering the economic consequences of our actions.

Question 6. As I've already noted, U.S. fisheries are among some of the most stringently managed fisheries globally. However, 80–90 percent of all seafood consumed in the U.S. is imported from other countries. Many of these countries have either little to no sustainable fishery management, or fail to comply by their own or even international fishery management regimes. In my own region, Spanish and Ecuadorian purse seiners have regularly made incursions into the U.S. EEZ in the Western Pacific to fish for tuna. Also, there are already signs that other parts of the Pacific are gearing up to supply the Hawaii market with bottomfish after the 2011 shutdown of the Northwestern Hawaiian Islands bottomfish fishery. Please explain how you will work to level the playing field for U.S. fishermen with respect to imports and import substitution?

Answer. It is not fair to our fishermen to hold them to a higher standard than we are willing to require of the rest of world's fish products that are sold in the United States.

It is imperative that we work internationally to end the overfishing crisis and soon. If confirmed, I will take hard look at the problem of how to stop illegal fish from coming into the U.S. The U.S. must be very tough at regional fisheries management organizations (RFMOs) and in other international fora on the nations that continue to break the rules and exploit loopholes in ocean governance systems.

Question 7. In 2007 NOAA was provided $65 million for education and outreach. It is my understanding that very few if any dollars were devoted to fisheries. Of all the NOAA line offices, fisheries is the most complex because it affects not only marine ecosystems but also seafood safety, people's jobs and management at domestic and international levels. How do you plan to provide funding to NMFS and Regional Fishery Management Councils for fishery education and outreach to engage the public in supporting fishery management and understanding the diverse and complex nature of the fishery management process?

Answer. NOAA cannot do its job without sufficient funding. NOAA needs more funding and I will work with OMB and Congress to get it. NOAA's FY 2009 budget request is $4.1 billion. NOAA's appropriation has been flat at $3.9 billion since FY 2005, while its mandates and the demand for its services have grown. With sufficient funding I believe we can improve our fishery management process.

Question 8. Since the advent of the Magnuson-Stevens Act, in 1976, the Regional Fishery Management Council appropriation has experienced some increase for new mandates but not as rapidly as the National Marine Fisheries Service budget. For example, in the decade between 1996 and 2006, the Council's budget increased by 50 percent from about $10 million to $15 million, while over the same time period the NMFS budget jumped from $300 million to $800 million, or a rise of nearly 200 percent. Even funding for the National Marine Sanctuary Program (NMSP) has

risen to a level more than double that of Regional Fishery Management Councils. However, Council responsibilities deal directly with issues such as jobs for fishermen and others in the seafood industry, the importance of sustainable food security and the need to minimize carbon footprints through fostering local fishing industries. The 2006 reauthorization the Magnuson-Stevens Act included several new mandates for the Regional Fishery Management Councils, including establishing annual catch limits and accountability measures. The NOAA Planning, Programming, Budgeting and Execution System (PBBES) supports a base budget of about $30 million for the Regional Fishery Management Councils. How will you ensure that the Regional Fishery Management Councils are adequately funded to meet all their responsibilities under the Magnuson-Stevens Act in 2009, 2010 and beyond?

Answer. I will need the support of key Members of Congress to obtain additional funding for NOAA and look forward to working with you and your staff on this important challenge. NOAA cannot do its job without sufficient funding. NOAA needs more funding and I will work with OMB and Congress to get it. NOAA's FY 2009 budget request is $4.1 billion. NOAA's appropriation has been flat at $3.9 billion since FY 2005, while its mandates and the demand for its services have grown.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. JOHN F. KERRY TO DR. JANE LUBCHENCO

Question 1. Last August, this Committee held a hearing on our Nation's failure to invest in next-generation climate modeling capability. As a result, we are falling behind in our ability to predict climate impacts at the regional and local scale. At that hearing, the witnesses discussed the need for an integrated, interagency effort to address the range of research, software, data storage and computing challenge associated with climate modeling. How should that be structured? What is the appropriate role for NOAA?

Answer. I believe we need a National Climate Service to meet the needs of our Nation to better understand climate impacts and deliver information critical to adaptation, mitigation, and management planning. Working with many other agencies, including the EPA, the White House, Department of Interior, Department of Energy and Department of Agriculture, NOAA should lead a National Climate Service based on its existing mandates to provide climate information and services and experience managing end to end climate operations. NOAA can build upon its strong climate monitoring, research, and assessment capabilities, and translate climate data and research into information and services that address the needs of stakeholders at the local, state, regional, and national level.

Question 2. The New England groundfishery is facing unprecedented challenges, as it looks to implement a sector-based management plan in 2009. Do you believe that sector-based management will provide an effective mechanism to support the rebuilding goals of the Magnuson-Stevens Act while providing a lifeline for the region's fishermen?

Answer. I believe a sector-based approach is a useful idea to pursue, particularly since the measures that have been used in the past have not served our dual goals of supporting both fishermen and the resources.

Question 2a. What role will you personally take in implementing sector-based management and ensuring the survival of the New England groundfishery?

Answer. I will be personally engaged in this issue, along with a strong team I will recruit to NOAA.

Question 3. Illegal, unreported and unregulated fishing poses a tremendous challenge for the sustainability of our ocean and fisheries resources. The absence of sanction measures within the Regional Fisheries Management Organizations (RFMOs) appears to be a significant challenge in enforcing any strong fisheries management measures within those organizations. Do you agree that this is a problem? Will the U.S. propose more stringent sanction measures within the RFMOs that it plays an active role in?

Answer. Illegal, unreported and unregulated fishing is a terrible problem, as is the failure of IFMs to address it with real sanctions. The U.S. must be very tough at the International Commission for the Conservation of Atlantic Tunas (ICCAT) and in other international fora on the nations that continue to harvest species such as blue fin tuna at unsustainable levels. I believe that it is important to understand the science and use it to guide decision-making. Unfortunately, ICCAT has been ignoring the science and now the blue fin population is on the verge of collapse. I will work to change this if I am confirmed.

Question 4. As you know, the International Whaling Commission (IWC) is the body charged with the conservation of the world's whales. The IWC is at a crossroads, and a new proposal regarding coastal whaling appears to support partial resumption of commercial whaling. As NOAA Administrator, will you seek to strengthen the existing commercial whaling moratorium? Do you plan to serve as the head of the U.S. delegation to the IWC?

Answer. Unfortunately, despite the International Whaling Commission (IWC) moratorium on commercial whaling, there are thousands of whales killed each year and their meat ends up being sold in markets in Japan, Iceland and Norway. I will work to see that the scientific whaling loophole, and others like it that allow commercial whaling to continue, are closed. I have not made final decisions on the IWC after Dr. William Hogarth's term expires later this year.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. KAY BAILEY HUTCHISON TO DR. JANE LUBCHENCO

Question 1. Would you ever recommend using the Antiquities Act to designate a marine protected area?

Answer. Antiquities Act decisions are made by the President. He ultimately has the discretion to use this authority regardless of my recommendation. However, I would advise the President that he consider all the tools at his disposal, including the NMSA and MSA. I would also strongly recommend that decision-making processes be open, transparent and informed by science as I have discussed in earlier questions. Further, I would advise where there are many constituencies and many concerns—for instance in an area that is highly utilized by recreational and commercial fishermen—the President should ensure that there is substantial consultation with user groups and accommodations of their concerns regardless of the authority used to make the designation.

Question 2. Are you aware of any current proposals, either in the Administration or from environmental groups, to use the Antiquities Act to declare marine monuments in the Gulf of Mexico? If such a proposal would come before the President, would you support or oppose such action?

Answer. I an not aware of any proposals being considered by this Administration to use the Antiquities Act to declare a marine monument. If such a proposal were to arise, I would advise the President as described above.

Question 3. What role do you feel an adjacent coastal State should have in determining the location and potential restrictions of a marine protected area?

Answer. As recognized in many statutes, states have a substantial stake in decision-making regarding management of coastal and marine resources. I believe that states and the Federal Government should be vital partners who work together to restore and protect our coastal and marine ecosystems and communities. If confirmed, I would look to existing partnerships as possible models, for example those in California, Rhode Island, and Massachusetts. These partnerships provide different approaches to improving ocean management, including establishing protected areas, in state waters. Among other things. I believe NOAA should provide them any requested technical assistance in that process.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. OLYMPIA J. SNOWE TO DR. JANE LUBCHENCO

Question 1. To understand policies and priorities, one need look no further than the budget. I was pleased to see an increase in the previous administration's budget request for FY 2009 putting NOAA's overall request above $4 billion for the first time. But such increases have not been adequately represented across all of NOAA's functions. In fact, absent an increase in funding for satellite programs, the 2009 request was a flatline, and the National Ocean Service (NOS) and National Marine Fisheries Service (NMFS) actually experienced a decrease of nearly $50 million each. It is in the process of allocating scarce funding resources that we truly reveal what programs we want to carry out and in what manner, and how we rank the importance of various programs. That is why, Dr. Lubchenco, I want to understand how you are preparing to provide leadership in NOAA's budget process.

What is your opinion of the adequacy of NOAA funding under the 8 years of the Bush Administration? While you have yet to put your mark on the FY10 budget request, what is your plan for working with the Office of Management and Budget to make sure that these other non-satellite programs—fisheries, endangered species

research, ocean science, marine mammals, and so on—receive the appropriate level of funding?

Answer. Both Republicans and Democrats in Congress have told me, and I agree that NOAA needs more funding for FY10 and beyond if confirmed, I will work with OMB and the Congress to get it. The additional funding for NOAA in the stimulus package will help with funding satellites that have been eating away at resources for other programs within NOAA. As you noted, NOAA's appropriation has been flat at $3.9 billion since FY 2005, while its mandates and the demand for its services have grown. I will also work to ensure that going forward NOAA's budget process is robust, forward-looking. and adequately accounts for the Nation's needs for oceanic and atmospheric information and services.

Question 2. As NOAA Administrator, you will be responsible for the Bush-established Climate Change Science Program Office—the CCSP—that has all but subsumed the U.S. Global Change Research Program—the GCRP—that Congress established under law in 1990. In reality, the research office has lacked any high level Agency attention for at least the last 4 years. Understanding the science of climate change is critical in developing a response to the massive problem as well as disseminating the data and information to develop momentum for major changes in energy and environmental policy as the U.S. Congress begins to debate climate change legislation this year and the U.S. negotiates an international climate change treaty.

How do you believe NOAA should be updating or restructuring its policies for its Federal research program office for research and distribution of climate change data so it can be utilized by other Administration officials, Congress, and regional and local policymakers and stakeholders?

Answer. I believe we need a National Climate Service to meet the needs of our Nation to better understand climate impacts and deliver information critical to adaptation, mitigation, and management planning. Working with many other agencies, including the EPA, Department of Interior, Department of Energy and Department of Agriculture, NOAA should lead a National Climate Service based on its existing statutory mandate to provide climate information and services. NOAA can build upon its strong climate monitoring, research, and assessment capabilities, and translate climate data and research into information and services that address the needs of stakeholders at the local, state, regional, and national level.

Question 3. Dr. Lubchenco, as you and I discussed in depth at the hearing, we must find ways to improve the relationship between NMFS and New England's fishermen. As long as this contentious relationship continues, it will undermine any attempts to move forward with credibility and cooperation. I truly appreciate your commitment to improving the "climate of trust" in the region, and I hope to work with you closely to achieve this.

Are you willing to commit to closely examining the culture and attitudes pervasive in the Northeast Regional Office and its leadership, and report back to me on the changes you make to improve the way it interacts with fishermen?

Answer. To improve the relationship between the Agency and the fishing industry and fishing dependent communities, it would be beneficial for NMFS to increase its social science capabilities. This would enable the Agency to understand the impacts of regulations prior to their implementation and plan accordingly to mitigate the negative effects. In addition, this would go a long way in building more productive relationships between the Agency and communities. However, in order to increase social science capabilities, NMFS will need to hire many additional individuals with this type of expertise.

Question 3a. Can you commit to putting a greater emphasis on NMFS socio-economic funding, research, and assessment, so that you have a greater understanding of the attitudes and behaviors of fishing community members that NMFS is trying to regulate?

In your response to a pre-hearing question from one of my colleagues on the Committee, you answered that you believed being asked to choose between protecting the environment and expanding the economy was a "false choice" and that both could and should be accomplished simultaneously. I happen to agree with that assessment, so I would ask you:

Do you believe that "false choice" also applies to the manner in which we manage our fisheries? Can we balance concerns for the long-term health of the fish stocks with the short term health of our fishing communities?

The Magnuson-Stevens Act mandates that NMFS minimize the socioeconomic ramifications of its fishery management plans on our communities while achieving optimum yield from the fishery. Do you feel that balance is being achieved today?

Answer. Yes. I am fully committed to improving the relationship between NOAA and fishermen all over the country, including in New England. I will personally

work to improve the trust between the agency and fishermen, and look forward to regularly reporting back to you on the changes we are making. In addition, I intend to hire a senior advisor, who will report directly to me, whose entire responsibility will be to conduct outreach to commercial and recreational fishermen and fishing communities. I will also commit to putting greater emphasis on understanding the perspectives of fishermen and fishing communities and the socio-economic dimensions of the regulations imposed by the agency. If confirmed, I look forward to working with you on this effort. We must work together to help solve these difficult problems. The viability of our fisheries depends upon healthy fish populations and healthy oceans. We must find a way to achieve long term sustainability for our fisheries in New England and elsewhere. Fishing is an important way of life and an integral part of our coastal heritage and culture.

Question 4. As a world-class scientist, Dr. Lubchenco, you have been at the forefront of scientific advancement and you understand the importance of data collection, data management, and data interpretation—and the need to ensure objectivity and integrity throughout the scientific process. But so often in fisheries management, NMFS lacks the stock assessment funds and resources that are necessary to gather enough data to support quality and timely analyses. As a result, our Council members are forced to make management recommendations based on incomplete data, different conclusions from competing models, and—as a result—a significant range of scientific uncertainty. And now the stakes are higher, because the Magnuson-Stevens Reauthorization Act of 2006 mandates science-based catch limits.

What is your philosophy about making policy and management decisions in the face of scientific uncertainty?

Given the fact that there will always be some degree of scientific uncertainty in fisheries management, would you direct NMFS to follow a strict precautionary principle that sets stronger fishing limits until there is proof that stocks can withstand more fishing? If so, how do you know when you have enough evidence to serve as this proof, and who would shoulder the burden of proof?

Are there alternatives to the precautionary principle that you would support, such as adaptive management, that would allow managers to strike a balance between harvesting and resource conservation?

Answer. My philosophy as a policymaker is to make the best decisions possible in the face of scientific uncertainty. As a principle, it is better to he precautionary, but policymakers must also be practical. Ultimately, I will be guided by the law, and the Magnuson Act Amendments mandate an end to overfishing by 2011. If confirmed, I pledge to work with you and to never surprise you with a decision that negatively impacts fishermen in your state.

Question 5. Not only does NMFS need to collect more data, but they need to help make this information accessible and credible in the eyes of fishermen. Dr. Lubchenco, you and I discussed how cooperative research can help to bridge this gap between the industry and scientists. But the fact is, various forms cooperative research has been around for at least a decade, and it has been occurring at the same time that trust between scientists and fishermen has evaporated. This may have something to do with a 45 percent decrease in funding from $18 million in 2007—already pitifully low given that national landings value in our fisheries is over $4 billion annually—to just over $10 million in 2008.

Since traditional cooperative research has had limited and mixed success in improving the scientist-fisherman relationship, how would you propose improving the way cooperative research is done in the Northeast and throughout the Nation?

What steps would you take to evaluate the effectiveness of cooperative research, and ensure that it is actually used in making and improving management decisions?

Answer. In my own experience I have seen cooperative research programs work very effectively on the West Coast. I have not studied in depth the problems with them in the Northeast region, but if confirmed, I pledge to do so. I will use my experience to evaluate what has worked and what has not with these cooperative research programs, and report back to you.

Question 6. As you become more familiar with the New England groundfishery, I'm sure you'll learn about its history with management based on allocating days-at-sea and the steps the Council is taking to shift to sector-based management—a management method allowing fishermen more control through self-selecting, cooperative organizations. Completing this transition may not be possible, however, if NMFS's proposed interim rules are allowed to proceed. By slashing days-atsea by sixty percent in many cases leaving fishermen with just 20 days to go fishing, NMFS's rules would bankrupt the industry—including infrastructure, shoreside support, and seafood industries—and this change could be irreversible, especially in Maine where so many fishermen have already left.

Dr. Lubchenco, I understand that NMFS's interim proposed rules are a product of the Bush Administration, so you cannot speak to their formation. But under your leadership, what direction would you give NMFS for guiding its work in developing the final groundfishing rule?

Specifically, would you direct them to use direction, already in the Magnuson-Stevens Act and regulatory guidelines, for appropriately considering and weighing the social and economic impacts of these rules?

Would you direct NMFS to use the flexibility it has under the MSA which specifically allows temporary interim rules to allow limited overfishing on a limited bases—in combination with accountability measures—so other management objectives could be achieved in future years?

Can you commit to giving more consideration to approving the interim rules proposed—and overwhelmingly approved twice by the Council—that would allow more fishing but still mandate accountability measures for overfishing and meet other legal requirements?

Answer. I understand that the New England groundfish rules have been an ongoing controversy, most recently in the courts and also in the New England Fishery Management Council. If confirmed, I will review the proposed interim final rule and ensure it fully complies with all the provisions of the Magnuson-Stevens Act, including the requirement to weigh the social and economic impacts of these rules.

Question 7. The concept of ecosystem management has, as you know better than any of us, been around for decades. I agree that fisheries management should consider and incorporate diverse information inputs and explore new models to understand and explain ecosystem function. Beyond these basic ideas, however, the definition of "ecosystem management" is still unresolved in the academic community. Several groups, including your Pew Ocean Commission, have advocated for ecosystem management of fisheries, and I'm curious to learn where you stand on this as a pillar of fisheries policy.

What is your definition of "ecosystem management" today and how would you apply this to marine fisheries?

Do you think that there is consensus across the academic, industry, and environmental communities about what ecosystem management is and how it is carried out?

Do you think that fisheries ecosystem management should be mandated by law, or do you think NOAA has sufficient authority to move in this direction now, as evolution of the field permits? If you do not think NOAA has the authority to incorporate more ecosystem information in management as it becomes available, exactly what is preventing this?

Answer. I believe strongly in the use of ecosystem-based management, and there is growing consensus on its use. Ecosystem-based management is far superior to managing ocean resources on a sector-by-sector basis and I would like to see states and local governments work toward using this approach. I believe NOAA should lead by example—NOAA should look at its own management decisions on a more ecosystem basis rather than by sector or statute. I hope to implement greater regional governance within NOAA across its programs. My predecessor, Admiral Lautenbacher, began the difficult process of breaking down the "silos" within NOAA. If confirmed, I would like to continue and increase those efforts.

Question 8. The economic impacts of endangered species listing can exacerbate an already fragile economy. Clearly, we must protect our endangered species and live up to the intent of the landmark Endangered Species Act, at the same time I think we can all agree that it is incumbent on Federal agencies that they provide the resources to implement the species recovery plans. In my home state of Maine, however, we have failed to receive even a modest amount of funding to restore our salmon fisheries, while massive amounts of resources are dedicated on the West Coast. Clearly, there needs to be a comprehensive plan to restore the salmon fisheries, and the State of Maine has worked tirelessly to coordinate with the Federal agencies. At the same time, bureaucracy has prevented the Federal Government from effectively and efficiently working with the State of Maine to develop a recovery strategy. One major cause of this failure on the part of the Federal Government is that both the Interior Department and NOAA jointly implement ESA issues involving Atlantic salmon, while on the Pacific coast, NOAA is the clear lead authority. While I strongly believe that the Interior Department should be a partner in recovery efforts, NOAA's expertise in both ocean and river ecosystems, should be the lead agency.

Do you believe that NOAA should be the lead agency in implementing recovery of the Atlantic salmon? Do you believe that current Federal resources dedicated to species recovery are sufficient to develop sustainable populations?

Answer. I am not yet familiar with the specific issues regarding recovery of Atlantic salmon in Maine, and the interagency jurisdictional issues involved. But if confirmed I will study these issues and will answer your questions regarding them. I will also work with you to obtain additional funding for recovery efforts because in my experience these are generally underfunded.

Question 9. International Conservation and Trade Sanctions: Sections 609 and 610 of the High Seas Driftnet Fishing Moratorium Protection Act—which were added as part of our last Magnuson Reauthorization—provide your agency with an extraordinary new set of powerful tools to combat IUU fishing and to improve protected species conservation through bycatch reduction. In particular, as we have learned through the painful failures of ICCAT to conserve bluefin tuna—the use of trade sanctions to control the market for fish harvested illegally appears to be the only effective tool left to prevent the wholesale destruction of some international fisheries. Similarly, the blatant disregard for bycatch conservation in foreign fisheries such as the failure to use circle hooks and other proven techniques in their pelagic longline fisheries completely undermine very comprehensive U.S. efforts to protect bycatch species such as sea turtles developed in close cooperation with our own swordfish and tuna longline fisheries. Will you aggressively implement and enforce these provisions? What are the consequences if you don't?

Answer. It is not fair to our fishermen to hold them to a higher standard than we are willing to require of the rest of world's fish products that are sold in the United States. At the same time the U.S. has an important leadership role to play by setting the best possible example for the rest of the world. It is imperative that we work internationally to end the overfishing crisis and soon. If confirmed, I will take hard look at the problem of how to stop illegal fish from coming into the U.S. The U.S. must be very tough at regional fisheries management organizations (RFMOs) and in other international fora on the nations that continue to break the rules and exploit loopholes in ocean governance systems. If confirmed, I will aggressively implement and enforce the relevant provisions of the Magnuson-Stevens Act and the High Seas Driftnet Fishing Moratorium Act.

Question 10. A similar provision lies in the Marine Mammal Protection Act which requires other nations to achieve the same standards of marine mammal bycatch protection as are required in U.S. fisheries in order to enjoy the benefits of selling their fish on the U.S. market. (MMPA section 101(a)(2) 16 U.S.C. 1371(a)(2)). Although Congress clearly intended that the failure to achieve U.S. standards would result in a trade sanction, it appears your agency and others have never implemented this provision of law. The Center for Biological Diversity filed a petition almost a year ago (March 4, 2008) asking the Departments of Commerce, Treasury and Homeland Security to ban imports of swordfish from countries that have failed to submit proof that they have met the U.S. standards as required by law. Do you support aggressive implementation of this authority?

I understand a proposed rule has been issued to seek comments on this petition, but given the extraordinary delay in responding so far—what do you envision is the time-frame for implementing this law? Are there other fisheries than swordfish that should be addressed as well?

Answer. I am not yet, familiar with the specific issues regarding trade sanctions in fisheries, and would look to my colleagues in the Administration for their expertise in these issues. In general. I support the use of all available tools to stop the unfair trade in illegal, unregulated and unreported fishing for swordfish, tunas and other pelagic species. If confirmed, I would move quickly to make progress on these issues.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. JOHNNY ISAKSON TO DR. JANE LUBCHENCO

Question 1. Describe your expectation of how sound science should inform marine and endangered species issues.

Answer. Throughout my teaching, leadership of large organizations, and participation in public service, I have emphasized the important role of clear scientific input in decisionmaking. I have stressed my belief that science should inform, not dictate, decision-making. Decisions should be based on a range of factors including values, economics, politics, and science. In other words, scientific information alone should not drive decisions, but it should be available in an understandable, relevant, salient, and credible fashion so that it can be taken into consideration. Scientific information should clearly articulate what is known and what is not known about a particular topic, and with what degree of certainty. It should describe what is known

about how systems work, how they are changing and the likely consequences of different policy choices.

Policy decisions on marine fisheries and endangered species are made by government leaders, and should be informed by the best scientific information available, in consultation with all interested parties.

Question 2. NOAA Marine Fisheries recently declared that flow reductions in the drought-stricken Savannah River would be adverse to the endangered Short Nose Sturgeon. Yet no science-based analysis was conducted to justify this adverse finding, and neither I nor my staff has been given any data by NOAA to support the decision. Given your view on the use of science in policymaking and regulation (see above), was the adverse finding appropriate?

Answer. I am not familiar with the NOAA decision regarding the Short Nose Sturgeon. If confirmed, I will immediately look into this issue and provide an answer.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. DAVID VITTER TO DR. JANE LUBCHENCO

Question 1. Recreational fishermen and conservationists were pleased on September 26, 2008 when President Bush signed an amendment to Executive Order #13474. It stated that "recreational fishing shall be managed as a sustainable activity in national wildlife refuges, national parks, national monuments, national marine sanctuaries, marine protected areas, or any other relevant conservation or management area or activities made under any Federal authority, consistent with applicable law." Do you plan to ask the new Administration to uphold this EO or will you move to repeal it?

Answer. If confirmed, I do not intend to seek changes to this Executive Order.

Question 2. In establishing any Marine Protected Area (MPA), the Magnuson Act requires: (1) an open, public process that is based on the best scientific information available; (2) criteria to assess the conservation benefits of the closed area; (3) establishment of a timetable for review of the closed area's performance that is consistent with the purposes of the closed area, and (4) that it be based on an assessment of the benefits and impacts of the closure. Do you plan to follow the statutes?

Answer. Absolutely.

Question 3. President-Elect Obama stated in the October 2008 edition of *Sport Fishing* magazine that "The decision to establish marine reserves should be made as a result of a transparent, science-based process and be the least intrusive possible to get the job done." Given your advocacy in favor of No Fishing Zones, will you support the President-Elect's position as outlined in his interview?

Answer. Yes.

Question 4. What is the largest number of people you have ever actually been responsible for? What was that role and what kind/level of staff were you leading?

Answer. I have led numerous large, complex projects and organizations and served on Boards of Directors for major foundations, governmental organizations and non-governmental organizations. These projects, organizations and boards and my roles include:

- American Association for the Advancement of Science (President and Chair of Board of Directors)
- International Council for Science (President and Chair of Board of Directors)
- National Academy of Sciences (Board of Directors)
- Partnership for Interdisciplinary Studies of Coastal Oceans (Founding Principal Investigator and Chair of Steering Committee)
- National Science Board (Board of Directors for the National Science Foundation)
- David and Lucile Packard Foundation (Board of Trustees)
- Communication Partnership for Science and the Sea (Chair of Principals)
- Aldo Leopold Leadership Program (Founding Chair)
- Monterey Bay Aquarium (Board of Trustees)
- Monterey Bay Aquarium Research Institute (Board of Trustees)
- Ecological Society of America (President, Chair of Board of Directors)
- Environmental Defense Fund (Director and Vice Chair of Board of Directors)
- Climate Central (Founding Director and Vice Chair of Board of Directors).

The size of staff and budget of these organizations varies. The larger ones that I have led include:

- American Association for the Advancement of Science
  - Headquarters in Washington, D.C.
  - Offices in North America, Europe, Asia
  - 143,000 members
  - 330 employees
  - Budget $66.4 million
  - As President and Chair of the Board of Directors, I had direct responsibility for the senior staff, budget, policy, and strategic direction of the organization.
- International Council for Science
  - 116 countries are the "national members"
  - 30 international disciplinary unions are "union members"
  - Offices in Europe, Asia, Africa, Latin America
  - Responsibility for 18 international organizations or programs such as the International Polar Year, the International Geo-Biosphere Program, the Scientific Committee on Ocean Research, the Scientific Committee on Atmospheric Research.
  - As President, I had direct responsibility for the senior staff, budget, strategic direction, policy and management of the organization.

In my more than thirty-year career as a scientist, simultaneously managing multiple ongoing research projects, and other scientific, academic, and policy endeavors, I have gained a wealth of experience in running an enterprise. I understand firsthand how to manage budgets, build a management team, maximize human resources, do strategic planning and solve problems to deliver tangible results.

Question 5. I'd like to know if there are any efforts being made on finding ways to accurately predict fog and confirm its density/duration/extent, particularly on shipping channels leading to major ports. Is there any infrared or other commercial vision technology available that can see through fog accurately and enable ships, aircraft and vehicles to move safely? This is one area where marine technology is lagging and causing long, unexpected delays for marine and other transportation services, especially in winter months.

Answer. I do not know if NOAA is conducting research on fog prediction. If confirmed, I will look into your question immediately and provide you with an answer. Ensuring maritime safety is a very important part of NOAA's mission—it is a responsibility I take very seriously.

Question 6. What is your opinion of Congressman Oberstar's 'Clean Water Restoration Act' and making every stream, pond or puddle subject to Federal regulation under the Clean Water Act?

Answer. I have not studied Congressman Oberstar's proposal. If confirmed, I will. But since NOAA does not have authority to act under the Clean Water Act, I will defer to my colleagues in other agencies for their interpretation of this legislation.

Question 7. If you have a choice between protecting the environment and in turn shrinking the economy or expanding the economy and improving the environment as technologies advance, which would you choose as the appropriate policy decision?

Answer. I do not believe that protecting the environment shrinks the economy—in my view this is a false choice. Our environment is better managed than it was in the early 1970s when the country first started passing modern environmental protection laws. Yet this environmental protection has not caused economic collapse. In fact, our economy has increased in size nearly 10 times over that period. In my years of research and study, I have found that the failure to protect the environment and our precious natural resources is far more expensive to society and the economy in the long run, than the immediate costs associated with environmental protection. Any short-run costs to protect the environment generally result in human health benefits as well as a sustainable economy that will provide jobs and profits not just today but for our children and their children. The key for the government is to create incentives to ensure that technology improvements keep pace with overall economic growth, and to invest in cutting edge science and technology.

Question 8. The state of California has proven what a disaster cap-and-trade can be for an economy. California moved forward, despite an economic downturn, on a cap-and-trade program that was justified by issuing what almost all experts agree was a rigged study on the economic impact of the cap-and-trade system. When the

California Air Resources Board (CARB) asked five independent economists to do an analysis of the regulations and the study, Harvard's Robert Stavins, chairman of the Federal Environmental Protection Agency's economic advisory committee under Bill Clinton, stated that "None of us knew who the other reviewers were, but we all came up with almost the same conclusion. The report was severely flawed and systematically underestimated costs." These "underestimations" have been a disaster for the state of California forcing the state to shed more jobs than any other since 2007. The fact is that climate change legislation will be expensive and energy intensive industries will move overseas. What can we do to prevent what has happened in California from happening to the rest of the country? In addition, what can we learn from the California debacle?

Answer. I have not studied the California situation you describe. It is my understanding that California's cap-and-trade policies will not go into effect until 2012. However, because NOAA does not have authority for regulating greenhouse gas emissions or for setting energy policy, this is not an issue for which I would have responsibility. NOAA's role is to ensure that policymakers have the best possible scientific understanding of the extent and impacts of climate change so that regulation and policies can reflect this information. If l am confirmed, I would work hard to discharge this responsibility efficiently and effectively. Some of the impacts of climate change that are relevant to these discussions include sea level rise, changes in air and water temperature, changing patterns of drought and intense precipitation, and increasing acidity of oceans. NOAA should play the role of honest broker in climate discussions by providing credible scientific data and analysis to assist policymakers in Congress, state and local governments, and the private sector in developing appropriate policies.

Question 9. How does an increase in the cost of energy affect low-income families?

Answer. NOAA's mission does not include energy policy matters. If confirmed I would look to Congress and my colleagues in the relevant agencies for this information. NOAA does have a key role to play here in helping Americans across the socioeconomic spectrum make cost-saving decisions about a wide variety of matters from weatherization to storm preparation by providing high quality weather and climate forecasting services

Question 10. What kind of "flexible mechanisms" for industry and energy producers would you like to see available in future climate change legislation? In addition, serious concerns have been raised in regards to the loss of manufacturing jobs here in the United States to our international competitors over the last decade, in large part due to the cost of doing business (regulatory and energy) here in the United States. How do you think climate regulation, such as "cap and trade" or a carbon tax, help make manufacturers more competitive so we can retain industry and jobs?

Answer. There is no doubt that our planet is warming, and the impacts of that warming are profound and must be dealt with. If I am confirmed as NOAA Administrator, my primary concern will be to ensure that businesses as well as Federal, state and local governments have the information they need to deal with the impacts of climate change. I also hope that NOAA can play the role of honest broker in the climate debate by providing uninhibited scientific data and analysis that can assist policymakers and Congress in developing regulatory mechanisms for dealing with greenhouse gas emissions.

Question 11. It has been noted by a number of industry representatives that some of the climate change proposals over recent years would result in the most expensive regulatory scheme in U.S. history. In light of the incoming Administration's efforts to pass a 'stimulus' package that may well exceed $1 trillion, would the cost to industry of complying with climate change regulation be counterproductive?

Answer. I understand that regulations impose costs on the businesses that must comply with them. However, it has been pointed out that the costs of NOT dealing with climate change are immense and potentially devastating to our economy and society. l note that there are also strong arguments that controlling greenhouse gas emissions will spawn a new wave of technologies and business opportunities that will both expand our economy and improve our competitiveness. Market based mechanisms to reduce greenhouse gas emissions will create incentives for the development of new technologies that are more energy efficient and less harmful to the environment, and eventually will result in more jobs and revenue for the economy than our current dependence on fossil fuels. Regardless of these considerations, NOAA is not directly responsible for setting these policies. Its role is to assisting policymakers by providing information about ongoing changes in the climate and likely impacts of future climate changes.

Question 12. Do you support the use of the National Marine Sanctuaries Act, including all the critical public and transparent processes under the Act, to establish future marine protected areas or other marine restricted areas?

Answer. Yes.

Question 13. Aerial photography is a commercial activity. It is recognized as such in OMB Circular A–76 and by virtue that other agencies (USGS, FEMA, TVA, USDA, Corps of Engineers) contract such work to the private sector in Louisiana and other states. Yet NOAA is still in the business of owning and operating their own aerial photo planes, and recently buying new ones, and owning cameras, including new digital aerial cameras, and collecting their own aerial photography when this capability already exists in a superior capacity in more than 100 private firms. Do you believe it is appropriate for NOAA to be competing with and duplicating the private sector in Louisiana and other states, and operating a commercial activity within the Commerce Department?

Answer. I am not yet familiar with the specific issues regarding NOAA's aerial photo planes and equipment or OMB Circular A–76. If confirmed, I assure you that I will study this issue carefully and ensure that NOAA resources are used wisely and efficiently.

Question 14. Since 1998 U.S. Department of Commerce Inspector General Reports and GAO reports recommended that NOAA's aircraft fleet and hydrographic ships be privatized, not expanded. In 2000, a NOAA-financed report was conducted by an organization called "Mitretek" found that NOAA's aircraft used for aerial photography, is twice as expensive to operate as the equipment used by the private sector in Louisiana and other states. Will you look at NOAA eliminating these activities, and help our private sector, and our small business in Louisiana and other states, by potentially privatizing these activities, particularly when the GAO, Commerce IG and NOAA's own study show the taxpayer can be better served by contracting these services to the more efficient private sector?

Answer. I understand the need to save costs and minimize duplication with the private sector. If confirmed. I assure you that 1 will study this issue carefully and ensure that NOAA resources are used wisely and efficiently.

Question 15. For over a decade, Congress has been encouraging and indeed mandating that NOAA transition from in house performance to contractor performance of its surveying and mapping related requirements, including charting and hydrographic surveying. This has been a bipartisan push as not only Congress, but it was also a Clinton Administration's National Performance Review (also known as Reinventing Government) championed by then-Vice President Gore. What steps will you take to follow this bipartisan initiative?

Answer. If confirmed, I pledge to review the studies you mentioned—the GAO Report, Commerce IG report, and other relevant information—and review the merits and cost effectiveness of targeted contractor performance.

Question 16. Over the past decade, there has been a tendency to seek advice from the National Academy of Sciences to help resolve uncertainties and internal disputes. This tendency reflects the hard reality that science is not always easy and that people can differ and still be responsible and well-meaning. Do you support the continued role of the NAS to address science issues? Given the delay this often causes, do you have an idea of an alternative dispute resolution forum that could assist?

Answer. I value the important role that the National Academy of Sciences plays in providing external assessments of the state of scientific knowledge about key issues or reviews of important existing or proposed programs. I also respect the scientific expertise within NOAA. Each has its place. As a scientist, if I am confirmed. I intend to pay close attention to ensuring that NOAA bases its decisions on the best possible scientific information regardless of the source.

Response to Written Questions Submitted by Hon. John D. Rockefeller IV to Dr. John Holdren

Question 1. What do you foresee as your greatest challenge as Director of OSTP (Office of Science and Technology Policy)?

Answer. In a way, the biggest challenging facing OSTP is and always has been how to meet its very diverse and substantial responsibilities with the small staff and budget at its disposal. This challenge translates into the need to recruit extremely talented, organized, and dedicated staff members—starting with the Associate Directors but extending right down through the secretaries—who will be both ingenious and hard-working in order to get it all done.

Another (and related) challenge is to develop the needed working relationships—with the President and Vice President, with the OMB and NSC and NEC, with the other S&T-rich Executive Branch departments and agencies, and with the Congress—without which there is no hope of OSTP doing the job that is needed from it. Meeting this challenge is a matter of investing the effort to create and nurture those relationships (an effort that must start with but cannot be limited to the OSTP Director), which means a lot of listening, not just talking.

These challenges of process are large, but not larger than the challenges of substance faced by OSTP in formulating advice—augmenting that of the other relevant departments, agencies and offices and recognizing the prerogatives of the Congress about S&T and the economy, S&T and national and homeland security, S&T for national and global public health, the role of S&T in addressing the energy/climate-change/oil-dependence challenge, and more. The challenge facing OSTP and all other organs of government that deal with science and technology is to help figure out how government, business, academia, and foundations and other NGO's can more effectively collaborate in developing and applying science and technology in ways that address all these dimensions of the well-being of our citizens.

Question 2. Dr Holdren, it has been said that climate change is an issue that we need to innovate our way out of, not regulate our way out of. As the Director of OSTP, what role do you see yourself playing in technology innovation to address climate change?

Answer. Science, technology, and innovation are all going to be crucial in mastering the climate-change challenge. We need to work harder on the science of climate change in order to better understand the ways in which the climate is changing and is likely to change going forward and to better understand all of the leverage points and possibilities for mitigation and adaptation. We need to make more extensive use of technologies already in hand for more efficient energy conversion and end-use, lower-carbon electricity generation and liquid-fuel production, and soil and forest management to minimize greenhouse-gas emissions. And we need innovation—research, development, demonstration, and accelerated deployment—of improved and new options for doing all of these things more efficiently, less expensively, and with smaller unwanted side effects.

With respect to the science dimension, it is in the nature of the problem that much of the relevant work will need to be funded and coordinated by the Federal Government, and this means that OSTP should play a role. While most of the funding in this domain will come through the budgets of NOAA, NASA, NSF, DOE, Department of Interior, Department of Agriculture, EPA, and more, OSTP has a responsibility to work with OMB and the Congress to see that the needed budgets materialize and that the tasks are appropriately allocated and coordinated across agencies. This obligation will entail, among other things, working to ensure that the provisions of the Global Change Research Act (GCRA), including modifications to it likely to be enacted in the new Congress, are properly carried out, and that the Climate Change Science Program (CCSP) that operates under that act fulfills its responsibilities and reaches its full potential. OSTP also has a responsibility to ensure that the findings of these scientific efforts are made known to the decisionmakers in both the Executive Branch and the Congress who need this information in order to craft appropriate policies for meeting the climate challenge.

With respect to the technology and innovation dimensions, the role of the private sector will be larger and that of the government small in comparison to that, but nonetheless critical in relation to augmenting the incentives for firms and individuals to choose climate-friendly technologies and for firms to invest in the R&D needed to develop better ones, as well as in contributing funding for early-stage and high-risk R&D where the private sector on its own would do less than society needs. The government's role in the technology and innovation aspects of the response to the climate challenge must also include fostering public-private partnerships in innovation where the comparative advantages of both sectors are brought to bear, as well as helping with the financing of costly demonstration projects (such as for CO_2 capture and sequestration) where the scale and risk of the needed efforts would inhibit solely private approaches. While, again, many Executive Branch departments and agencies as well as the Congress must be and are involved in shaping and implementing these functions, a number of which are carried out under the auspices of the Climate Change Technology Program (CCTP) created under the GCRA, the OSTP has an important facilitating and coordinating role.

Two further roles of OSTP in relation to the climate-change challenge should be mentioned, and both have to do with the "P" in OSTP. The existing technologies germane to addressing the challenge will not be deployed, nor will improved and new ones be developed and deployed, with the pace and in the magnitude that the challenge requires unless and until there are national policies in place that either re-

quire increased use of such technologies or reward their use by penalizing emissions of greenhouse gases. In this respect, meeting the challenge is not a matter of innovation *or* regulation but rather of innovation *and* regulation. And OSTP has a role in helping to ensure that the people crafting the policies have the information they need—about the science of climate change and its impacts and about the technologies available to respond to it—in order to make those policies both adequately responsive and technically and economically realistic.

The other relevant role of OSTP in the policy domain relates to policy for the strengthening of science, technology, engineering, and mathematics (STEM) education our country will need if we are to have the workforce required, going forward, to expand and sustain research and innovation addressing the climate challenge, and if we are to have the degree of public understanding of that challenge, and the role of science and technology in addressing it, required to gain and sustain the public's support for the needed efforts.

Question 2a. Can you outline a strategy to make coal compatible with a safe climate?

Answer. The key here is to finish developing and demonstrating, and then to widely deploy, technologies that can capture and sequester away from the atmosphere the carbon dioxide (CO_2) that burning coal ordinarily releases to the atmosphere. I'm on record in the reports of the independent, bipartisan, foundation-funded National Commission on Energy Policy (in which I have served as Co-Chair), and elsewhere, as favoring increased public and private investment in—and public-private partnerships for—research, development, and demonstration of such technologies. President Obama is also on record favoring this approach, and funding for pursuing it will be part of the $150 billion he has committed to spend over a ten-year period on clean energy technologies.

Demonstration and pilot-scale facilities have established or are in the process of establishing the feasibility of all of the major components needed for CO_2 capture and sequestration (CCS) by a number of different routes, and CCS is being practiced on a near-commercial scale using CO_2 sources other than coal-burning in several locations around the world. It is time to put all of the ingredients together in some integrated demonstrations of CCS in large coal-burning power plants, using coals of different types, technologies that would be suitable for retrofit of existing plants as well as others that would only attractive in plants built from scratch, and different geologic formations for the sequestration stage.

Such projects will help to determine which approaches to capture are going to be most versatile and economical and to better characterize the sequestration performance of a variety of candidate geologic environments. In parallel, work will be needed to determine how best to address legal and regulatory issues that would arise with large-scale use of these technologies.

CCS will not be inexpensive. Given the cost, CCS technologies for coal-fired power plants will not be deployed on a large scale unless this is required by regulations or motivated with incentives in the form of significant financial rewards for reducing CO_2 emissions (achievable, for example, with tradable emissions permits or a carbon tax). In other words, getting CCS implemented will require significant policy initiatives aimed at that result.

Question 2b. Dr Holdren, you have said that a market signal is necessary for the development and deployment of carbon capture and storage technologies with ongoing coal use. What role can OSTP (Office of Science and Technology Policy) play as Congress and the Federal agencies determine what that market may look like?

Answer. The national climate policy that the country will need in order to get on a path of reductions in greenhouse-gas emissions corresponding to the President's announced goals in this domain will emerge from collaboration and interaction between the Executive Branch and the Congress. Within the executive branch, many different departments and agencies will be involved, and in recognition of the size of the associated coordination challenge a new position of Energy-Climate Policy Coordinator has been created in the Executive Office of the President and filled by former EPA Administrator Carol Browner. The role of OSTP in this process will be to ensure that all of the relevant science and technology information needed as input to the crafting of sensible climate-policy proposals is available to the President and Vice President, to Ms. Browner, to the inter-agency process they will lead, and to see that this science and technology information is shared as well with the Congress.

Question 3. Dr. Holdren, coordinating climate science research across the Federal Government is challenging given the number of Federal agencies involved and different agency priorities. As the Director of OSTP (Office of Science and Technology

Policy), how do you propose prioritizing climate science research efforts and strengthening U.S. research efforts on climate change?

Answer. If confirmed, I will see that OSTP works with NOAA, NASA, NSF, DOE, EPA and the other relevant executive-branch departments and offices, as well as with the Congress, to ensure . . .

1. that the Nation has a strong, integrated climate-science program to observe, understand, predict, and respond to climate change;

2. that OSTP and OMB lead an interagency process of budget coordination, identification of areas in need of augmentation, and justification of the budgets proposed to Congress;

3. that currently missing and much needed capacity is added in adaptation research as well as in assessment, outreach, communication, and climate services;

4. that the requisite 10-year plan, annual report, and National Assessments are produced regularly and provide Congress with useful, policy-relevant information; and

5. that the USA is a strong partner in international assessments and global monitoring.

I would expect to give early priority, in these efforts, to: (a) bolstering our capacity to monitor climate change and its impacts, including not only expanding our monitoring networks on land and on the oceans but also strengthening our faltering system of Earth-observation satellites; (b) substantially boosting efforts in adaptation research; and (c) producing the sorts of integrated assessment of the pace, patterns, and regional impacts of climate change that will be needed by the Obama Administration and the Congress as input to their deliberations on the goals and measures to be embraced for both mitigation and adaptation.

Question 4. Do you believe that the current level of Federal funding for research and development is adequate? Are there any areas you feel need immediate attention?

Answer. I believe we are substantially under-investing in research and development. Both President Obama and Congress have recognized this funding shortfall and have committed to doubling Federal R&D investments in coming years. As one recent report concluded, "Unless substantial investments are made to the engine of innovation—basic scientific research and development—the current generation may be the first in our country's history to leave their children and grandchildren a lower sustained standard of living." [1]

Federal support for the physical sciences and engineering has been declining as a fraction of GDP for decades, and, after a period of growth of the life sciences, the National Institutes of Health (NIH) budget has been steadily losing buying power for the past 5 years. As a result, our science agencies are often able to support no more than one in five of the proposals that they receive, arresting the careers of our young scientists and blocking our ability to pursue many remarkable recent advances.

There is now a growing recognition that new investments in federally sponsored research can be a direct investment in America's future economic prosperity. It is now well understood that since World War II, more than half of overall economic growth is attributable to innovation.

One key area where we are under funding research is in the area of stem-cell research. Human embryonic stem cells have great potential for treating a wide variety of diseases and health conditions and for providing new insights into human development and disease. The Obama Administration will reverse the Bush Administration's ban on Federal funding for embryonic stem cell research on cell lines created after August 9, 2001 by Executive Order and will allow all scientists to participate in this important new field, in accord with the rigorous ethical guidelines proposed by the National Research Council.

Question 4a. Do you believe that the current balance of Federal funding for research and development across science and engineering disciplines is appropriate? If not, how do you believe the portfolio of funding should be rebalanced?

Answer. One of the important roles of OSTP and its director is helping to achieve balance in our Federal R&D portfolio. I am not yet familiar enough with all of the portfolio's pieces to offer any specific thoughts at this time on what rebalancing might be needed. If confirmed, I will certainly work closely with the relevant cabinet

[1] Norman Augustine, former CEO of Lockheed Martin, in a follow-up to "The Gathering Storm" report entitled, "Is America Falling Off the Flat Earth?"

departments and agencies, the OMB, and the Congress to arrive at a coordinated and balanced R&D funding portfolio for contemporary conditions and challenges.

Question 4b. Do you believe that interdisciplinary research is sufficiently supported? If not, what actions would you take to increase the funding to support such research?

Answer. Many of the most exciting opportunities in research lie at the boundaries between disciplines. Multidisciplinary research is important for achieving many critical national goals, moreover, because the challenges we face—whether in innovation for economic growth, or developing a climate-friendly energy system, or making our society more secure against terrorists—can only be successfully addressed by combining tools, techniques, and insights from researchers in different fields.

Funding interdisciplinary work can be challenging, in part because of the added complexity of peer review in interdisciplinary domains and in part because such work can be seen as competing with established fields of research in a "zero-sum game." This problem can be greatly reduced if total Federal investments in research are expanding in the manner that President Obama and the Congress have envisioned, so that interdisciplinary efforts can be expanded without reducing support for more traditional areas of research.

Question 5. Dr. Holdren, do you see a role for the Office of Science and Technology Policy to help the Federal Government improve acquisition, management and oversight of civilian satellite programs?

Answer. OSTP can play an important role in coordinating interagency satellite policy. I believe we must increase government oversight and improve the interagency partnerships central to the management of civilian satellite programs, which among other things are critical to the Nation's climate and weather forecasting.

We need to proactively manage our programs to avert future cost and schedule overruns. Agencies must work together to manage the contractors building these satellites and demand cost and schedule accountability.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. BARBARA BOXER TO DR. JOHN HOLDREN

Question 1. There are many areas where the jurisdictions of scientific agencies overlap, particularly with respect to environmental issues such as climate change. Federal agencies have been criticized in the past for a lack of coordination on these areas of overlap, leading to duplicative efforts or incomplete information. As the Director of the Office of Science and Technology Policy, part of your responsibilities will entail leading interagency efforts to develop sound science policies and budgets. How will you promote coordination among agencies on long-term climate change data collection and analysis, as well as research on the environmental and health impacts of nanotechnology?

Answer. We face enormous challenges in energy and climate and need to act both quickly and carefully. An effective strategy will affect many parts of our economy, and many different Executive Branch agencies, as well as the Congress, will have roles in developing and implementing it. Fortunately the President has assembled a team of leaders in the energy and climate domain who are not only experienced but who have nearly all worked with each other previously; this will make coordination easier. As Director of OSTP (if confirmed), I'd also plan to harness the interagency National Science and Technology Council (NSTC), which has traditionally been coordinated by OSTP, to the task of helping ensure effective, coherent preparation of plans, budgeting, and execution of multi-agency efforts. (On this issue, please see also my answers to Senator Rockefeller's questions 3 and 4, above.)

Nanotechnology has the potential to lead to major economic and other societal benefits, such as low-cost solar cells, smart anti-cancer therapeutics, sensors for environmental monitoring, and breakthroughs in our ability to store and process information. It is clear, however, that we need to increase our understanding of the environment, health and safety (EHS) risks associated with nanotechnology. I am committed to using the NSTC to identify gaps in our current nano-EHS research portfolio and to increase the exchange of information among science agencies, regulatory agencies, and external stakeholders. Our strategy will build on the existing work of the Nanotechnology Environmental and Health Implications (NEHI) Working Group, and will incorporate information from a recent National Research Council review along with inputs from stakeholders in industry, academia, and non-governmental organizations.

Question 2. As you know, the economic stimulus bill includes funding for basic scientific research and development across several agencies and missions. How do you

plan to help coordinate these investments and ensure that this money is allocated effectively, efficiently and responsibly across the many agencies with science and technology related missions?

Answer. The stimulus investments in basic R&D in various agencies are not only crucial for creating new jobs and opportunities for today, they are essential for creating the new industries and long-term opportunities that we will need for tomorrow. If confirmed, I will work closely with these agencies to ensure that these investments produce results. In addition, I intend to work closely with the Nation's Chief Technology Officer and a new Open Government Initiative to transform government through transparency, participation, and collaboration. At the heart of this effort is a new website called *recovery.gov* which is an unprecedented effort focused on ensuring that stimulus dollars are used effectively, efficiently, and responsibly.

Question 3. I appreciate the commitment you expressed in your statement to elevating the role of science in formulating policy decisions and revitalizing our economy. I would just like you to elaborate more on one aspect of science that you only touched on briefly—ocean science. How will you work to ensure that adequate funding and technical resources are devoted to achieving the Ocean Research Priorities Plan and Implementation Strategy, including reevaluating and revising the strategy as necessary?

Answer. Oceans are crucial to our well-being because they play a central role in global weather and climate, are a major source of protein for much of the world's population, provide employment in fisheries and recreation, serve as home to much of the planet's biodiversity, and more. If confirmed, I will work with NOAA and other relevant agencies, as well as with the Congress, to complete and implement the strong, integrated, well-managed program of ocean research and stewardship that is essential to sustain a healthy and productive marine environment and the communities that depend upon it. The Ocean Research Priorities Plan and Implementation Strategy developed by the NSTC's Joint Subcommittee on Ocean Science and Technology in the last administration appears to provide a useful framework for analyzing needs and moving ahead with meeting them, but I would want to study it more closely and seek input from the relevant Executive Branch agencies and committees of Congress before reaching any conclusions about what revisions in it might be warranted.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARIA CANTWELL TO DR. JOHN HOLDREN

Question 1. Costs for the National Polar-orbiting Operational Environmental Satellite System have spiraled out of control from $6.5 billion to at least $92.5 billion. Isn't one of the challenges facing this program the fact that it's a tri-agency acquisition involving NOAA, NASA and DOD?

Answer. Yes. The management of the NPOESS program and ensuring continuity of weather and climate data need to be important priorities for the administration's leadership team. The tri-agency leadership in NOAA, NASA, and DOD needs to be better coordinated and more clearly focused on oversight of and accountability from the program contractors, and if confirmed as Director of OSTP I would expect to help with that.

Question 1a. I'm going to be holding Dr. Lubchenco's feet to the fire on this, but wouldn't you agree that because this troubled program involves three agencies, she can't do this alone?

Answer. I have known and worked with Dr. Lubchenco for more than 20 years, and I have immense confidence in her abilities. But certainly in the multi-agency activity in question there is a role for both OMB and OSTP in helping with management and coordination.

Question 1b. Wouldn't you agree that she is going to need help from higher-up in the Administration to make this work?

Answer. I am confident that whatever help she needs will be provided.

Question 1c. Can you promise me that you and others in the White House will help apply the pressure needed to fix this program and make this tri-agency acquisition work?

Answer. Yes.

Question 2. If nominated, will you work with me and Committee to pass climate change adaptation legislation that will help ensure our government takes climate change into account when investing taxpayer dollars in various infrastructure projects and in managing our Nation's public lands?

Answer. Absolutely.

Question 3. I recall you were a member of the Presidential Committee of Advisors on Science and Technology (PCAST) Energy Research and Development Panel that issued the November 1997 report entitled 'Federal Energy Research and Development for the Challenges of the Twenty-First Century'. Among other things, that report proposed funding levels for a variety of clean energy technologies that to its credit has sewed as the basis for these types of investments for over the past decade. Looking back at the report, where do you believe that the PCAST panel hit the mark, where do you believe that its aim was a little off, and looking forward, do you see a need for a major recalibration of priorities within our Nation's clean energy portfolio?

Answer. I appreciate these kind comments about the 1997 PCAST report on Federal energy R&D that I chaired. In the intervening decade and more it has become clear that the climate-change driver of energy R&D requirements—which is far from the only driver but was recognized by our Committee already in 1997 as the most demanding one—is even more demanding than we thought in terms of the kinds and degree of energy-technology improvements that will be required if the climate-change challenge is to be adequately and affordably addressed.

And, although we recognized at the time that the Federal Government needs to play a role, in concert with the private sector, in commercial-scale demonstration as well as in R&D of some of the needed advanced technologies, it is now clearer how large and costly that role needs to be. That is why the Obama campaign talked about $15 billion per year for clean energy research, development, and demonstration (RD&D) for the next 10 years. One place we certainly missed the mark in 1997 was in seriously understating what should be spent on research and development of CO_2 capture and sequestration.

Several substantial efforts at designing a suitable portfolio of clean-energy RD&D going forward have been underway over the past couple of years in the National Research Council, in a set of university and NGO efforts funded by the Doris Duke Charitable Foundation, and elsewhere, and some of these are expected to release their findings over the next few months. I know that Secretary Chu and his staff at DOE will be reviewing the existing portfolio there, and the plans for the next few years, in light of all these findings as well as their own internal analyses. The Obama Administration's energy-climate principals' group being convened by Carol Browner will be looking at this question in the context of all of the relevant Executive Branch agencies. As I am part of that process and will continue to be if confirmed by the Senate as Director of OSTP, I don't want to pre-empt it here with too many of my personal views. I can certainly assure you that this question of the clean-energy RD&D portfolio is one I and others in the Administration are giving the closest scrutiny and will, obviously, be in close touch with the Congress about.

Question 4. Should we as a Nation be concerned with the increasing globalization of R&D and innovation? What are some of the things you plan to do as the President's science advisor to ensure continued U.S. competitiveness in the global marketplace of R&D and innovation?

Answer. Ensuring that the U.S. continues to lead the world in science and technology will be a central priority for me if I am confirmed as Director of OSTP. Our talent for innovation is still the envy of the world, but we face unprecedented challenges that demand new approaches. I am especially concerned that we have been reducing support for science at a time when many other nations are increasing it, a situation that already threatens our leadership in many critical areas of science. This competitive situation may only worsen over time because the number of U.S. students pursuing technical careers is declining. The U.S. ranks 17th among developed nations in the proportion of college students receiving degrees in science or engineering; we were in third place thirty years ago.

That is why I believe we must increase funding for basic research in physical and life sciences, mathematics, and engineering at a rate that would double basic research budgets over the next decade. We need to increase research grants for early-career researchers to keep young scientists entering these fields. We need to increase support for high-risk, high-payoff research portfolios at our science agencies. And we need to invest in the breakthrough research we need to meet our energy challenges and to transform our defense programs.

Question 5. What do we need to do as a Nation to convince more women and underrepresented minorities to pursue career paths in Science, Technology, Engineering, and Mathematical fields? And if they do choose to pursue careers in STEM fields, what, if any, policies can be put in place to make it easier for them to remain in these career paths.

Answer. I would be especially proud, if confirmed, to serve a President who understands the importance of women and minorities in science. For example in the U.S.

Senate, Senator Obama passed three amendments to the America COMPETES Act to increase participation of women and underrepresented minorities in the professions of science, technology, engineering, and mathematics; to offer competitive state grants to support summer term education programs to help students develop skills in math and problem solving; and to establish a mentoring program for women and minorities as they advance in those fields.

All Americans will need strong STEM backgrounds to participate effectively in a competitive global economy. President Obama has made it clear to me that this will be one of my most important responsibilities if confirmed.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. JOHN F. KERRY TO DR. JOHN HOLDREN

Question 1. Last August, this Committee held a hearing on our Nation's failure to invest in next-generation climate modeling capability. As a result, we are falling behind in our ability to predict climate impacts at the regional and local scale. At that hearing, the witnesses discussed the need for an integrated, interagency effort to address the range of research, software, data storage and computing challenge associated with climate modeling. How should that be structured? What is the appropriate role for NOAA?

Answer. I understand the American Recovery and Reinvestment Act includes $170 million for NOAA to address critical gaps in climate modeling and establish climate data records for continuing research into the cause, effects and ways to mitigate climate change. NOAA will clearly have an instrumental role. But we can do more across agencies as well to build on our climate modeling capabilities. This new funding is another important piece of the interagency efforts to be coordinated with other climate science efforts as needed to ensure an integrated research effort. Improving our climate modeling capability is critical to furthering our understanding of the impacts of climate change in society, and will be a priority under my leadership at OSTP, if confirmed.

Question 2. The underlying authorizing legislation for the National Nanotechnology Initiative allows the President to "establish or designate" an advisory board composed of members with expert knowledge of nanotechnology from academia, industry, and non-profit/advocacy organizations. President Bush opted to designate PCAST (President's Council of Advisors on Science and Technology) instead of appointing a new advisory board. However, many criticized this move, citing that PCAST did not have the specific expert knowledge to review the NNI. According to a National Academies of Science review on the NNI, they state that:

Answer. While the designation of PCAST as the NNI advisory panel testifies to the importance of the initiative, *it lacks an independent advisory group with specific expertise in nanoscience and nanotechnology*. Such a dedicated panel could provide advice on setting priorities, balancing large-scale and individual investigator research, and the value of high-risk, high pay-off interdisciplinary research.

As a result, the NAS recommended that "The Federal Government should establish an independent advisory panel with appropriate experience to facilitate cutting-edge research on and responsible development of nanotechnology."

OSTP transition team members have indicated that they prefer not to establish a new board and will continue to rely on PCAST. They believe that the new PCAST would be a vastly improved advisory mechanism, but the concern still remains that given PCAST's wide mandate to advise on all aspects of science and technology, there is insufficient expertise in nanotechnology to provide proper oversight over the NNI.

Question 2a. Do you believe that the President should appoint an independent advisory board to review the NNI, as mandated by law? If no, please explain why you feel that conducting oversight over the NNI through PCAST is sufficient? In my nanotechnology bill that I introduced last year, I make it very clear the need for an independent advisory board with specific nanotechnology expertise. Will you commit to working with me on this matter as we move forward on this legislation?

Answer. My current view is that the President will be best served by having PCAST, with its diverse group of distinguished experts in science, technology, and innovation from industry and academia, function as the sole Presidential-level advisory committee on S&T. I believe that establishing multiple Presidential advisory committees will diminish the influence and effectiveness of any one of them. As a practical matter, given all of the competing demands on the President's schedule, he is unlikely to be able to have meaningful interaction with more than one such committee.

On important topics such as nanotechnology, however, I will recommend that the President establish committees under the aegis of PCAST that will have the stature and in-depth expertise needed to provide the Administration with high-quality, independent advice on the important issues you raise. I look forward to working with you on this topic to meet our shared goals.

Question 3. Nanoscale science, engineering and technology—commonly referred to collectively as nanotechnology—is believed by many to offer extraordinary economic and societal benefits. Congress has demonstrated continuing support for nanotechnology and has directed its attention primarily to three topics that may affect the realization of this hoped for potential: Federal research and development (R&D) in nanotechnology; U.S. competitiveness; and environment, health, and safety (ENS) concerns. In 2000, the United States launched the world's first national nanotechnology program. Since then, the Federal Government has invested nearly $10 billion in nanoscale science, engineering, and technology through the U.S. National Nanotechnology Initiative (NNI). U.S. companies and state governments have invested billions more. As a result of this focus and these investments, the United States has, in the view of many experts, emerged as a global leader in nanotechnology. However, the competition for global leadership in nanotechnology is intensifying as countries and companies around the world increase their investments. The Federal Government has invested, through FY2009, nearly $10 billion in nanotechnology R&D. What role can the Federal Government play in further helping industry commercialize this research?

Answer. The NNI can expand its role in promoting nanotechnology transfer and commercialization for societal benefit by:

a. Coordinating with regional, state, and local organizations supporting nanotechnology development and commercialization;

b. Working with industry through mechanisms such as the Nanomanufacturing, Industry Liaison and Innovation Working Group;

c. Taking advantage of programs such as the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STIR);

d. Supporting additional public-private partnerships using mechanisms such as the Nanoelectronics Research Initiative and other government-industry-university collaborations.

Question 3a. Environmental, health, and safety issues have become a top concern about nanotechnology. How much additional funding should be provided to support EHS research? How should this money be allocated among agencies? Should a portion of these funds be used as a central funding source to respond to needs that agencies are not currently addressing? If so, how should such a funding source be structured and managed?

Answer. I share the goal of promoting the responsible development of nanotechnology. OSTP is carefully evaluating proposals for targeted funding increases for nano-related EHS research. There are important knowledge gaps in the EHS dimensions of nano identified that we should address quickly as possible. I do not believe that there is a single agency that is in a position to sponsor or conduct all of the necessary research. This is because of the important roles played by a variety of different agencies on the environment, occupational safety, the oversight of drugs, medical devices, and consumer products, and the management of the National Toxicological Program.

Question 3b. Do you believe that rapid advances in nanotechnology, biotechnology, and other emerging fields present any challenges to the U.S. and global regulatory systems? If so, how might you seek to address them?

Answer. In many instances, emerging technologies have advanced more rapidly than our ability to establish a policy, legal, and regulatory framework that maximizes the economic and societal benefits while managing the risks. For example, it is clear that there are gaps in our understanding of the EHS dimensions of nanotechnology. It is likely that several key regulatory agencies will need to increase their capacity to promote the responsible development of nanotechnology. There are also important questions a out how to apply existing laws and regulations to nanotechnology-based products. If confirmed, I am committed to working closely with the relevant agencies to create a sound policy and regulatory framework.

Question 4. Patients and researchers have been frustrated for 7 years as they try to forge ahead in one of the most promising areas of biological research—embryonic stem cell research. The progress that has been made in just a decade is astounding and the expectations for therapeutic applications for the results of this research have never been higher for the millions of patients around living with disease for which this research holds out hope. But, researchers are grappling with Federal re-

strictions on funding the equivalent of tying one hand behind their back. Can we assume relief is forthcoming so we can get the Federal Government fully behind this research?

Answer. Yes. Stem cell research holds the promise of improving our lives in at least three ways—by substituting normal cells for damaged cells to treat diabetes, Parkinson's disease, spinal cord injury, heart failure and other disorders; by providing scientists with safe and convenient models of disease; and by helping to understand fundamental aspects of normal development and cell dysfunction.

For these reasons, I strongly support expanding research on stem cells. I believe that the restrictions that President Bush has placed on funding of human embryonic stem cell research have handcuffed our scientists and hindered our ability to compete with other nations. I expect President Obama to lift the current funding ban soon.

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. MARK WARNER TO DR. JOHN HOLDREN

Question. In follow up to our previous exchange, I would appreciate a further elaboration of President Obama's and your vision concerning the role of the CTO. Virginia and other states that have created a cabinet-level Secretary of Technology can provide valuable insight regarding this position. I recognize that this individual has not yet been chosen, but can you elaborate on what you consider to be the most important qualities and characteristics for the position? Will this person look outward toward the private sector to identify innovative techniques and practices to be incorporated within the Federal Government? Also, how will this person interact with other agencies and what role will the CTO have in terms of policy execution in each realm?

Answer. Indeed, Virginia has been a leader and provides an important model for the Federal CTO. As you know in the 21st century, our economic success will depend not only on our ability to invent new technologies but also in our ability to harness the power and potential of new technologies to address some of our most pressing problems.

That is why President Obama has promised to appoint the Nation's first Chief Technology Officer (CTO)—to ensure that our government and all its agencies have the right infrastructure, policies and services for the 21st century. The CTO will have a specific focus on transparency, by ensuring that each arm of the Federal Government makes its records open and accessible as the E-Government Act requires. The CTO will also focus on using new technologies to solicit and receive information back from citizens to improve the functioning of democratic government.

While a CIO may be more inward facing, the CTO may be more outward facing and can help ensure technological interoperability of key government functions. For example, the Chief Technology Officer will oversee the development of a national, interoperable wireless network for local, state and Federal first responders as the 9/11 Commission recommended. This will ensure that fire officials, police officers and EMTs from different jurisdictions have the ability to communicate with each other during a crisis and we do not have a repeat of the failure to deliver critical public services that occurred in the aftermath of Hurricane Katrina.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. DAVID VITTER TO DR. JOHN HOLDREN

Question 1. In 1971, in an article with Paul Ehrlich titled Global Ecology, you predicted that "some form of ecocatastrophe, if not thermonuclear war, seems almost certain to overtake us before the end of the century." Now that it is 2008, what is the reason neither of those things happened?

Answer. One of the many things I have learned in the nearly four decades since I wrote those words is that, as Enrico Fermi famously said, "Predictions are difficult, especially about the future." But even then, at the age of 26, I knew enough to hedge a little bit: I did say "*almost* certain."

I do think that we were at least as lucky as we were smart in managing to get through the decades of the Cold War without a nuclear war—there were certainly a number of close calls. I think that most of the presidents, generals, and admirals who commanded our nuclear forces through those years would agree we were lucky. A number of them have told me as much.

As for ecological catastrophe, there's no agreed definition on precisely what would qualify, but certainly there are reasonable people who would argue we are in the middle of a number of them: the staggering rate of species extinctions (for which

the best estimates are in the range of 100 to 1000 times the extinction rate over most of pre-human time); the expanding dead zones in coastal seas; the decline in the global populations of sharks, billfish, and tuna to perhaps 10 percent of their pre-human levels; and the continuing rapid deforestation of the tropics.

To the extent that nothing that everybody would agree is a full-blown catastrophe has yet materialized, I would say, as in the case of nuclear war, that we have been partly smart and partly lucky. On the smart side, since 1971 the world rate of population growth has fallen by almost half; we have developed and deployed technologies that have reduced the amount of energy and other physical resources needed to make a dollar of GDP and that have reduced the amount of pollution emitted in the course of providing a kilowatt-hour of electricity or a pound of steel; we have established Marine Protected Areas where fish stocks can recover from over-exploitation; and we have invested substantial resources in cleaning up inland waters and toxic waste dumps.

Those are outcomes that those of us who were issuing warnings about environmental dangers in the 1960s and 1970s were recommending at the time as ways to reduce those dangers. Our aim in discussing the harm that was likely to occur if society did not take evasive action was to help bring that evasive action about. I am happy to say that environmental laws passed by the U.S. Congress—including NEPA, the Clean Air Act, the Clean Water Act, the Surface Mining Act, the Endangered Species Act, the Marine Mammal Protection Act, the Resource Conservation and Recovery Act, and CAFE standards—played a large part in this country's doing what was needed to reduce some of the biggest dangers.

Question 2. In 1986, you predicted that global warming would cause the deaths of one billion people by 2020. Paul Ehrlich attributes this claim to you in his article The Machinery of Nature. Do you believe that number is still accurate? If not, can you give us a revised number?

Answer. I believe what I wrote was that global climate change *could* cause the deaths of a billion people by 2020. This was not a prediction but a statement about what could happen if climate change crossed a tipping point in the intervening period, leading to large declines in food production. I think this is not likely, but I believe it is a "downside" outcome that we should be investing significant effort to avoid.

Question 3. In 1978 you stated in a University of Houston Law Review, that "people are the bane of rational energy policy." Can you explain what you meant by that and who or what would be appropriate for drafting rational energy policy?

Answer. The sentence as a whole said the following: "However, if people are the bane of rational energy planning, they are also its goal." As explained in the surrounding text, what I meant was that the best-laid plans are often thwarted by human frailty and unpredictability (oil tankers running aground, actions of the OPEC cartel, etc) and also that people often want contradictory things from energy policy: they want their energy to be convenient, reliable, free of environmental impacts and political liabilities, and dirt cheap; and if there are going to be some environmental impacts, they want them to be in somebody else's back yard. The surrounding text also explained that saying people are the goal of energy planning means we should not be interested in expanding energy supply for its own sake, but rather in doing so in ways and for purposes that increase the sum of human well-being.

One reason energy policy is so challenging, as I argued in that article, is that there is no "free lunch" in energy supply. The energy options that are the cheapest are often the dirtiest ones (as coal power plants without environmental controls demonstrate) or the most problematic from the political and security standpoint (as the cheap imported oil of the early 1970s demonstrated). And if nobody is willing to accept any environmental intrusion at all from energy systems—no coal mines or drilling rigs anywhere, no pipelines across the tundra, no transmission lines or windmills spoiling the view—that's eventually going to mean not having the energy we need.

Developing sensible energy policy would be easier if we who have studied the issue—scientists and Senators alike—did a better job of educating the public to understand that there are tradeoffs in getting the energy we need and that cheaper is not always better (particularly if the low monetary cost comes from not including in the price of energy the cost of limiting environmental damages and national-security liabilities that otherwise not just the users of the energy but the whole society will have to live with). I note that the thrust of my 1978 article in the Houston Law Review, which was entitled "Coal in Context: Its Role in the National Energy Future," was precisely that coal is so important to U.S. energy supply that we simply

must make the effort to reduce its environmental impacts to the point that continued use of coal will be environmentally tolerable and acceptable to the public.

I believe that the most appropriate people to be making energy policy are our elected representatives, meaning, at the national level, the Congress and the President and Vice President. Obviously, these elected leaders need to be informed by the best advice they can get from their appointed staffs and the agencies over which these appointees preside and, of course, by the views of business people, academics, NGO's of all varieties, and the wider public. Making sure that our elected leaders and all those who report to them or seek to influence them are well informed about the scientific and technological dimensions of the energy-policy choices (and other policy choices!) faced by our Nation will be important to getting the best possible results. The White House Office of Science and Technology Policy that I hope to have the privilege of directing has an important role to play in helping to ensure that this information flow works as it should.

Question 4. In 1973 you encouraged a "decline in fertility to well below replacement" in the United States, because "280 million in 2040 is likely to be too many." This was in your article "Population and the American Predicament." Currently the U.S. population is 304 million. What are your thoughts at this juncture on the appropriate population level?

Answer. Population growth brings both benefits and liabilities. In the 1973 article cited, I offered the personal judgment that the then U.S. population of 212 million was more than large enough to provide most of the benefits associated with high population and that further growth was likely to increase costs more than it increased benefits. Balancing costs and benefits of population growth is a complex business, of course, and reasonable people can disagree about where it comes out For my part, I don't pretend to know what the best eventual population for the United States would be. That is partly a matter of how good our technology and our management can be in the future, partly a matter of environmental and resource constraints that are still imperfectly understood, and partly a matter of social preferences that are well outside the domain of science and technology policy in which I'd be engaged if the Senate confirms me as Director of OSTP.

Question 5. In 2006, in the article The War on Hot Air, you suggested that global sea levels could rise by 13 feet by the end of this century. However, in the IPCC's 2007 report the suggested potential is a rise of 13 *inches.* Can you explain the severe disparity, and if you still believe the rise will be 13 feet?

Answer. The indicated article was not written by me, but it quoted a figure I had given in a speech as near the upper end of the uncertainty range for the amount of sea-level rise that could occur by 2100.

There is no disagreement in the Earth-science community about the amount of sea-level rise that would eventually result from disappearance of the great ice sheets on Greenland and Antarctica. The answer given by the IPCC and ice experts everywhere is 7 meters (23 feet) if the Greenland ice sheet disappears, another 5 meters (16 feet) if the most vulnerable part of the Antarctic ice sheet disappears, and a total of about 70 meters (230 feet) if the world got so warm that all of the Antarctic ice sheet as well as that of Greenland, plus all of the mountain glaciers, melted entirely.

What is much more uncertain is how *rapidly* the increase in sea level from ice loss could happen, given warming at rates projected to be possible in this century and beyond. The IPCC's 2007 report gave a range of 7 inches to 25 inches for the amount of sea-level rise projected for 2100, taking into account the thermal expansion of a warming ocean and gradual melting of mountain glaciers and the Greenland and Antarctic ice sheets. But the report also noted that phenomena known to have occurred in natural warming periods in the past are capable of causing much more rapid disintegration of the ice sheets—and correspondingly faster sea-level rise—which the IPCC did not put into its estimate because the dynamics of these processes are not yet well enough understood to include them in the quantitative models.

Scientists who study the climate of prehistoric times (using a variety of kinds of evidence preserved in tree rings, ice sheets, corals, sediments, and the like) reported in 2005 that there were two natural warming periods in the last 19,000 years when these faster modes of ice-sheet disintegration raised the level of the oceans at a rate of as much as 2 to 5 meters (6.5 to 16 feet) *per century.* This was the basis of statements I made subsequently to the effect that increases in this range could not be ruled out under the similarly rapid warming forecast for the 21st century.

Studies published since then have indicated that the upper limit of sea-level rise to be expected by 2100 is 1–2 meters. This remains a very active area of research, and the best estimate could change again, but since these latest reports came out

I have been citing the 1–2 meter (3.3 to 6.6 feet) estimate of the upper limit as the most up-to-date that is available.

Question 6. You have consistently held the position that environmental damage is directly proportional to economic growth. Are you of the position that we can no longer grow the economy without doing damage to the environment?

Answer. What I have said is that environmental impact would grow in proportion to economic growth *if* "technology" stayed constant, where "technology", as explained in my writings about this, is shorthand for the particular mixture of goods and services and technologies for providing them that generate the economic activity recorded in GDP and are also responsible for the impact of this activity on the environment. Of course, technology does not stay constant over time. The mix of goods and services changes and the technologies used to provide them changes. The technology factor can get better (smaller impact per dollar of GDP) if the economic mix becomes less impact-intensive (*e.g.,* less heavy manufacturing, more services) or if the particular technologies used become environmentally less disruptive per unit of good or service. It can also get worse. If we want to hold environmental impact constant or reduce it as our economy grows, the only way to do so is to make sure that the technology factor improves at a rate equal to or faster than the rate at which the economy is growing. This is one of the key reasons it's so important to invest in science and technology—so we will have the technologies available to achieve these improvements at the needed pace. President Obama is committed to seizing the opportunities presented by science, engineering, and innovation to protect the environment *and* grow the economy, and if confirmed by the Senate I will all I can to help in that effort.

Question 7. What is your definition of "fear mongering?"

Answer. To fear-monger is to arouse concerns about dangers one knows are imaginary, or to arouse concerns out of proportion to the magnitude one believes the real dangers to have. It would be fear mongering to say, without evidence, that an asteroid is about to strike the Earth and wipe out life here. But it is not fear-mongering to tell a home-owner that his/her house could burn down, perhaps killing the occupants as well as destroying the investment, and that therefore it would be wise to dispose of the oily rags in the garage and buy some smoke alarms and some fire insurance. Nor should such warnings be characterized after the fact as fear mongering even if, in the whole tenure of the home-owner in the house, it does not burn down, or if it does but the smoke alarms save the occupants and the insurance recoups the financial loss.

Question 8. Specifically list forms of energy that you find acceptable as a way of growing the economy. in addition, please list the forms of energy that cannot be used to grow the economy without destroying the environment.

Answer. I have been saying and writing for forty years that we don't have the luxury of insisting on perfection in our energy sources, because all of them have liabilities of one sort or another and the fact is we need energy to meet basic human needs and to expand and sustain economic prosperity. I think the answer is to continue to invest in research and development to improve the energy sources we already have and to invent additional ones, in order to have the best portfolio of options possible at any given time, and then to let the marketplace, as modified by policy and other manifestations of the public's wishes, choose the mix that will be used.

I wrote in 1971 that I thought we'd find the quickest, least expensive, least environmentally disruptive energy source for the decades ahead to be increased energy efficiency—using lights, appliances, building envelopes, cars, airplanes, and manufacturing processes that deliver more product or service for less energy—so that the energy saved could be used elsewhere in the economy. That proved to be true. From 1970 to 2005 the amount of primary energy needed to make a real dollar of GDP in the United States fell two-fold. This meant that more energy was made available to our economy in this period from these savings than was provided by the expansion of all other energy sources combined. I believe that this will continue to be true for at least the next few decades, as well.

But efficiency improvements cannot do the whole job. Even compact fluorescent bulbs and LED lighting still use electricity, and the most fuel-efficient hybrids on the road still use hydrocarbon or alcohol fuels. We will continue to need a portfolio of ways to provide electricity, portable fuels, and heat. I think that, for the immediate future, the ingredients of that portfolio will need to continue to include:

- *petroleum-derived fuels* for our motor vehicles and aircraft especially, but with due attention to reducing the ecosystem impacts of getting those fuels domestically, the foreign-policy liabilities and economic vulnerabilities of getting them abroad, and the emissions from burning them;

- *biofuels* derived from currently practical as well as new feedstocks in ways that reduce petroleum dependence and greenhouse-gas emissions while minimizing competition with food production and destruction of forests;
- *natural gas,* which is the cleanest-burning and least CO_2-intensive of all of the fossil fuels, as well as the one most conducive to electricity generation and combined heat and power (CHP) at high efficiency and relatively low capital cost;
- *coal,* from which more than half of U.S. electricity currently comes, but which is also our most environmentally disruptive energy source and warrants efforts to move as rapidly as practicable toward less damaging ways of mining it and toward the capacity to capture and sequester away from the atmosphere most of the CO_2 that would otherwise be released from burning it;
- *nuclear energy,* currently accounting for 20 percent of U.S. electricity supply, a proportion that could be expanded with the benefit of reduced emissions of CO_2 and criteria air pollutants;
- *hydropower,* for which the best sites for large installations in the United States are mostly already in use, but which has additional potential in small-hydro and run-of-river installations with due attention to minimizing environmental impacts;
- *wind power,* which is currently the least expensive of the "new renewables" for electricity generation and also has arguably the lowest environmental impact of any of the currently available electricity-generating technologies (although still not zero, as objections on grounds of visual intrusion and impacts on birds and bats demonstrate).

Other energy sources of promise that we should be working to develop or improve in terms of their competitiveness include hot-dry-rock geothermal energy, solar-thermal electricity generation, solar-photovoltaic electricity generation, direct solar production of hydrogen, energy from ocean currents and waves, and fusion. I believe that President Obama's plan to invest $150 billion over 10 years in improving existing energy sources and developing new ones will be a great boost in getting us where we need to go.

Energy sources I think would be problematic to increase *significantly* in connection with fueling U.S. economic growth, because of the environmental or security impacts of such expansion, include:

- oil imports from politically unstable regions and from countries that use their oil-import revenues for purposes inimical to the interests of the United States;
- new coal-burning power plants that do not capture and sequester CO_2 and are not designed to be retrofitted to do so;
- coal-to-liquids and other synfuels technologies that do not use CO_2 capture and sequestration to achieve at least neutrality in "well-to-wheels" CO_2 emissions compared to gasoline produced from crude petroleum;
- biofuels technologies that compete directly with food production and thus drive up food prices, or that result in deforestation or other forms of land-use change that lead to net increases in CO_2 emissions;

Question 9. Do you believe California has been a good model for cap-and-trade, and how are low-income families affected by the cost of energy? In addition, what are your thoughts on the statement that "economic development is the key to human well-being?"

Answer. California's cap-and-trade policies, which are part of a bill passed by the California legislature in 2006 (AB32), will not go into effect until 2012. The program is designed to return California to 1990 emissions levels by 2020, which is the same figure as mentioned by President Obama during the campaign as a prospective intermediate goal for the country as a whole. The President has also made clear that he favors a cap-and-trade approach to emissions reductions, but the extent to which the details of the Federal approach do or do not resemble those of the California plan remains to be worked out by the administration in concert with the Congress.

Of course, charging a price for emitting CO_2 will necessarily increase the cost of using fossil fuels. But this will not necessarily increase the overall cost of energy services, because higher fossil fuel prices will motivate increased private investments in energy-efficiency improvements that will save money at the higher energy prices by reducing the amount of energy needed to deliver a given service and because part of the revenues from auctioning the emission permits is likely to be invested by the government in additional energy-efficiency programs that will have similar effects.

As a general matter, poor people are the most vulnerable segment of our society to increases in energy costs. That vulnerability can be reduced, however, with progressive rate structures ensuring that any overall price increases are born mainly by the larger users and by devoting a part of permit revenues to programs that provide insulation, energy-efficient windows, compact fluorescent bulbs, and the like to poor people.

I certainly believe that economic development is one of the keys to improving human well-being. I have been emphatic in my writings and speeches over the years that human well-being rests on a foundation of three pillars—economic, environmental, and sociopolitical (where the last includes national and personal security, personal freedoms, access to a working system of justice, etc.). It is my position that all three pillars are indispensable, in the same sense that a three-legged stool falls down if any one leg fails. It is therefore important to be sure that, in seeking to strengthen any one of the legs, we do not do so in ways that seriously weaken either one of the others. That is a challenge to which science and technology have much to contribute.

Question 10. In regards to malaria deaths, how many people have died of malaria globally since banning DDT for the use of malaria suppression?

Answer. Malaria remains a terrible scourge across much of the world's tropical and subtropical area, killing 900,000 people per year. But I don't believe lack of use of DDT has been a significant contributor to our failure to better control this disease. Under the international agreement governing DDT use—the Stockholm Convention on Persistent Organic Pollutants—governments believing that they need DDT for malaria control can and do get exemptions to use it, and they are not expected to stop using it until they are satisfied that alternatives are workable for their specific needs.

The World Health Organization's attempt in the 1950s and 1960s to eradicate malaria with a massive DDT-spraying program did help to control malaria for a time, but it ultimately failed mainly because many species of mosquito around the world evolved resistance to DDT. This plus growing evidence of harm to humans and other animals from DDT and its breakdown products led most countries to give up DDT use for malaria control in favor of integrated approaches combining elimination of mosquito breeding sites, biological controls, spraying of alternative chemicals, and early detection and prompt treatment of malaria cases. The plan that President Obama has announced to eliminate the scourge of malaria worldwide by 2015 entails working in partnership with developing countries, donor nations, and private and non-profit organizations to achieve universal access to these proven, integrated approaches to prevention and treatment

Question 11. Do you still support government funded sterilization as a useful tool for de-development of industrialized economies?

Answer. I have never supported government-funded sterilization. The term "de-development" was used by me and some of my co-authors for a few years in the 1970s but then abandoned as unhelpful. At the time, further development in the industrialized nations was seen as entailing large increases in emissions of toxic and climate-altering substances, habitat destruction, extinction of species, and unsustainable practices in agriculture, fisheries, and forestry. My co-authors and I explained that by "de-development" we meant scaling back these harmful practices by, for example, reducing per-capita energy use through improvements in energy end-use efficiency, doing the same with water use, and making products that last longer and are designed for easy recycle. The term I have lately been using in discussing what I think we should be aiming for in these and related respects is not "de-development" but "sustainable prosperity."

Question 12. One of the few guarantees of climate change legislation is that if will increase the cost of electricity to consumers and energy to industry. How does this create jobs and at what point is an increase in the cost of electricity on low-income families unacceptable?

Answer. As discussed in my answer to question 9, above, measures to reduce the emissions of CO_2 will initially increase the unit costs of electricity and fuel, but responses to these increases are likely to include energy-efficiency improvements that reduce the amount of electricity or fuel needed to provide a given service, thus reducing the adverse economic impact on the consumer. Impacts on low-income families can be ameliorated through utility (electricity and natural gas) rate structures and through programs that use some of the revenues from the sale of emissions permits to help the poor with energy-saving investments.

Creating economic incentives to reduce greenhouse-gas emissions by charging for emissions permits will stimulate investment in research, development, demonstration, and deployment of improved and new technologies both for using energy more

efficiently in the production of the goods and services that people want and for providing electricity and fuel in ways that emit less greenhouse gases than today's energy-supply technologies do. These investments will lead to the creation of new jobs and the founding of new businesses, just as control of conventional air pollution and water pollution starting in the 1970s led ultimately to a set of environmental- protection businesses that today generate hundreds of billions of dollars of annual revenue in this country.

Question 13. Dr. Holdren, you have made a number of astonishingly dire predictions over the past four decades of approaching environmental catastrophes that would lead to widespread human suffering and death. Have any of these predictions come true? Why do you think that is? Do you think that any of your predictions are still likely to come true in the future? Which ones? Do you think it would be advisable to base important public policies on any of these predictions or on similarly wild-eyed predictions that you may develop while serving as White House science, not science fiction, adviser?

Answer. Statements I have made about dangers from nuclear weapons, pressures on supplies of food and water, pollution, and impacts of climate change have been intended not as predictions but as projections about where we were heading and, thus, why it would be a good idea to change course in ways that would reduce these dangers. To the extent that some of the potential harm identified in these projections has not yet happened or has not happened to the degree I said was possible, I believe this is at least partly because society did take construction actions to reduce the dangers. (I listed a number of those constructive actions, including a number of environmental laws passed by the U.S. Congress and signed into law by six U.S. presidents of both parties, in my answers to the pre-hearing questions.) I believe that identifying possible adverse outcomes of actions taken or not taken, as well as identifying and analyzing appropriate strategies for reducing the dangers, is as appropriate in the domain of science and technology policy as it is in the domain of economic policy, and if confirmed by the Senate as Director of the Office of Science and Technology Policy I would take this responsibility seriously.

Question 14. Dr. Holdren, you have been a tireless advocate for drastic reductions in population. You have also advocated de-development and reductions in the standard of living in the developed economies. Do you favor mandatory government-enforced reductions in population in this or any other country? Have you ever commended China's one-child policy? 1 assume you support abortion. Have you also commended Dutch-style euthanasia policies? Do you welcome the financial crisis and economic recession as a way to accomplish your goals of de-development and lower living standards? Why not?

Answer. Actually, I have written relatively little on population issues since the 1970s. I do not favor government-enforced reductions in population in the United States or elsewhere. I do not favor the harsh measures employed in China in favor of that country's one-child-per-family policy. I do not favor euthanasia. I am appalled by the current financial crisis because of its adverse impacts on the well-being of U.S. citizens and people around the world. My use of the term "de-development" three decades ago was in the context of aspects of economic growth, as it was then being pursued, that were causing considerable harm. As indicated in my answers to pre-hearing questions, I concluded long ago that the term was poorly chosen, and I have ever since been using the terms "sustainable development" and "sustainable prosperity" to convey what I think we should be trying to achieve. My interest in the interaction of science and technology with the human condition has always been to try to ensure that science and technology are used to increase the sum of human well-being, taking into account well-being's environmental and socio-political aspects as well as its economic aspect. I wish anyone who doubts this would read my 2007 Presidential address for the American Association for the Advancement of Science, "Science and Technology for Sustainable Well-Being", which was published in the 25 January 2008 edition of SCIENCE and is available online at *http://www.sciencemag.org/cgi/content/full/319/5862/424*.

Question 15. Dr. Holdren, you are a man of strong political convictions. It appears that you have often put your scientific position and expertise in the service of your political commitments. It appears that you have sometimes forced the science to fit your agenda. Don't you think this disqualifies you for the roles of WH science adviser and director of OSTP? The science adviser is charged with providing the President with objective and useful scientific information and analysis to inform policy choices. The OSTP serves as a conduit for the entire scientific community, not just one politically-engaged part of it, to share its knowledge and views and concerns with the administration. The science adviser and OSTP director is not supposed to push a policy agenda or to fit or cherry pick the scientific facts and evidence to sup-

port a particular agenda. Do you think that a person of such strong political commitments as you have can check those commitments at the door? If so, do you think that some of the scientists you have attacked and criticized would be able to check their views at the door if they were nominated to serve as science adviser. For example, Professor Richard S. Lindzen of MIT has much more professional competence as a climate scientist than you do. In fact, I note that you are not a climate scientist. Professor Lindzen has published many highly regarded papers in atmospheric physics and has been a member of the National Academy of Sciences for approximately thirty years. He has also commented on the public policy debate on global warming, although he has never promoted a political agenda in the way you have. Do you think Professor Lindzen is qualified to be White House science adviser and director of OSTP? Would you support his confirmation if he were nominated at some point in the future?

Answer. With respect, I disagree with the question's characterization of how I have conducted myself over my four-decade career working on issues of science and technology as they affect public policy. My policy preferences on issues where insights from science and technology are germane have been shaped by my understanding of the relevant science and technology, not the other way around. (That is not to say that insights from science and technology always tell us what policies to prefer; more often than not they do not suffice for that. But they do often tell us something about what policy needs to achieve or to avoid.)

As to whether I am a climate scientist, the question appears to embody a rather narrow definition of what a climate scientist is. I do not have a degree in meteorology, but I do hold a tenured full professorship in one of the leading university departments of Earth Science in the world. I have two degrees in aeronautics and astronautics from MIT in which my major fields of study were fluid dynamics and aerospace engineering, and a PhD from Stanford that included further study of fluid dynamics and a doctoral thesis on theoretical plasma physics. Fluid dynamics is what governs the motions of the atmosphere. The mathematics of plasma physics is very similar to the mathematics used in modeling the Earth's climate. I have been teaching environmental science, including the science of climate change, for more than 35 years at Caltech, the University of California, Berkeley, and Harvard, and I have been publishing peer-reviewed articles and reports about the causes and consequences of climate change, and the remedies for it, for even longer.

While I am not willing to engage, in this venue, in a comparison of my qualifications to be Director of OSTP with those of others, I will note that I am a long-time member of both the National Academy of Sciences and the National Academy of Engineering, a Fellow of the American Physical Society and the American Academy of Arts and Sciences, and a former President and Chair of the Board of the American Association for the Advancement of Science (elected by the membership of this, the largest general science society in the world and the publisher of the journal SCIENCE). I believe I was nominated by President Obama to serve as his Assistant for Science and Technology and Director of the Office of Science and Technology Policy not only because of my knowledge of and contributions to the issue of climate change (although that is certainly *one* of the important science and technology issues facing this administration and this country) but also because of my experience with a variety of other environmental issues; with nuclear and nonnuclear energy technologies; with space science and technology; with nuclear weapons, nuclear arms control, and nonproliferation; with international cooperation in science and technology; and with the study and practice of how science and technology policy work in the White House.

Question 16. Dr. Holdren, you have been dismissive and have sometimes sneered at the views of highly qualified professional climate scientists, who are often described in the media as climate skeptics, and even though you are not a climate scientist. People such as Professor Richard Lindzen of MIT, Professor John Christy of the University of Alabama at Huntsville, Dr. Roy Spencer of the University of Alabama at Huntsville, Professor Patrick Michaels of the University of Virginia, and Professor Emeritus and former director of the U S. Weather Service Fred Singer. Have you ever called any of these distinguished scientists (or any scientists I haven't named) "deniers", thereby implying that they are somehow similar to Holocaust deniers, simply because they have expressed views you disagree with. If you are confirmed, what evidence can you offer that you would be able to consider fairly and to represent their expert views? Will you continue to denigrate expert scientific views you disagree with and the scientists who hold them while serving President Obama?

Answer. I would not say I have "sneered" at the views of any of the individuals named in the question, although I have certainly disagreed publicly with a number of specific arguments that some of these individuals have advanced. Most of the in-

dividuals named do not deny that climate change is occurring or that human activities have something to do with it, but rather take the view that the uncertainties are larger and the most likely consequences smaller than what most climate scientists believe to be the case. In the rare instance that one finds a climate scientist of any sort who actually denies that human activities are changing the climate of the Earth, I would say that the term "climate-change denier" is accurate without imputing any similarity or relationship to those who deny the reality of the Holocaust. These are very different kinds of denial.

Question 17. Dr. Holdren, you have made many strong claims about global warming and its impacts. Rather than listing those claims, can you provide evidence for some of them? You have stated that global warming is accelerating and happening faster than predicted. Can you show any satellite or surface global temperature data sets that support your claim? Are you aware of any data sets that do not support your claim? What criteria have you applied to prefer one temperature data set to another? You have stated that the impacts of global warming are already apparent and worse than predicted Can you comment on some of these? For example sea level rise. What is your view? Is it supported by the IPCC's Fourth Assessment Report? For example, you have claimed that droughts, Moods, and storms are also increasing as a result of global warming. What professional expertise has allowed you to pick out and prefer a few studies that support your claim out of the many studies that do not? Since you are not a climate scientist, you may not be aware of the scientific literature that does not support your alarmist views. Therefore, we would be happy to share some of those studies with you and invite your comments on them.

Answer. The question mentions the IPCC's Fourth Assessment Report. It is a fine compilation of much of the evidence for the statements I have made about global climate change and its impacts.

Where the question implies that the IPCC Fourth Assessment does not support what I have said (namely, about the potential extent of sea-level rise in the 21st century), I have already explained in my written answers to pre-hearing questions, as well as in the oral Q&A portion of my hearing, that the IPCC report itself makes clear that the authors chose to present quantitative estimates only for those contributing phenomena that they felt could be modeled reasonably accurately at the time they wrote. This excluded the mechanisms for rapid ice sheet disintegration that paleoclimatological studies have indicated were responsible for rates of sea level rise of 2 to 5 meters (6.6 to 16 feet) per century during natural warming periods in the past 20,000 years (see R. B. Alley *et al., Science,* 310: 456–460, 2005; J. T. Overpeck *et al., Science* 311: 1747–50, 2006). The IPCC authors actually made clear that their lower figures, which included only thermal expansion of sea water and the gradual melting of land ice, were *neither* a "best estimate" *nor* an "upper bound" of sea-level to be expected by 2100 because of the exclusion of the faster mechanisms from their quantitative analysis. As I indicated in my earlier answers, a series of studies published since the IPCC report was finalized suggest that the best current estimate of the maximum sea-level rise to be expected by 2100 is 1–2 meters, i.e, 3.3 to 6.6 feet (see, *e.g.,* S. Rahmstorf, *Science* 315: 368–370, 2007; W. T. Pfeffer *et al., Science* 321: 1340–43, 2008, and references therein).

In addition to the reports of the IPCC, accessible accounts of the evidence for the character and impacts of global climate change, with extensive references to the peer-reviewed scientific literature, can be found in the reports on the subject of the U.N. Scientific Expert Group on Climate Change and Sustainable Development, for which I was one of the coordinating lead authors (*www.unfoundation.org/SEG/*); the U.S. National Academy of Sciences (*http://dels.nas.edulglobalchange*); the U.S. National Center for Atmospheric Research (*www.ucar.edu*); and the U.K. Meteorological Office (*www.met-office.gov.uk*), as well as on a myriad of websites run by some of the most respected climatologists (*e.g., www.columbia.edu/~*jeh1/, *stephenschneider.stanford.edu, www.realclimate.org*).

Besides these relatively comprehensive accounts of the scientific evidence relating to climate change and its impacts, I offer the following as recent substantiation, in the peer-reviewed literature, of what I have characterized as the "mainstream" or "center of gravity" position on specific points to which the question calls attention:

- For recent accounts of the evidence that climate change is accelerating, please see, *e.g.,* Canadell, J. G., *et al.* (2007) *Proceedings of the National Academy of Sciences,* 104(47): 18866–18870; Raupach, M. R., *et al.* (2007) *Proceedings of the National Academy of Sciences,* 104(24): 10288–10293; Rahmstorf, S., *et al.* (2007) *Science,* 316: 709.
- On the consistency of surface temperature records and satellite measurements, showing global warming at a pace unusual against the backdrop of recent natural variability, please see, *e.g.,* National Research Council, Board on Atmos-

pheric Sciences and Climate, *Surface Temperature Reconstructions for the Last 2,000 Years,* 2006 (*http://www.nap.edu/catalog/11676.html*); Karl, T. R., *et al.,* editors, *Temperature Trends in the Lower Atmosphere: Steps for Understanding and Reconciling Differences.* A Report by the Climate Change Science Program and the Subcommittee on Global Change Research, Washington, DC, 2006 (*http://www.climatescience.gov/Library/sap/sap1-1/finalreport/default.htm*); Mears, C.A. and F.J. Wentz, *Science* 309: 1548–51, 2005.

- On increases in droughts, heat waves, and wildfires linked to global climate change, please see, *e.g.,* Barnett, T. P., *et al.* (2008) *Science* 319: 1080–1083; Karl, T. R., *et al.* (2008) *Weather and Climate Extremes in a Changing Climate* (*http://www.climatescience.gov/Library/sap/sap3-3/final-report/default.htm*); Westerling, A., *et al.* (2006) *Science,* 313: 940–943.
- On the link between global climate change and powerful tropical storms, please see, *e.g.,* Elsner, J. B. *et al., Nature* 455: 92–95, 2008; Saunders, M. A. and A. S. Lea, *Nature,* 451: 557, 2008; Mann, M. E. and K. A. Emanuel, *Eos,* 87 (24), 233, 2006; Sriver, R. and M. Huber, *Geophysical Research Letters,* 33, L11705, 2006.

I do not agree with the question's suggestion that only a few studies support my characterizations of current understandings in climate science while many do not. Indeed, I believe that the opposite is true, at least if one confines attention to the peer-reviewed scientific literature.

Of course, one does not determine what is most likely to be correct only by counting up the numbers of scientific papers on each side of an issue; if one has the background needed to do so, one reads the analyses, examines the data and the arguments, and tries to reach a reasoned conclusion about which findings should be taken most seriously. In every scientific field, many things make it into the peer-reviewed literature that subsequently are shown to be incorrect. (This was the case with some of the early interpretations of satellite data on tropospheric temperatures, appearing to show a cooling rather than the expected warming.) That is why it is so important to stay up to date, and also why the reports of the National Research Council and the Intergovernmental Panel on Climate Change—in which leaders in the field devote great effort to sorting out the science that stands up to scrutiny from the science that does not—have such high credibility.

Question 18. Dr. Holdren, on global warming and several other scientific issues with important public policy consequences, your views in my opinion are not well supported in the expert scientific literature and in fact have been described, perhaps uncharitably, as being on the kooky fringe. As scientific adviser, how will you put aside your own non-mainstream personal views and represent mainstream scientific views on global warming and other scientific topics that have serious ramifications for public policy?

Answer. As indicated in the preceding answer, I do not agree with the question's premise that my views on climate-change science are not well supported in the expert scientific literature and that they differ from mainstream scientific views on the topic. I consider the mainstream views to be those presented in the reviews of climate science issued by the National Research Council and the Intergovernmental Panel on Climate Change and summarized periodically in statements issued by, *e.g.,* the presidents of the national academies of science of most of the countries that have such academies, the leaderships of the principal professional societies dealing in the physical and Earth sciences, and so on. (A compilation of those statements is available at *http://www.logicalscience.com/consensus/consensusD1.htm.*)

I believe it would be my responsibility as Director of the Office of Science and Technology, if confirmed by the U.S. Senate, to communicate to the President and others the content of these mainstream views as well as the range of scientific opinion diverging from the mainstream, in both the more optimistic and more pessimistic directions, and my best judgment about the implications for policy of the ranges of disagreement and uncertainty that exist. As in other subject areas, in developing these formulations I would expect to draw upon the insights and judgments of experts on the OSTP staff, on the President's Council of Advisors on Science and Technology, in cabinet departments and other Federal agencies as appropriate, and across the wider science and technology communities.

Question 19. Dr. Holdren, during your nomination hearing you mentioned that you still believe one billion people will die from global warming by 2020. You also mentioned that in your scientific predictions you have "hedged your bets" and "were within the scientific feeling at that time." When you advise the President do you plan on "hedging your bets" and going with the "feeling at the time?"

Answer. With respect, I did not say I believe a billion people *will* die from the impacts of climate change by 2020; I said I believe such a terrible outcome remains *possible,* and I explained that the way this could come about would be if global climate crossed a tipping point into a climate regime that drastically reduced world food production. (On climate tipping points and their possible imminence, please see, *e.g.,* Lenton, T. M., *et al., Proceedings of the National Academy of Sciences* 105(6): 1786–1793, 2008; on the vulnerability of world food production to climate change, please see, *e.g.,* Lobell, D. L., *et al., Science* 319, 607–610, 2008, and D. S. Battisti and R. L. Naylor, *Science* 323: 240244, 2009.)

More generally, the future being inherently uncertain, all statements about it should be "hedged"; that is, the uncertainty should be acknowledged, and the assumptions on which particular projections or scenarios are based should be stated. I have always tried to do that, although this is not necessarily apparent when someone quotes a single sentence or part of a sentence out of context. I have also always tried to base my statements about trends and associated risks on the best scientific information and judgments available at the time. (If, in the press of oral Q&A at my hearing, I ended up saying "scientific feeling" rather than "scientific understanding" or "scientific judgment", I regret the imprecision.) Of course, scientific information gets better as time goes on, and I hope that my capacity to assess such information—and to draw upon others to help me assess it—has also improved over time.