

MCNUTT AND MAJUMDAR NOMINATIONS

HEARING BEFORE THE COMMITTEE ON ENERGY AND NATURAL RESOURCES UNITED STATES SENATE

ONE HUNDRED ELEVENTH CONGRESS

FIRST SESSION

TO

CONSIDER THE NOMINATIONS OF MARCIA K. MCNUTT, TO BE DIRECTOR OF THE UNITED STATES GEOLOGICAL SURVEY, AND ARUN MAJUMDAR, TO BE DIRECTOR OF THE ADVANCED RESEARCH PROJECTS AGENCY-ENERGY, DEPARTMENT OF ENERGY

OCTOBER 8, 2009



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MCNUTT AND MAJUMDAR NOMINATIONS

THURSDAY, OCTOBER 8, 2009

U.S. SENATE,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
Washington, DC.

The committee met, pursuant to notice, at 10:22 a.m., in room SD-366, Dirksen Senate Office Building, Hon. Jeff Bingaman, chairman, presiding.

OPENING STATEMENT OF HON. JEFF BINGAMAN, U.S. SENATOR FROM NEW MEXICO

The CHAIRMAN. Let us go ahead with our hearing on Dr. McNutt and Dr. Majumdar. Let me make a short statement about the two of them and proceed with that.

Dr. Marcia McNutt, has been nominated to be the Director of the Geological Survey. This is one of the Federal Government's oldest scientific bodies, the principal source of scientific information about our Nation's land, minerals, and water resources, the second oldest office that is under this committee's jurisdiction.

Dr. Arun Majumdar has been nominated to be the Director of the Advanced Research Projects Agency at the Department of Energy, ARPA-E as it is known. It was established by the Energy Policy Act of 2005 to overcome technological barriers to the development of advanced energy technologies, but the director's post was left unfilled by the previous administration. If confirmed, Mr. Majumdar will be its first director.

Both Dr. McNutt and Dr. Majumdar are extremely well qualified for the positions to which the President has nominated them. Dr. McNutt is currently the President and Chief Executive Officer of the Monterey Bay Aquarium Research Institute and Professor of Marine Geophysics at both Stanford University and the University of California at Santa Cruz. Since earning her doctorate in earth sciences at the Scripps Institution of Oceanography, Dr. McNutt has also taught geophysics at MIT, authored 90 scientific papers, has been repeatedly recognized for her scientific achievements. If confirmed, she will be the first woman to head the USGS in its 130-year history.

Dr. Majumdar is currently the Associate Laboratory Director for Energy and Environment at the Lawrence Berkeley National Laboratory and a professor of mechanical engineering and material science and engineering at the University of California at Berkeley.

Like Dr. McNutt, Dr. Majumdar is a highly distinguished research scientist. In addition, he has been an entrepreneur, has advised startup companies and venture capital firms in Silicon Val-

ley. He is also an authority on energy efficiency, renewable energy, and energy storage.

I strongly support both nominees. I am pleased to welcome them to our committee this morning.

Let me recognize Senator Murkowski for any statement she would like to make.

[The prepared statement of Senator Brownback follows:]

PREPARED STATEMENT OF HON. SAM BROWNBACK, U.S. SENATOR FROM KANSAS

Thank you Mr. Chairman and Ranking Member Murkowski and congratulations to both nominees for your selection to serve within the Obama Administration

I'm extremely impressed with the experience both of you have in your respected areas of science, and I hope you maintain your commitment to the advancement of science from an objective viewpoint.

I support the goals you both have laid out in your written testimony. I don't think anyone would argue with the importance of studying the submarine areas off the coast of the United States to better understand their resource potential, or providing scientific and engineering innovations to advance energy efficiency and security.

But I ask that when you pursue these objectives, you do so from an unbiased objective approach that takes into account all scientific studies absent political ideologies, and hopefully therefore, moving our nation towards the goal of greater energy independence.

I believe, through balanced policy, we can achieve this goal. What I don't believe, is that we can achieve this goal by promulgating national carbon emission regulation, regulation which I believe will only further cripple our national economy without any positive impact on global temperature reduction.

Before I close, I wanted to address one issue I have with the Advanced Research Projects Agency-Energy at the DOE. Specifically, I was troubled that the Funding Opportunity Announcement for this program limits participation eligibility to U.S. operations of companies' headquartered abroad. Nationwide, these companies employ over 5 million Americans including 46,500 Kansans. There are no other programs at DOE that define these US companies as "foreign entities" and there is nothing in either applicable law or regulation that would require these restrictions. Many of these companies are longtime partners with the DOE and have expertise in this area that can help advance U.S. energy goals. As such, allowing their participation in ARPA-E, very much like DOE successfully does in other programs, could positively impact future U.S. employment while contributing to the success of the program. I know that officials at the Department have had discussions with folks on this issue and I appreciate the Secretary's acknowledgement of those concerns and a commitment to consider the issue and look to modify future requirements. I would ask that the exchange of letters regarding this issue, and my full statement, be entered into the record. In addition, I would like your assurance, Mr. Majumdar, that the policy will be carefully reviewed, and hopefully changed, in light of these considerations.

Thank you again for testifying today, and I look forward to working with both of you in the future.

ATTACHMENTS.—EXCHANGE OF LETTERS FROM SENATOR BROWNBACK

ORGANIZATION FOR INTERNATIONAL INVESTMENT,
May 26, 2009.

Hon. STEVEN CHU,
Secretary of Energy, 1000 Independence Ave., S.W., Washington, DC.

DEAR SECRETARY CHU: On behalf of the Organization for International Investment (OFII) and the more than 5 million American workers employed here by U.S. subsidiaries of foreign-based multinationals, I write to express concern about participation restrictions placed on these companies in a recent ARPA-E Funding Opportunity Announcement (FOA).¹ This discriminatory treatment of certain U.S. companies is not mandated by applicable law or regulation. Restricting the ability of these companies and their American workers to fully participate in the program and compete for program funds undermines the effectiveness of the program, calls into question the U.S. commitment to a nondiscriminatory environment for foreign in-

¹APRA-E Funding Opportunity Announcement # DE-FOA-0000065.

vestment, and invites similar protectionist retribution from other countries. We urge you to reconsider these restrictions and issue an amendment to the FOA that removes these restrictions and allows all U.S.-domiciled companies, regardless of ultimate ownership, to compete on a level playing field for available ARPAAE funds. Representatives of our member companies would be pleased to meet with you and your staff to provide further information on how their participation has benefited similar programs.

By way of further background, OFII is a business association representing the U.S. operations of many of the world's largest international companies. These operations directly employ more than 5 million Americans here in the United States and support an annual U.S. payroll of over \$364 billion. As evidenced by the attached membership list, many OFII members are household name companies with historic and substantial U.S. operations. Many are significant partners of your Department, and will be adversely affected by these new provisions.

The restrictions included in the ARPA-E FOA would limit the ability of numerous U.S.-incorporated companies to participate fully in this important program. Two restrictions are particularly troublesome. First, the FOA prohibits a foreign entity² from serving as the lead of a team competing for ARPA-E funds. Second, the FOA requires that "no more than 25% of the ARPA-E funds may be expended by the combination of all foreign entities on the project . . . regardless of whether the work is performed in the United States or a foreign location." These restrictions are both surprising and onerous because, to the extent it is important that ARPA-E funded activities take place within the United States, the existing FOA requirement that 90% of the work be performed on U.S. soil would accomplish that goal.

As currently drafted, the restrictions on the participation of "foreign entities" will severely limit the ability of such significant DOE partners as Saint-Gobain, BASF, Philips Electronics, and Bosch from participating in the program. These companies employ thousands of American workers who work in research, production and office facilities throughout the United States. As such, the restrictions discriminate in favor of some U.S. companies and workers while disadvantaging other U.S. companies and workers. OFII Member Companies can make important contributions to the ARPA-E program and their participation would be of significant benefit to the Department and to the United States. Respectfully, restrictions that limit in any material way their ability to participate undermine the effectiveness of the program, make no economic sense, and will deprive U.S. taxpayers of the full value of their investment.

We would further note that these restrictions are not legally required. We understand that the restrictions were adopted by Departmental program officials believing they were "in the spirit" of the Buy America provisions in the American Recovery and Reinvestment Act. We are very concerned that the program officials did not appreciate the significantly adverse and public impact of these restrictions on U.S. companies, on the effectiveness of the ARPA-E program, and on U.S. trade policy more generally.

Setting aside any questions the restrictions raise under U.S. international agreements, they are also inconsistent with the longstanding and explicit U.S. policy to encourage foreign investment in the United States and accord nondiscriminatory treatment. The FOA invites discrimination against U.S. companies abroad, which is exactly what President Obama and the other G20 Leaders pledged to avoid through their commitment to "promote global trade and investment and reject protectionism."

Finally, the restrictions currently set forth in the FOA are a disturbing example of what can happen when government crafts overtly protectionist policies. The atmosphere created by the "Buy America" provisions has encouraged officials to discriminate believing such discrimination is consistent with what appears to be prevailing policy. This is the very concern that we, along with dozens of companies and other trade associations, raised in our February 4th letter to the President opposing the Buy America provisions. In that letter, we warned that such a provision would "send the wrong message at the worst possible time." Our fear was that the "wrong" message would be received by other countries. It is now clear that the wrong message was heard by U.S. officials as well.

We strongly urge you to remove these unprecedented and unwarranted restrictions from the ARPA-E funding opportunity announcement, and to ensure that no

²The FOA definition of a "foreign entity" is overly broad and includes any entity that is "directly or indirectly owned or controlled by a foreign company or government."

similar restrictions are included in future FOAs for the ARPA-E program or other DOE programs.

Sincerely,

NANCY MCLERNON,
President & CEO.

DEPARTMENT OF ENERGY,
Washington, DC, July 29, 2009.

Ms. Nancy McLernon,
President and CEO, Organization for International Investment, 1225 Nineteenth Street, NW, Suite 501, Washington, DC.

DEAR MS. MCLERNON: Thank you for your May 26, 2009, letter concerning foreign participation and funding under the first Funding Opportunity Announcement (FOA) issued by the Advanced Research Projects Agency-Energy (ARPA-E).

You correctly note that the FOA permits participation by foreign entities and allows substantial funding of activities by foreign entities. However, you question the requirement that lead organizations be U.S. entities as well as the limitation on the percentage of ARPA-E funds that may be received by foreign entities participating in a selected project.

The first ARPA-E FOA provisions sought to strike a thoughtful balance on the issue of foreign participation, permitting a substantial role for foreign entities with the resources and capabilities to participate in the important transformational goals of ARPA-E, while meeting the stipulations of the American Recovery and Reinvestment Act. The second ARPA-E FOA will be modified based on other factors, and we will coordinate this with the Department of Commerce and the Office of the United States Trade Representative (USTR).

I believe that transformational results in energy research can be achieved when technology leaders and researchers from all over the world commit themselves to innovation. By supporting a global interest in collaborative energy research and innovations in energy technologies I hope to address better the energy, economic, and climate needs shared by all countries.

Again, thank you for your interest in this important program. If you have any questions or require additional information, please contact me or Shane Kosinski, Advanced Research Projects Agency-Energy, at (202) 287-1057.

Sincerely,

STEVEN CHU,
Secretary.

**STATEMENT OF HON. LISA MURKOWSKI, U.S. SENATOR
FROM ALASKA**

Senator MURKOWSKI. Thank you, Mr. Chairman. I appreciate the hearing this morning and I want to thank our nominees for their willingness to serve.

You have noted the distinguished history within the USGS. Ms. McNutt will have 130 years of USGS history to deal with, while Mr. Majumdar has the luxury and also the challenge of being nominated to head an agency with almost no history to defend. So I do not know which is better here.

Certainly on its face, the mission of the USGS is quite straightforward, to provide reliable scientific information about our Nation's resources. Good and complete information about the extent and the location of our Nation's natural resources is clearly essential and I believe the foundation of wise decisions regarding energy and land use policy. USGS also serves as a place where we help to educate Americans as to what our resources are and what they are not.

I look forward to your responses to questions, Ms. McNutt. I do hope that you commit to providing the information that will allow us to do just that: understand where our resources are and where they may not be.

I would also like to recognize the importance of another part of the USGS mission. Alaska, as you know, is part of this Pacific Rim of Fire, which is very geologically active. It is exposed on nearly a daily basis to threats from volcanoes and earthquakes and tsunamis. We have one volcano down on the chain that is picking up in activity. We had our major airport in the State, as well as other airports, shut down in March and April. It kept my kids from returning home from spring break, while they were skiing out there. It really ruined their day, I am sure.

But I think we recognize that this geologic activity is not something that is remote and just happens where there is no impact to commerce and to human activity. It is incredibly important that within USGS they help to work with us to predict and minimize the risk to people in the State of Alaska. I look forward to discussing these issues with you and so many others.

As far as the responsibilities within the Advanced Research Projects Agency, I think Senator Bond made the comment that food does not come from the back of a grocery store, and as such, we know that water does not originate from the faucet and copper wire does not originate from some endless spool in the hardware store. Gasoline does not originate from the filling station. But I think there are some who believe that there is this immaculate conception for energy. It just happens, that there is some magical technology that is going to appear overnight and just transform our Nation's energy use.

That in one sense, Mr. Majumdar, is your job. I hope that you are successful in this, but hope is not much to build a prosperous economy on. While we wait for that today, we have to focus clearly on how we best assess, how we manage and how we produce the resources that will stabilize and advance our economy today and for some time into the future. I will look forward to your comments as well.

With that, Mr. Chairman, I am ready to go.

The CHAIRMAN. All right.

Let me ask the two nominees to please come forward to the witness table. Representative Farr, please have a chair. Let us hear first from Representative Farr, who is here to introduce Dr. McNutt and who represents an area in California that she hails from, as I understand it. We are very glad to have you before the committee. Go ahead, please.

**STATEMENT OF HON. SAM FARR, U.S. REPRESENTATIVE
FROM CALIFORNIA**

Mr. FARR. Thank you very much, Mr. Chairman. I am, indeed, honored to be before your committee and Ranking Member Murkowski and my friend, Senator Udall, and Senator Risch. I really appreciate the opportunity. I am really honored to be able to introduce to you Dr. McNutt, a scientist of exceptionally high caliber, and commend her to you as President Obama's nominee to head the USGS.

Of course, it is bittersweet for me because Dr. McNutt is leaving my district where she has had an important and a lasting impact as a scientist, as a leader, as a member of our community.

Dr. McNutt first arrived in Monterey more than a decade ago from the Massachusetts Institute of Technology to take charge of the Monterey Bay Aquarium Research Institute, better known locally as MBARI. This was an institute founded by the late David Packard.

Her arrival coincided with the Year of the Ocean, and Dr. McNutt immediately joined in and became a leader in the planning of this high-profile event, in which I was heavily involved. That was the event in which President Clinton and the First Lady visited and had a White House conference on the oceans in Monterey.

Out of this grew a multi-institutional cooperative alliance that she chaired for many years called the Monterey Bay Crescent Ocean Research Consortium. The consortium continues to this day and is outstanding for its breadth and density of its oceanographic and scientific prowess, unrivaled anywhere in the world.

Taken together, these activities are illustrative not just of Dr. McNutt's initiative and leadership, but also of her pioneering vision.

I point this out because it is such a clear example of Dr. McNutt's farsighted thinking and of how her collaborative style and commitment to working with other institutions have built such enduring programs and productive relationships.

I would like to also mention that Dr. McNutt is one of the few women to have achieved membership in all three honorary academies: the National Academy of Sciences, the American Academy of Arts and Sciences, and the American Philosophical Society.

Thank you for allowing me the tremendous honor to introduce you to Dr. McNutt, and with her today is her daughter Meredith and daughter Dana.

[The prepared statement of Mr. Farr follows:]

PREPARED STATEMENT OF HON. SAM FARR, U.S. REPRESENTATIVE FROM CALIFORNIA

Thank you Chairman Bingaman and members of the Committee for granting me the opportunity to speak to you here today: it is a great privilege. It is also a great privilege and a sincere pleasure to introduce Dr. Marcia McNutt, a scientist of exceptionally high caliber, and to commend her to you as President Obama's nominee to head the United States Geological Survey. Of course this is a bittersweet moment for me because it means that Dr. McNutt will be leaving my district, where she has had an important and a lasting impact as a scientist, as a leader and as a member of our community.

Dr. McNutt first arrived in Monterey more than a decade ago from the prestigious Massachusetts Institute of Technology to take charge of the Monterey Bay Aquarium Research Institute, better known as MBARI. Of course all of the ocean leaders in the Central Coast were keenly interested in what direction she might take this, then young, institution; it had so much promise but had, to date, been somewhat insular from the other oceanographic institutions in the area. Her arrival coincided with the Year of the Ocean. Dr. McNutt immediately joined in and became a leader in the planning for this high-profile event, in which I was also heavily involved.

Out of this grew an inter-institutional cooperative alliance that she chaired for many years, called the Monterey Bay Crescent Ocean Research Consortium, or MBCORC. The existence of MBCORC provided the nucleus for one of the first successful regional ocean observing systems, CeNCOOS, which is hosted at MBARI. Taken together, these activities are illustrative not just of Dr. McNutt's initiative and leadership, but also of her pioneering vision. The Monterey Bay Crescent Ocean Research Consortium continues to this day and is astounding for the breadth and density of its oceanographic and scientific prowess, unrivaled anywhere else in the world.

I point this out because it is such a clear example of Dr. McNutt's far sighted thinking and of how her collaborative style and commitment to working with other institutions have built such enduring programs and productive relationships. I

would also like to mention that Dr. McNutt is one of the very few women to have earned what is the academic equivalent of the "triple crown:" membership in all three honorary academies: The National Academy of Sciences, the American Academy of Arts and Sciences, and the American Philosophical Society.

Thank you again for allowing me the tremendous honor to introduce to you, Dr. Marcia McNutt.

The CHAIRMAN. Thank you for being here to make the introduction. We appreciate it very much. We appreciate you taking time out of your busy schedule.

Let me just go through the protocol that we do with all nominees.

We would excuse you, Representative Farr. If you need to get back to the House, we certainly understand that.

The rules of our committee that apply to all nominees require they be sworn in connection with their testimony. So let me just ask the two nominees if they would please stand and raise your right hand.

Do you solemnly swear that the testimony you are about to give to the Senate Committee on Energy and Natural Resources shall be the truth, the whole truth, and nothing but the truth?

Ms. McNUTT. I do.

Mr. MAJUMDAR. I do.

The CHAIRMAN. You may be seated.

Before you begin your statements, let me ask three questions that we address to each nominee that comes before this committee.

First, will you be available to appear before this committee and other congressional committees to represent departmental positions and to respond to issues of concern to the Congress?

Dr. McNutt?

Ms. McNUTT. I will.

The CHAIRMAN. Dr. Majumdar?

Mr. MAJUMDAR. I will.

The CHAIRMAN. The second question. Are you aware of any personal holdings, investments, or interests that could constitute a conflict of interest or create the appearance of such a conflict should you be confirmed and assume the office to which you have been nominated by the President?

Dr. McNutt?

Ms. McNUTT. My investments, personal holdings, and other interests have been reviewed both by myself and the appropriate ethics counselors within the Federal Government. I have taken appropriate action to avoid any conflicts of interest. There are no conflicts of interest or appearances thereof to my knowledge.

The CHAIRMAN. Dr. Majumdar?

Mr. MAJUMDAR. My investments, personal holdings, and other interests have been reviewed both by myself and the appropriate ethics counselors within the Federal Government. I have taken appropriate actions to avoid any conflicts of interest. There are no conflicts of interest or appearances thereof to my knowledge.

The CHAIRMAN. Thank you both.

Our third and final question is, are you involved or do you have any assets that are held in a blind trust?

Dr. McNutt?

Ms. McNUTT. No.

Mr. MAJUMDAR. No.

The CHAIRMAN. OK, thank you both very much.

At this point, if either of you have a desire to introduce family members, we welcome that. Dr. McNutt, I know your daughters are here. If you would like to introduce them or anyone else, go ahead.

Ms. MCNUTT. Yes, Senator. I would like to introduce two of my daughters who took the red-eye to be with us this morning. First is my daughter Meredith who is a graduate student at Berkeley. She is studying green real estate development at the Haas School of Business. Next to her is my daughter Dana who works in Silicon Valley for a company in IT security, and she is also obtaining a graduate degree at the Engineering School at Santa Clara University.

Dana's identical twin sister Ashley graduated from Stanford in philosophy and political science, but she is Miss Rodeo California, and her royal duties have kept her in California this week.

[Laughter.]

The CHAIRMAN. We can certainly understand that. That is a higher calling than anything we are doing around here.

[Laughter.]

The CHAIRMAN. Dr. Majumdar, why do you not go ahead, if you would like to introduce family members.

Mr. MAJUMDAR. Sure. Let me introduce my wife of 19 years, Dr. Aruna Joshi, and our two daughters Shalini and Anjali. Shalini is taking her SAT exams this Saturday, so I wish her the best of luck. My 76-year-old mother sends her regrets to you that she could not be here today.

The CHAIRMAN. We are sorry she could not be, but we welcome those who are here, the families of both nominees.

At this point, let me just have each of you give any opening statement that you would like to give and then we will have a few questions.

Dr. McNutt, why don't you go ahead first?

STATEMENT OF MARCIA K. MCNUTT, PH.D., TO BE DIRECTOR OF THE UNITED STATES GEOLOGICAL SOCIETY, DEPARTMENT OF THE INTERIOR

Ms. MCNUTT. Senator Bingaman, Senator Murkowski, Senator Udall, I am honored to come before you as the President's nominee for Director of the U.S. Geological Survey. You have my prepared statement. Time is short. Therefore, I will depart from those remarks and just speak from the heart.

I would argue that the USGS is the Nation's premier science agency because it provides unbiased data and assessments on resources critical to the very fabric of our daily lives, such as water and energy. The USGS helps keep us safe from natural hazards and provides essential scientific information about the quality of our environment and how it is changing.

I know that you take very seriously the task of confirming just the right person to direct this organization, and I need to convince you that I am that person.

First, I am a good scientist certified by the National Academy. Science organizations need science leadership. Good scientists know that it is not just about finding the right answers. It is about knowing what questions to ask in the first place.

Second, I am a leader. I was president of the American Geophysical Union, the largest international body of geoscience professionals in the world, including hydrologists, atmospheric scientists, oceanographers, geologists, and geobiologists.

Third, I am a seasoned administrator, having run a research institution for 12 years now. I understand the importance of strategic planning, audit, HR policies and procedures, regular maintenance from the perspective of someone who has been responsible for all of those functions.

Fourth, I am familiar with the culture of the USGS having been a former employee. A common cause of failure of leaders who are brought in from the outside to head organizations is inability to assimilate the culture of the new organization. I will be right at home at the USGS.

Fifth, I am a strong believer in team building. My current institution has thrived on destroying conventional boundaries between disciplines and on building uncommon partnerships. The USGS and its many partners succeed through team work.

Finally, in closing, public service is a tradition in my family. My father was a freshman at Harvard when the Japanese attacked Pearl Harbor. He lied about his age and waived a heart murmur to enlist in the infantry. I do not think that my father considered the contributions he could make to his country were any more important at that time than the contributions I hope I can make. I believe that the Nation's need for timely information on natural hazards, environmental and climate change, and water, energy, biological, and other natural hazards has never been greater.

After my father landed at the beaches of Normandy and fought his way to Berlin, he was the youngest 2nd lieutenant in the U.S. Army, younger than my daughters today. He earned the Silver Star, the Bronze Star, and two Purple Hearts. I could only dream that my contributions to my country would approach those of my father.

Thank you for your time, and I look forward to the challenge, should you honor me with this confirmation.

[The prepared statement of Ms. McNutt follows:]

PREPARED STATEMENT OF MARCIA K. MCNUTT, PH.D., TO BE DIRECTOR OF THE UNITED STATES GEOLOGICAL SOCIETY, DEPARTMENT OF THE INTERIOR

Chairman Bingaman, Senator Murkowski, distinguished members of the Energy and Natural Resources Committee, I am honored to come before you as President Obama's nominee for Director of the US Geological Survey. I am excited about this opportunity to join Secretary Salazar's team at the Department of the Interior, especially now, when the nation's need for timely information on natural hazards, environmental and climate change, and water, energy, biological, and other natural resources has never been greater.

My inspiration for dedicating my life to the Earth sciences comes from having lived in some of the most beautiful landscapes that America has to offer: the 10,000 lakes of Minnesota, the Rocky Mountains of Colorado, the sandy beaches of La Jolla and Cape Cod, and now John Steinbeck's *Pastures of Heaven* above Monterey Bay. I always knew I wanted to be a scientist, but even when I was young I could never picture myself in a lab coat with a test tube.

I majored in Physics at Colorado College, but my favorite college course was Introduction to Geology, taught by Professor John Lewis. Colorado College uses the block plan in which students only take one course at a time for a month. Introduction to Geology is two blocks long. So my first two months at college were spent with Doc Lewis and about 19 other students scrambling around the Front Range with our back packs and sleeping bags trying to piece together the geologic history of the

Southern Rockies from first principles. We never cracked a book the entire time. I was drawn to the grandeur of the Earth sciences and awed by the time and space scales upon which Earth processes played out. No lab coat. No test tube. Science outside!

Once I arrived at graduate school at Scripps Institution of Oceanography, I switched fields from Physical Oceanography to Marine Geophysics because plate tectonics was revolutionizing the geosciences. With the vast majority of plate boundaries under the ocean, marine geophysicists would be the ones to put the pieces of the theory together. Entering the field at that time was like becoming a biologist right after Darwin wrote *Origin of the Species* or becoming a physicist right after Einstein wrote the *Special Theory of Relativity*. Old papers, textbooks, and theories were suddenly rendered irrelevant, such that there was no large body of prior knowledge to be absorbed. Observations had to be reinterpreted within the context of the new framework. Major marine expeditions were led, and often staffed entirely, by my fellow graduate students and myself, because many of the more senior practitioners in the field were too slow to embrace the new paradigm. It was a heady time filled with the excitement of scientific discovery. Science at sea!

I credit the US Geological Survey for giving me my first “real” job after receiving my PhD. I spent three wonderful years in the Office of Earthquake Studies in Menlo Park, California, calibrating the strength of plates on time scales relevant to the earthquake generation process. Working on the earthquake problem, in California, gave me my first taste of what it was like to be involved in research of interest to the general public, not just my fellow scientists. This was science people use! I also benefitted from this time at the GS in that I can still appreciate the culture of the organization from the viewpoint of someone who has spent time “down in the trenches,” and yet the intervening years away allow me to bring a fresh perspective to the organization.

The majority of my career has been spent at the Massachusetts Institute of Technology, where I served on the faculty in the Department of Earth, Atmospheric, and Planetary Sciences for 15 years, and was eventually awarded an endowed chair. I enjoyed being surrounded every day by some of the brightest young minds in the country, engaging them in forefront research problems, and watching them grow intellectually each day. My favorite part about MIT was serving as a freshman advisor and hearing the personal stories of the students each September. Many represented the first generation in their families to attend college. Whether they had come from the barrios of San Antonio or the plains of North Dakota, the one thing they shared was the fact that they had earned their place in the MIT freshman class by their own effort. And back home, an entire community was cheering them on.

My research took me and my students all over the planet: to the islands of French Polynesia, the Tibet Plateau, Iceland, Siberia, and Antarctica. At MIT I learned how to do what really counts, how to find, measure, and nurture excellence, and to become ridiculously efficient at multi-tasking. Equally importantly, I developed a complete intolerance for sloppy science and anything but the highest ethical standards.

My most recent posting for the last 12 years has been as the President and CEO of the Monterey Bay Aquarium Research Institute, better known as MBARI. MBARI is an oceanographic research institution founded by David Packard and privately funded by the David and Lucile Packard Foundation. With its emphasis on peer relationships between scientists and engineers and encouragement of high-risk research and technology development, MBARI is best described as a “NASA for the oceans,” albeit at a smaller budget scale. This latest position has given me ample experience in leadership, management, and administration, as well as considerable opportunity to familiarize myself with issues and opportunities in environmental chemistry and biology.

In looking back at my time at MBARI, I believe I have left a mark on several aspects of institute operations. First, teamwork. Across science, engineering, marine operations, outreach programs, and administrative areas, everyone functions as a well-oiled team. To a person, everyone understands that the reason we exist is to support the research mission and to make it progress smoothly and flawlessly. Second, our mission. I helped redirect MBARI from a broadly constituted portfolio in basic research to a more targeted set of socially relevant topics such as ocean acidification, eutrophication, methane hydrates, and harmful algal blooms, nearly a decade before they became common buzzwords. Finally, the staff. I am proud of the people I have hired, their work ethic, and their commitment to Packard’s founding vision of how a different kind of institution can truly make a difference.

You may all be wondering why I would consider leaving such a scientific paradise and relocating from my beloved *Pastures of Heaven* at this time. This nation is facing important decisions concerning future uses of its precious resources: water, energy, and environment. We are increasingly at economic risk from natural hazards.

The challenges associated with climate change must be better understood. Submarine areas under US control out to the 200 mile limit are equal to the subaerial land area of this great nation, and yet the seabed resources have yet to be explored and inventoried. In deciding how best to move forward, our leaders, including members of Congress, the President, and the Secretary of the Interior, need sound, unbiased, scientific advice. Science is not the only factor in decision making, but it needs to be one of the factors. The USGS has long-term records and scientific expertise that can be used for making good choices based on solid data, and can look into the geologic record to determine whether recent conditions are likely to be representative of the future. Now, more than ever before, the nation needs the USGS, and I would be proud, if confirmed, to lead this effort.

So, in summary, these are the skills and qualities I would hope to bring to the leadership of the US Geological Survey, if confirmed:

- The capacity to be inspired by the natural world
- A love for science outside
- An appreciation for the culture of the US Geological Survey
- A history of association with some of the finest research institutions in the nation
- The ability to recognize and nurture excellence
- High ethical standards
- An aptitude for leadership
- Experience in team building
- A track record for asking the right scientific questions

Thank you for the opportunity to come before you, and I look forward to this challenge, should you confirm me for this position.

The CHAIRMAN. Thank you for your statement.
Dr. Majumdar, go right ahead.

**STATEMENT OF ARUN MAJUMDAR, PH.D., TO BE DIRECTOR OF
THE ADVANCED RESEARCH PROJECTS AGENCY-ENERGY,
DEPARTMENT OF ENERGY**

Mr. MAJUMDAR. Thank you. Chairman Bingaman, Ranking Member Murkowski, and distinguished members of this committee, it is my distinct honor and privilege to appear before you today as President Obama's nominee to be the first Director of the Advanced Research Projects Agency-Energy, or ARPA-E.

I wish to thank President Obama for nominating me to join his administration and Secretary Chu first for inspiring me and many others at Berkeley and now for showing his confidence in me.

Almost a quarter century ago, I came to this country from the land of Mahatma Gandhi as a 22-year-old graduate student, hoping to receive a doctorate from the best higher education and research system in the world. This was a dream that my father had for me. He came to this country in 1957 to receive an education in telecommunication and radar and returned to India 2 years later with many friendships and a deep admiration for the people of this country. In his wildest of dreams, however, I am not sure he could have predicted that I would appear before you today.

In the course of my journey, I have discovered not only the scientific and technological prowess of this great Nation, but also a country that opened its arms, welcomed me with warmth, and adopted me as one of her own. I am proud to be a naturalized citizen of the United States of America. I am deeply appreciative of the opportunity and the freedom that the country has offered me and will always be honored to serve in any capacity the country asks of me.

After receiving my Ph.D., in mechanical engineering from the University of California at Berkeley, I spent my career in aca-

demia, spanning Arizona State University, University of California at Santa Barbara, and finally at Berkeley. I have been very fortunate to work with some of the smartest minds in science and engineering, including many Ph.D.s, post-doctoral fellows, fellow faculty, and industrial scientists and hundreds of undergraduate students. I have been an advisor for both science and engineering at the Department of Energy, the National Science Foundation, for PCAST, and for various startup companies and venture capital firms in the Bay Area, which is the world's most vibrant ecosystem for technological and business innovation.

The focus of my work has always been to solve industrial or societal problems and to dig deep into science when faced with difficult technical challenges. I have risked delving into new fields of research where I had no background, and I have thrived on quickly learning the landscape and opening new paths where previously none existed. For these contributions, I was elected as one of the youngest members to the National Academy of Engineering, which is the Nation's highest honor in engineering. I have served as the director of several institutes in both academia and professional organizations and have recently led the energy efficiency innovation efforts at Berkeley Labs. In February of this year, I testified before this committee on how to reduce energy consumption in buildings. If confirmed, I will bring this breadth and depth of knowledge in science, engineering, and management of technological innovations to lead ARPA-E from its genesis.

One of the models for ARPA-E is DARPA, which was created in 1958 in response to the launch of Sputnik. This committee and others were instrumental in authorizing ARPA-E and pointing it to address three Sputniks of our generation: energy independence and security, reduction of greenhouse gas emissions, and American competitiveness in the global energy and environment market.

The goal of ARPA-E is to identify and anticipate technological barriers and gaps that impede progress toward these objectives and to rapidly innovate to overcome or circumvent them. ARPA-E will complement existing R&D programs by drawing upon the scientific discoveries and combining them with new engineering approaches to create innovative solutions for the market. Speed, calculated risks, internal competition, and agility will be the keys to the technological innovations that mark our success. Our Nation's history is replete with examples of pioneers and entrepreneurs who took risks, often failed initially, quickly learned from their failures, competed against each other, and innovated in both technology and business to create the largest industrial base the world has ever seen. If confirmed, I will lead ARPA-E to tap into this truly American ethos and identify and support the pioneers of the future.

I believe that the Nation that creates an economy based on reduced energy consumption, clean energy supply, and a smart energy infrastructure will lead the global economy of the 21st century. With the best R&D infrastructure in the world and a thriving innovation ecosystem in business and entrepreneurship, we have all the ingredients for success and we have made a great start.

ARPA-E can play a critical role in accelerating progress toward these goals. The program has taken its first steps this year, and if confirmed, I pledge to use all my knowledge, expertise, and expe-

rience to help grow ARPA-E into a robust engine of American innovation in energy and environment.

It is a privilege and an honor to testify before you today, and I look forward to answering any questions you may have. Thank you very much.

[The prepared statement of Mr. Majumdar follows:]

PREPARED STATEMENT OF ARUN MAJUMDAR, PH.D., TO BE DIRECTOR OF THE
ADVANCED RESEARCH PROJECTS AGENCY-ENERGY, DEPARTMENT OF ENERGY

Chairman Bingaman, Ranking Member Murkowski, and distinguished members of this committee, it is my distinct honor and privilege to appear before you today as President Obama's nominee to be the first Director of the Advanced Research Projects Agency—Energy or ARPA-E.

I wish to thank President Obama for nominating me to join his administration, and Secretary Chu, first for inspiring me and many others at Berkeley, and now for showing his confidence in me.

Please allow me to introduce my wife of 19 years, Dr. Aruna Joshi, and our two daughters, Shalini and Anjali. My 76-year old mother sends her regrets to you that she could not be here today.

Almost a quarter century ago, I came to this country from the land of Mahatma Gandhi as a 22-year old graduate student, hoping to receive a doctorate from the best higher education and research system in the world. This was a dream that my father had for me. He came to this country in 1957 to receive an education in telecommunication and radar, and returned to India two years later with many friendships and a deep admiration for the people of this country. In the wildest of dreams, however, I am not sure he could have predicted that I would appear before you today.

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It is a privilege and an honor to testify before you today, and I look forward to answering any questions you may have. Thank you.

The CHAIRMAN. Thank you both very much for your very good statements.

Let me ask a couple of questions and then defer to Senator Murkowski for her questions and then others.

Dr. McNutt, one of the bills that we were able to pass here recently is the Secure Water Act. This is legislation that requires the USGS to compile data and develop strategies to address impacts associated with climate change.

I do not know if you are in a position at this point, but if you are, I would be anxious to hear what plans USGS has to implement the Secure Water Act, how those plans fit within the structure established by Secretary Salazar's recent order addressing the impacts of climate change on America's land, water, and natural and cultural resources. Do you have enough information to give us some insights on that at this point?

Ms. McNUTT. Thank you for that question, Senator.

I do know that, of course, the Secretary is extremely interested in moving forward in understanding impacts of climate and one of the major impacts is, of course, on water supplies. The Secure Water Act, in its emphasis on research on water, will fit right in with that.

The fact that the Secure Water Act is based on the recommendations of a National Academy report is, of course, greatly in its favor because it is good science. It fits right in with the mission of the USGS, and as we all know, the USGS, in its cooperative program with the States, has worked very hard to try to keep its stream gauge network funded to provide vital information and data on the water resources in the United States. I very much would look forward, if confirmed, to working with you and this committee to put the stream gauge network on a solid financial footing.

The CHAIRMAN. Thank you for that.

Let me just make one other comment. In previous years here, under the previous administration, we had real problems maintaining funding for USGS' work related to water. There were proposed cuts in the water resources programs at USGS. Coming from an arid State and, of course, with the concerns that climate change could make it even more arid, which many of the scientists have now concluded, I am anxious that we adequately fund the Department's budget to do the work required in these important programs. The ones I have in mind are the National Stream Flow In-

formation Program, the National Groundwater Resources Monitoring Program, and the Cooperative Water Program.

So I hope that you will be able to give those real priority. If you will, once confirmed, be fighting for adequate funding for them within the administration, I will be doing what I can to see that Congress supports that as well.

Ms. McNUTT. I think we are on the same wavelength there, Senator.

The CHAIRMAN. Dr. Majumdar, let me just mention to you—I think in your statements, you have got a good phrase there, “thriving innovation ecosystem,” as something that we need to promote and generate in our economy and our country and that the research and development infrastructure is an essential part of that.

A lot of what you are going to be trying to do at ARPA-E, at least the way I think about it—and maybe you could comment as to where I am wrong on this, if I am. At our national laboratories, Department of Energy laboratories, as you have experienced there at Berkeley, the labs have a portion of money which is generally referred to as LDRD that the lab director can direct to those areas that have great potential but which do not necessarily have a sponsor in the sense of an agency that has come to them saying please do this or please do that. It seems to me that your job nationally is to do the same type of thing, identify those areas that have that same kind of great potential long-term and hopefully we will be able to maintain funding so that your new agency will be able to nurture those and develop those.

Am I thinking of it properly by making that analogy to the LDRD funding at our national labs?

Mr. MAJUMDAR. Thank you, Senator. I think the analogy is very appropriate. Having been in the national lab in Berkeley, I have been part of the LDRD system, and I think those are some of the ideas that we think are the catalysts of the future to grow something bigger and which often will not be looked at that favorably with the funding agencies because it is just too early. So in that respect, it is a great analogy.

I think in the first round of proposals that ARPA-E had that I was not involved in, they received a tremendous interest from the scientific and engineering community, overwhelming in fact, which just goes to show how much sort of pent-up interest there is in looking at innovations in the energy and environment area.

The CHAIRMAN. Very good.

Senator Murkowski.

Senator MURKOWSKI. Thank you, Mr. Chairman.

Dr. McNutt, I appreciate the conversation that you had with the chairman about the water resources and the studies there. I would just add another one to put on your radar screen.

Back in 2007, we passed the Alaska Water Resources Act that required USGS to do a study of the aquifers that are in the urban areas of the State, Anchorage, south central, and down in Homer, as we look to potential water shortages within the State.

So the commitment that I believe I heard from you was that you would be working to get these. If not the studies, you mentioned the stream gauge network, which we recognize have not been given the greatest priority from a funding perspective. But it sounds like

you have got a commitment here to work in this area, and I would just appreciate you recognizing the Alaska piece up there as well. Oftentimes, I think it is believed that because we are surrounded by water and we have so many rivers and natural water sources, that we are OK up there. But we still would ask for the assistance that we gained in 2007 with that study.

I wanted to ask you about the data that has been requested. As we look to the situation on our public lands and making decisions as to whether we develop our natural resources there, it is important that we fully understand what it is that we have. Earlier this year, I had sent a letter to Secretary Salazar requesting that the Department provide our office with maps and data that outlined the minerals, the oil and gas that is available, some of our renewable energy resources within some of these newly proposed wilderness areas and other land set-asides. Much of that data that they will need within Interior will be coming from USGS data bases.

So the question I ask of you at this point in time is whether you will commit to providing that data to the committee as we have requested, and as that is collected, if within USGS you can provide us with a list of the energy and the mineral resources that are already set aside within these wilderness areas. So a collection of the data, and then providing that to us as well, is required.

Ms. McNUTT. Senator, thank you for bringing up this issue. During my Hill visits in preparation for this hearing, I heard about this issue actually from several Senators already, and clearly this is a big issue when it comes to setting aside wilderness areas to know ahead of time what exactly is being set aside.

I think for many of these areas, there probably is already information that is known, and I simply do not know yet what kind of workload it would be. I would like to work with the Senators here on this committee and with the staff at the USGS to get an estimate of what it would take to actually meet your needs for this and come back to you with some kind of estimate of what we could deliver for you that would meet your needs and not impact other critical areas of the Survey's mission at the same time.

Senator MURKOWSKI. I would appreciate your review of that. As I think you probably learned in your visits, it is an issue that I think has generated a great deal of interest amongst members. It is important that we understand where our resources are and as we are talking about public land set-asides, what we are doing. The policy decisions are done using the science.

Dr. Majumdar, let me ask you. Within ARPA-E, you are focusing on some pretty exciting things, and a lot of dreaming, a lot of visioning. Some would say it is impossible. But you are taking on some high-risk, high-pay-off technologies, and we have to believe that for every success that you have, you are going to have multiple failures. Given that we live in a technological age where, again, we expect an instantaneous result—we expect if we flip that switch, all of a sudden, we are going to be able to go from power that is generated by coal to power created by wind just like that—what is the real timeline, when we live in this world of instantaneous response? What is reasonable in terms of a timeline for us here in Congress to gauge the effectiveness of this program within ARPA-E?

Mr. MAJUMDAR. Thank you, Senator. I think that is a very good question.

I feel a timeline depends really on the technology. In some cases, you are right. I think there will be—when anyone takes high risks and looks for high pay-offs, there will be a few things that may not go exactly the way we planned. But I think the real gain from that is to learn from the failures and sort of get around them in the future.

I appreciate the question. I think the time depends on what we want to do. In some cases, I think the goal of ARPA-E—and if confirmed, this is where I would go—is to look at the industry and see where are the gaps, where are the technological barriers. You know, it is supposed to be a projects agency. So if there is a barrier, you can create a project and let five teams compete with each other and solve the problem, and then move on to other things.

In that case, it could be—some of them could be shorter, but there are some issues which are much more longer-term. How do you take sunlight and create a fuel out of that? There are some basic science issues that are still being discovered right now. You know, if they get discovered, the question is then how to accelerate that into a commercial setting. Those can take longer.

So it really depends on the kind of problems that ARPA-E solves. So it could be anywhere from 3 to 4 or 5 years or it could be even longer.

Senator MURKOWSKI. The difficulty is in managing those expectations.

Mr. MAJUMDAR. Yes.

Senator MURKOWSKI. You are looking at it from the scientific perspective, and I appreciate that.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you.

Senator Udall.

Senator UDALL. Thank you, Mr. Chairman.

Good morning to both of you. I am very excited to think about the fact that when you are confirmed, the leadership you will bring to both of these important agencies.

If I might, Dr. McNutt, I would turn to you first. I was pleased to note your connection to Colorado. You are a proud graduate of Colorado College. The USGS has a long history of directors who have deep roots in the landscapes, particularly of the West. John Wesley Powell, the first director of the USGS, of course is renowned for his adventures in the Grand Canyon. I dare to say I think you meet that standard. Clearly, there were times in your life where you spent more nights under the stars in a year's time than you did under a roof. I think we are going to be very well served by your leadership in the USGS.

You also, I think, give us an important standard to keep in mind in responding to Senator Bingaman's questions. We focus a lot on one liquid, oil, a hydrocarbon, but I think if we focus on the building block of life here on our planet, H₂O, water, and ensure that we have affordable, safe, and clean supplies of water, we will have healthy societies, less conflict, and a bright future. So I look forward to the work you do there.

If I could direct a question your way, you talked about the need to survey the coasts and that we know very little about those areas out to the 200-mile limit. Could you speak for a minute or so on your plans there and what you think we could do?

Ms. MCNUTT. Yes. Thank you for that question, Senator.

When I first arrived at my current institution, MBARI, we had no capabilities basically in-house for under-sea mapping, and I built a program there, which is now considered the Nation's best for high-resolution, deep-sea mapping, which is delivered by autonomous underwater vehicles, which is a high-resolution, multi-beam sonar with sub-bottom profiling and is the, basically, envy of the world.

Of course, the USGS' program, from what I understand right now, is mostly coastal mapping, habitat mapping, and for its mission right now, is a very good program, interferometric mapping with unmanned surface vehicles.

But I think there is a lot of work to be done with this vast portion of our under-sea territory which basically doubles the land area of the U.S. out to the 200-mile limit where we have resources that are basically unmapped and unassessed. So if confirmed in this position, I would definitely like to move the USGS in the direction of helping the U.S. catalog and assess and inventory what we have in that area and work with other agencies such as NOAA and U.S. Fish and Wildlife Service and MMS to help understand what we have in that region.

Senator UDALL. Even those of us who represent land-locked States look forward to those findings and that new data set. I know the Senator from Alaska is eager to know about those resources and to further expand the size of the State of Alaska, I am sure.

[Laughter.]

Ms. MCNUTT. As a first step in that, the USGS has done a great job actually up in the Arctic already.

Senator UDALL. Thank you for those comments.

Dr. Majumdar, I want to welcome you as well. My wife and I took our honeymoon in India and climbed some mountains there, of all things, and I have great fondness for the Indian people and have been proud to get to know a number of Indo-Americans who have become Americans. I am proud to be an American with you. I had a chance to meet the Dalai Lama yesterday, and when you meet the Dalai Lama, of course, you think of Mahatma Gandhi as well and that line of remarkable leaders who we have been fortunate to have as human beings.

You clearly have a real interest in energy efficiency technology. I think there is a lot of violent agreement now on the Hill about the potential for energy efficiency. Could you just speak for a minute, as I see my time will expire, about this world of energy efficiency and what we could be doing and perhaps some of the potential that we do not even see today when it comes to energy efficiency?

Mr. MAJUMDAR. Thank you, Senator. Thank you also for the kind comments about your honeymoon in India.

Senator UDALL. Yes.

Mr. MAJUMDAR. I think energy efficiency is often called the low-hanging fruit, but as Senator Bingaman had said the last time

when I testified, it is tough to choose what to pick. I think that is appropriate.

When I look at energy efficiency, there are three areas where energy goes, the big chunks. One is buildings, which is 40 percent of our energy, and three-quarters, 75 percent, of our electricity. They are really in many ways inefficient. The buildings do not work properly. Let me just give you an example.

For example, in this building or in many large buildings, the centralized chillers, which are by themselves very efficient, but even if there is 1 percent in the building, the big chiller has to start running, and that is very inefficient as a system. So here is the problem. How do you take a centralized system and make it decentralized so that you can have cooling and heating on demand and only at certain locations? So that is a technical challenge that I think, you know, one could devote some effort in that. So buildings is one big area.

Transportation systems, making more efficient internal combustion engines; electrification, looking into batteries and high energy density batteries, which is safe and which are low cost, and that is on the transportation side.

Then the industrial. So things like cement, steel, glass manufacturing needs a lot of heat and all that heat is wasted, if some of the heat could be recovered and used in useful ways.

There is a lot of potential out there. So I think this is really a huge opportunity for the United States.

Senator UDALL. Thank you. You just demonstrated why you are going to be a tremendous leader of ARPA-E. Thank you.

Mr. MAJUMDAR. Thank you.

The CHAIRMAN. Senator Risch.

Senator RISCH. Thank you very much. Dr. McNutt, in looking at the work that you have done, I am obviously very impressed with the ocean work, and certainly that is going to be important as we move forward. I think probably one of the biggest blanks in our scientific knowledge in America is ocean conditions. I think that transcends to a lot of different inquiries, not the least of which is salmon recovery, which is really important in the Pacific Northwest. Certainly with climate change, obviously, ocean conditions play a big part, and we know very little about it. So I am impressed to see that, and I am impressed to see that you bring that knowledge to the agency.

Having said that, I have a much less visionary question for you and much more practical. Those of us who live out west frequently pick up USGS maps, and they are something we have used for a long time. They are a tremendous resource for Americans, particularly those of us who live in the West. Unfortunately, every time I pick one up, if you look at the bottom, it says it was based on work that was done in the 1960s.

Are there any plans afoot to bring this forward, or do you have other higher priorities than this that are on the books?

Ms. McNUTT. OK. That is a very good question, Senator, and from what I understand, just based on some very preliminary briefings, there are moves afoot to do new registrations of all of the USGS data sets to make sure that they are all such that the points from all of the data sets, whether it is a topographic data set or

a LANDSAT data set or an ecological data set, that they are all perfectly registered, which will improve all of them.

So whether that involves a reissuing of the maps, I would guess that that probably does, but I will have to get back to you on the details of exactly what that involves in terms of the topo maps themselves. So I do not exactly have the answer in terms of what that involves with the topographic maps, but I believe it does because of the fact that not all of them actually go back to exactly the same datum.

Senator RISCH. That is true—they do not go back to the same data. The actual work on the topo maps is good; the problem is there have been a lot of changes. Many, many roads have been built over the last 40–50 years that are not on there, and structures, improvements and what have you. So I would encourage you to do something in that regard, although I understand your focus is on ocean conditions. Those of us that live in the West—we are interior States, as Senator Udall indicated, although we do have a seaport in Idaho, believe it or not, we are interested in the surface that we have available to us.

Ms. MCNUTT. Senator, I do not want to give the impression that my focus is entirely on the ocean, although I do believe that there are many new opportunities there. Basically as humans, we live on the land and that is where the rubber is going to meet the road with many of the challenges we face. So certainly I would, if confirmed, not ignore the land where we have to live, where we have to grow our food, where we have to build our homes, where we have to build our constructs. So, no, I will not ignore the land.

Senator RISCH. Thank you, Doctor.

Thank you, Mr. Chairman.

The CHAIRMAN. Senator Risch, let me just ask, before going to Senator Barrasso, where is your seaport?

Senator RISCH. It is in Lewiston, Idaho.

The CHAIRMAN. Lewiston, Idaho. I did not know that was a seaport.

Senator RISCH. It is a seaport. So long as the dams remain in the lower Snake River, it will be a seaport.

The CHAIRMAN. All right. Yes, I learned quite a bit this morning. Go ahead, Senator Barrasso.

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

I want to congratulate both of you on these nominations. I want to welcome your families, congratulate them as well for being here.

Dr. McNutt, thanks so much for taking the time to come to my office and visit earlier today. We talked about a range of things, including monitoring of volcanoes in the West. We talked about energy needs across the world, talked about global climate change, talked about carbon and carbon sequestration.

I wanted to just visit a little bit about some of the energy needs. Wyoming is a State with abundant resources in coal, which to me remain the most affordable, reliable, secure source of energy. I think it is an irreplaceable part of our energy portfolio. Clean coal and carbon capture and sequestration technology are critical components of making our energy cleaner. Wyoming is a leader in these issues and I believe can be a big part of the solution. We also

have significant capacity, as you and I have discussed, for underground carbon sequestration compared to other States.

Can I ask you what role you see coal playing in America's energy future?

Ms. MCNUTT. Yes, Senator. I have been briefed on some preliminary USGS studies, and from what I understand, the country does have significant coal resources, but from what I understand, about 0.5 percent is recoverable in existing mines and about 10 percent is easily recoverable. Then the curve starts going up pretty quickly in terms of the cost of recovery. So although there is a lot of it out there, the cost starts going up pretty quickly, and as the cost goes up, it is because of the technology for getting it out of the ground and the environmental costs and other things too. So at that point, it starts trading off with other types of energy as well. So we have a lot of it is the good news, but the bad news is we start paying more for it.

Senator BARRASSO. What role will your agency play in the administration's efforts toward carbon capture and sequestration?

Ms. MCNUTT. The role that the USGS plays in that is that we are involved in doing the methodology and ultimately, if funded, an assessment of how much storage is available, both geological and biological, for CO₂ storage.

Senator BARRASSO. What kind of major challenges do you think we face in working on carbon capture and sequestration?

Senator BARRASSO. I think that basically the back-of-the-envelope calculations that I have seen from both my involvement with Stanford University and my service on Schlumberger's Technology Committee is that the U.S. as a Nation has decades' worth of storage in abandoned oil fields and centuries of storage in salt mines.

Senator BARRASSO. As you know, throughout the West, there are split estates where the land is owned by one group for ranching purposes and others and then the minerals under the land by another. Sometimes that is the Federal Government. You may not have given thought to this, but the pore space under the land—it is not mineral. It is not the top for grazing or for growing. It is the pore space, and we have been dealing with that in Wyoming. I do not know if you have ever given any thought to the Federal Government, if they would own that pore space or who would own that pore space, or how you would envision that with some of these split estates where the surface is owned by one and the under-surface, the minerals, by the Federal Government because we have a lot of Federal Government involvement.

Ms. MCNUTT. Senator, these sound like very difficult legal and policy discussions that would be well above my pay grade.

Senator BARRASSO. They may be your pay grade. You will, I am sure, hear more about those.

So thank you, Mr. Chairman.

The CHAIRMAN. Most of what we consider around here is above our respective pay grades, but that does not hold us back.

[Laughter.]

The CHAIRMAN. Senator Murkowski, did you have any other questions?

Senator MURKOWSKI. I do not have any follow-ups.

The CHAIRMAN. All right. Thank you both very much. We hope to be able to move your nominations to the full Senate quickly, and we appreciate your being here.

That will conclude our hearing.

[Whereupon, at 11:15 a.m., the hearing was adjourned.]

APPENDIX

RESPONSES TO ADDITIONAL QUESTIONS

RESPONSES OF MARCIA K. MCNUTT, PH.D., TO QUESTIONS FROM
SENATOR MURKOWSKI

Question 1. An increasing number of technological improvements have shrunk the drilling footprint for oil and gas, including deeper and longer reaches for accessing oil and gas reserves. In your considerable experience with the earth sciences, have you encountered any scenario where directional oil and gas drilling has caused surface impacts outside of its drillpad footprint? I mean to ask in terms of surface subsidence, seismicity, geological changes, anything that a layperson might consider a risk.

Answer. I am not an expert on directional drilling and its environmental impact, but do have some passing exposure to the technology from my service on Schlumberger's Technology Committee. I have personally used directional drilling at my own institution to install the casing for a cabled observatory across a very dynamic shoreline to the deep sea. Directional drilling offsets the footprint of the surface expression of the drilling from the subsurface tapping of the oil and gas deposits. My understanding is that the issues you raise, such as ground subsidence, induced seismicity, and other geological changes are less dependent on the drilling technology than on other factors.

Question 2. I recently had the opportunity to visit a 4-D seismic facility in the Gulf region. It was a truly fascinating technology to witness in action—originally there was two-dimensional seismic and now 3-D seismic is commonly used to zero in on mineral resources thousands of feet below the ground or the ocean floor. My question is whether you've had a chance to view and really get a sense of this modern surveying technology, and if you feel it will play an important role in energy exploration during your tenure?

Answer. A few years ago I had the opportunity to see the fabulous imaging facilities at the University of Texas, Austin. I was similarly impressed by its capability to visualize large 3-D seismic data sets. At the time, they were using the facility for both aquifer and oil reservoir modeling. Such 3-D imaging is definitely here now for energy exploration, and I believe that during my tenure, if confirmed, we will need to move to 4-D on account of the highly unstable state of resources such as methane hydrates. This is yet another area where the USGS will rely on partnerships on account of the high overhead in building and maintaining such state-of-the-art data acquisition, processing, and imaging facilities. Based on my experience, there is excess external capacity that the USGS can leverage.

Question 3. I have a bill (S. 782) pending to better fund USGS efforts to monitor the nation's volcanoes. It would support upgraded observation efforts, not just in Yellowstone and along the West Coast, but in Alaska as well. What is your opinion of the bill and the importance of better science concerning our nation's geophysical hazards?

Answer. I agree that it is important to have the best and most up-to-date science regarding natural hazards that is available to us. Worldwide, events associated with geophysical hazards cause many deaths and result in billions of dollars of damage in destruction to homes and infrastructure and aid. Information provided by the USGS is important to help in both the preparation for these events and in our understanding of how and why these events happen. I am not familiar with the details of S. 782, but if confirmed I will become more familiar with this legislation.

Question 4. Secretary Salazar recently signed an order that outlines the Department of the Interior's basic strategy for responding to the "current and future impacts of climate change on America's land, water, ocean, fish, wildlife, and cultural resources." As a non-regulatory agency responsible for producing objective scientific information, what role do you believe the USGS can and should play in this effort?

Answer. As the science agency for the Department of the Interior and because of its interdisciplinary climate change science expertise, the USGS is well positioned to provide objective, unbiased, timely and responsive science information to a diverse group of decision makers. The principal focus of this information is to provide a better understanding to policy makers of the impacts and effects of climate change on a wide array of America's natural and cultural resources, including water availability for both human and ecological needs, the ability to find, extract and transport energy resources, the proliferation of invasive species and wildland fire, and the risks of sea-level rise and coastal erosion on America's critical infrastructure, to name just a few. I believe that the appropriate role for the USGS is to provide the science needed to enable more effective and cost efficient decision and policy making.

Question 5. Earlier this year, Secretary Salazar testified before our Committee about the renewable energy potential of the United States. The maps he brought with him were meant to show resource locations throughout the country, but left off my home state of Alaska as well as Hawaii. Obviously, I wasn't happy about that, and it's not an isolated incident. Quite a few of the maps produced by executive agencies depict only the Lower 48, and make no mention of our offshore states. If confirmed as Director of the USGS, will you commit to including all 50 states—including Alaska and Hawaii—on any map that depicts the Lower 48?

Answer. I will, and I can think of no reason why Alaska and Hawaii should not be included with the rest of the states in a map depicting the entire United States. I might add personally that I have had many occasions in the course of my own research to visit many locations in both Alaska and Hawaii, and hope to make more visits to USGS facilities there if confirmed.

Question 6. Please describe the role of the USGS in addressing water availability problems throughout the United States.

Answer. As I understand it, the USGS develops and delivers technical information and analytical tools to resource professionals and the general public, allowing them to evaluate the questions they face about the quantity, quality, and use of water resources across the Nation. This includes hydrological, geological, and biological information, as well as the ancillary data that allow sound analysis of that information. I am also aware that much of this information is provided through the USGS's Cooperative Water Program, a partnership with states, tribes, and local governments, to provide important information.

Question 7. If confirmed, how would you increase our understanding of underground water resources?

Answer. Historically, the USGS has been a leader in the assessment and development of techniques for studying the Nation's groundwater resources. If confirmed, I will work to build on these strengths to assure that the USGS continues to provide both relevant, up-to-date basic information and cutting edge technology to evaluate the Nation's groundwater resources.

Question 8. Please describe what will be the most important ground water related challenges facing the nation over the next decade and the role that the USGS should play in addressing these challenges.

Answer. Groundwater is one of the Nation's most important natural resources, and it faces many pressures from human development. My own home is in the Salinas Valley, the "salad bowl of the Nation," which exports \$3.4 billion annually in agricultural produce thanks to the Salinas aquifer. The challenges include the quality of the resource, its sustainability, and its connection to surface water. Climate change could both increase these pressures and make groundwater even more valuable to society during periods of drought and water stress. Many aquifers cross State boundaries. I believe that the USGS is the primary federal agency responsible for providing an objective assessment of the quality and quantity of groundwater in the Nation's aquifers, and the agency has a unique capability to provide nationally consistent information. The USGS also plays a major role in developing models and techniques for evaluating groundwater.

Question 9. If confirmed, how will you manage the stream gauge program? What options will you pursue to ensure that adequate funding is provided to the program?

Answer. If confirmed, I will continue to manage the streamgauge program in accordance with the plan described in the National Streamflow Information Program documents. I am very aware of the importance of the USGS streamgauge program and will work with the Administration to ensure it receives continued support.

Question 10. Please describe your perspective on the appropriate role the federal government, the state government and the private sector should play in collecting and analyzing water monitoring data.

Answer. There is a certain portion of water monitoring that can and should be left to the private sector because there is a regulatory framework that oversees it,

a large enough market to drive competition, a simple connection between what is measured and who it is measured for, and/or a user base willing (or required) to pay for the information. The role for government is indicated when the private sector is unlikely to step in because the monitoring is regarded as a public good and it is, for that reason, not possible to apportion costs to the users. In fact, depending on whether the year is a flood year or a drought year, the degree to which various federal, state, local, and private groups have a need for the information could change. Federal/state partnerships are an excellent mechanism for sharing the responsibility for monitoring because many surface and subsurface water systems cross state boundaries; even within states, jurisdictions are shared.

Question 11. As you are well aware, the Arctic has recently become an area of great focus, and scientific input is essential to guiding the development of policies in and for this region. The Federal approach to Arctic scientific research is encapsulated in the Arctic Research and Policy Act of 1984. This Act created the US Arctic Research Commission (USARC), a small independent agency that provides goals for Arctic research, and created the Interagency Arctic Research and Policy Committee (IARPC), which implements these goals. These agencies and yours have specific responsibilities outlined in the Act, yet recently these entities have not worked together effectively to create an integrated scientific research plan and an associated budget. Will you provide leadership from DOI and USGS to ensuring that the Act is implemented as defined in law?

Answer. While I am not familiar with the Arctic Research and Policy Act, I know that Arctic policy is important to Secretary Salazar and agree that scientific research is important to effective management of Arctic resources and ecosystems. If confirmed, I will ensure that the USGS is providing leadership, within the context of its role under the law, to implement that Act.

Question 12. Will you commit to supporting re-investment in Arctic research infrastructure, critical to the conduct of scientific research?

Answer. I agree that scientific research is critically important to effective management of Arctic resources and ecosystems. I will commit to soliciting, evaluating and considering research needs for the Arctic within the U.S. Geological Survey's budget process.

Question 13. We commemorated the 20th anniversary of the giant Exxon Valdez oil spill in Alaska last March. After the spill, Congress passed the Oil Pollution Act of 1990. That law promised Americans a robust oil spill prevention and response research program. The interagency coordinating committee on oil pollution research, created by that law that includes your agency, besides MMS, is an "orphan" committee. To the best of my knowledge this committee has not met recently and has never met regularly. Yet we have expanded the nation's offshore drilling program in Alaska and citizens of Alaska's North Slope have sued to slow down exploration because Alaskans still have questions about oil cleanup in ice conditions. A new 8-nation Arctic Marine Shipping Assessment, delivered to the Arctic Council in April, further stresses the need for this research. As such, will you commit to ensure that the nation has a well-planned and support well-funded oil spill research program, and further that this program, in cold regions, is well coordinated with the US Arctic Research Commission and the Interagency Arctic Research and Policy Committee?

Answer. I understand that the USGS has done significant research on the biological impacts of the Exxon Valdez oil spill, but I am not familiar with the interagency coordinating committee you mention. If confirmed, I look forward to learning more about the work of this committee and will ensure that the USGS work in this arena is coordinated with MMS and is available to the committee. Through my position as chair of the National Research Council's Ocean Studies Board, I know that the Board has been asked to undertake a study of oil spill cleanup in ice-covered regions and is in the process of raising the necessary agency support to begin the study. I hope that the results of this study will also help with concrete recommendations for any research needs for oil spill research for ice covered areas.

RESPONSES OF MARCIA K. McNUTT, PH.D., TO QUESTIONS FROM SENATOR BARRASSO

Question 14. Secretary Salazar recently signed a Secretarial Order incorporating climate change into all land management decisions at the Department of Interior. I am concerned that the Order puts into question past and future management agreements.

It could have serious implications for all public land uses:

- Recreational use;
- Oil and gas development;
- Renewable energy development;

- Grazing;
- And Hunting and Fishing;

These regulations will hit the Western United States the hardest. This Administration cannot continue to promulgate sweeping regulations on climate change, before Congress acts on an energy strategy. These decisions have major impacts on the American people, American jobs, and our economy. As the lone science agency within the Department of Interior, you will be at the center of this initiative.

- What is your agency's role in this initiative?
- What will your focus be in implementing this order?
- What mechanisms will you use to provide transparency in your agency's research and recommendations?

Answer. As I understand it, the USGS role in implementing the Secretarial Order is to provide the science, monitoring, modeling, and decision support to enable and empower more effective decisions and policies by those who make them. Thus, its focus is on providing the very best climate change science information in a timely and responsive manner so that those responsible for making resource management decisions and for developing and shaping the Nation's policies regarding resources impacted by climate change can do so with confidence. If confirmed, I am committed to the continuation of the USGS peer-review process, which ensures that all science-based information and related conclusions are unbiased and objective, and that the processes involved are well-understood and transparent.

Question 15. There is a Yellowstone Volcano Observatory in Wyoming, jointly operated by the USGS, Yellowstone National Park, and the University of Utah. The volcanic monitoring work done at Yellowstone provides important data for ensuring public safety. I have received comments from people in the State that the data on volcanic activity produced by the Yellowstone Volcanic Observatory is not easily accessible for non-Observatory officials.

- What can USGS do to share appropriate information with local officials, emergency personnel, and the public in order to plan and prepare for volcanic activity?
- I would like to have your commitment to work with me and those officials to identify solutions to these problems.

Answer. While I am not familiar with this specific issue, I agree that it is important to have up-to-date scientific and monitoring data available to the public. If confirmed, I will look into the situation at the Yellowstone Volcano Observatory and look forward to addressing your constituents' concerns.

RESPONSES OF MARCIA K. MCNUTT, PH.D., TO QUESTIONS FROM SENATOR STABENOW

Question 16. The United States Geological Survey plays an important role in Great Lakes management and research. These waters make up 20 percent of the world's fresh water supply, and thirty-three million people rely on the Great Lakes for their drinking water, including 10 million just from Lake Michigan alone. The Great Lakes' coastlines are also home to wetlands, dunes and endangered species and plants. Lake Michigan alone contains over 417 coastal wetlands, the most of any Great Lake. However, the Great Lakes are not just an important natural resource, but they are also a critical part of Michigan's economy and quality of life. Millions of people use the Great Lakes each year to enjoy our beaches, fishing and boating.

Given the importance of the Great Lakes and the role USGS plays in their management and protection, could you please describe USGS's role in working with other agencies to ensure that the \$400 million Congress is appropriating for the Great Lakes Restoration Initiative is effectively used?

Answer. I appreciate the value and importance of collaboration for achieving the goals of the Great Lakes Restoration Initiative (GLRI) in a fiscally responsible and effective manner. I am informed that the USGS is in close communication with other agencies involved in this initiative and is coordinating its efforts to avoid overlap and maximize use of funds. If confirmed, I look forward to working to ensure effective use of the Great Lakes Restoration funds appropriated by Congress.

Question 17. Dr. McNutt, the USGS is currently in the lead in inventorying the various geologic opportunities across the Nation for sequestration of carbon from our coal-fired and other carbon-intensive power plants. Can you please explain to the Committee your views on the future of carbon sequestration as a means to reduce greenhouse gas emissions and your vision of where the USGS would fit into this future as the premier earth science agency of the Federal government? Would you agree to keep this Committee informed as to the status of the inventory of carbon

capture and sequestration sites, including the viability of the Mt. Simon formation in Michigan?

Answer. The true global storage capacity of geologic formations is unknown at this point. Geologic storage capacity varies on a regional and national scale, as well as by reservoir type. A more refined understanding of geologic storage capacity is needed to determine how much of the overall storage capacity could actually be utilized to reduce greenhouse gas emissions. I understand that the USGS has worked up a methodology for assessing the capacity for geologic sequestration of carbon that is currently out for peer review. If confirmed, I look forward to keeping the Committee informed of our progress in gaining understanding at various sites.

RESPONSES OF ARUN MAJUMDAR TO QUESTIONS FROM SENATOR MURKOWSKI

Question 1. When it comes to advanced research project agencies run by the government, I think most of us are familiar with DARPA (Defense) and HSARPA (Homeland Security). It seems to me that a major difference with ARPA-E, if not the difference, is who the customer is. For both DARPA and HSARPA, the customer is the Government. For ARPA-E, the customer is the individual consumer. What differences do you envision ARPA-E having from the other advanced research project agencies to meet the consumer needs?

Answer. I agree that the end user issue is a key distinction. In the case of ARPA-E there are a number of potential customers. For example, in some cases ARPA-E will look at common technical barriers faced by an industry and create a focused effort to overcome or circumvent these barriers. In such cases, the customer will be the industry or business. In the case of efficiency work, ARPA-E customers could be utilities that are implementing efficiency programs. Federal, state and local governments could also be consumers, given their large building stocks and transportation fleets.

Another difference between ARPA-E and DARPA/HSARPA is that, while ARPA-E will be focused on creating new technology, it will also be strongly influenced by the demands of policy and markets. Hence, cost and economic issues as well as scalability will be key factors affecting ARPA-E decisions, whereas DARPA/HSARPA are generally shielded from such considerations. It is very important for ARPA-E to engage with both business communities and policy makers to ensure that there is alignment between technology, policy, and markets so that ARPA-E technologies can be adopted quickly.

Question 2. Please explain your view of the relationship and role of the existing applied science programs within DOE, the energy frontier research centers, the new energy innovation hubs, and ARPA-E when it comes to developing new energy technologies.

Answer. ARPA-E will be a projects agency, with its projects designed to identify, anticipate, and overcome technical barriers that require innovation. ARPA-E will partner with the Office of Science to expand or adapt its basic research to overcome or circumvent these barriers, and it will work with the applied programs (EERE, FE, OE, NE) to deploy these innovations to the market at scale. One key difference between ARPA-E and other DOE offices is that program managers in ARPA-E will be temporary; therefore, partnerships with the DOE institutional programs will be essential to provide institutional memory in these technical fields. Speed, risk-taking, nimble, agile, internal competition, focus on technological innovation, addressing market needs, and time-bound describe the way ARPA-E will operate.

ARPA-E and EFRCs: EFRCs are focused on basic science—understanding matter at the level of electrons, understanding complex emergent behavior, highly non-equilibrium behavior, etc. Their goal is to understand nature. The relationship between ARPA-E and EFRCs will be two fold:

1. ARPA-E will use the scientific toolbox provided by the EFRCs and other science programs to attack a problem or a technical barrier of industrial relevance.
2. ARPA-E will identify technical barriers of industrial relevance, and if it finds that the science is not understood well, inform relevant EFRCs and other science programs to focus on better understanding the science.

ARPA-E and Hubs: The Energy Innovation Hubs have the following characteristics: (a) they will look at long-term transformation of a whole field; (b) they will span basic science to market penetration; (c) the teams will be placed under one roof (or perhaps two). In contrast, ARPA-E's focus will be short term (3 years) projects-based programs that will address a technical barrier of industrial relevance. Once that barrier is overcome or circumvented, that program will be closed and new pro-

grams, perhaps in other topics, will be created. ARPA-E and the Hubs will, hence, be distinct but they will be able to leverage each other.

Question 3. Given the constraints on the DOE budget and the desire to increase funding for the science and applied R&D programs, what priority should be placed on funding ARPA-E?

Answer. As the nominee for director of ARPA-E, I believe funding ARPA-E should be a very high priority. Particularly in these early years, it is important to show growth in the budget in order to build a constituency within the technical community and recruit the best program managers. As the members of this committee know, Congress included ARPA-E in the America COMPETES Act in large part due to the need for innovative approaches to energy. We have a three pronged energy challenge in terms of: (a) energy independence and national security; (b) reduced green house gas emissions; (c) American competitiveness in the global market. If confirmed, I look forward to working with DOE leadership and with Congress to ensure that ARPA-E has the funding necessary to make real progress on all three fronts.

Question 4. Funding for current ARPA-E programs came from the stimulus bill. Do you expect a funding request for ARPA-E in the Fiscal Year 2011 DOE budget? If so, for how much?

Answer. I have not been involved in the formulation of DOE's FY 2011 budget; but if confirmed, I will work with DOE leadership and with Congress to assure adequate funding for ARPA-E.

Question 5. I understand around 3,500 concept papers were received in response to the initial funding opportunity released in April. Do you expect a similar number of concept papers for future funding opportunities? When do you expect the final decision to be made on which concept applications from the initial opportunity will receive funding?

Answer. While I was not involved with the initial ARPA-E solicitation, I believe that the high volume of concept papers submitted indicates a very strong demand for this type of funding opportunity, suggesting that future solicitations will also yield a high volume of applications. My understanding is that DOE intends to announce award selections from this first FOA by the end of this year. I also understand that, while this first FOA was extremely broad, the next may seek to identify topic areas of greatest interest to ARPA-E. At the same time, however, I believe we should make some provision for unsolicited proposals in topics not covered by focused programs. Such an option can help assure that ARPA-E does not miss any truly innovative and game-changing ideas. ARPA-E needs to create a reputation of openness—a “go-to” place for truly extraordinary ideas.

Question 6. The ARPA-E funding opportunity announcement issued in July, 2009, severely limited the participation of the Federally Funded Research and Development Centers (FFRDCs) and prohibited the FFRDCs from leading projects. Do you see this restriction being lifted for future funding opportunities?

Answer. Good ideas and innovations can come from anywhere—academia, national labs, industry, non-profits, individual inventors, etc. ARPA-E should be able to support the best ideas, regardless of where they come, including FFRDCs. If confirmed, I plan to look into this issue and draw on the lessons learned from the first solicitation to see if any adjustments are necessary.

Question 7. The funding opportunity announcement also limited the period of performance for projects to 36 months. Technology innovation is neither a linear nor predictable process. As director of ARPA-E how would you measure the success of projects funded under this funding opportunity if the stated objectives of the projects are not met as a result of this somewhat arbitrary time constraint? Do you think that an arbitrary time constraint is consistent with the mission of ARPA-E?

Answer. I agree that technology innovation is not necessarily linear or predictable, but we have an obligation to strike a balance by preventing an open-ended process that taps into a funding stream in perpetuity. That being said, some projects, even if they are not “completed,” may merit support beyond the time constraint, based on progress or promise. If confirmed, I look forward to working with the committee to balance these priorities.

Question 8. How quickly do you anticipate having enough Program Managers on board to move forward with additional funding opportunities? From which sectors (industry, laboratories, universities, etc.) do you hope to find and attract program managers?

Answer. As a new agency, ARPA-E must be staffed quickly with a team of the ablest, most experienced men and women in energy science, technology, and business. If confirmed, I will work to put together such a team. Program managers will receive both autonomy and scrutiny as they work to create projects that identify and reduce barriers through technological innovation and address the three goals of

ARPA-E—energy independence and security; reduced green house gas emission; and American competitiveness. Since program managers will be temporary, i.e. 3-4 years, there will be a constant churn of fresh minds and ideas in ARPA-E.

I anticipate that at current funding levels, ARPA-E should have a team of about 10-12 technical program managers. Currently, it has three. My goal will be to recruit program managers who have the following characteristics:

1. Active/practicing scientists and engineers from the best R&D labs in academia, national labs, and industry
2. Limited appointment of 3-5 years
3. Solid science/engineering foundations, deep knowledge of their field, and demonstrated creative R&D
4. Demonstrated ability to “sniff out” important problems, of interdisciplinary work, of “team science”, and innovations in fields other than their own
5. Entrepreneurial
6. Ability to span and bridge basic science and engineering systems
7. Willingness to learn and ability to learn quickly

Question 9. Once you have program managers on board, do you anticipate that the program managers would be given the freedom and flexibility to construct research and development teams from among the various participants in our Nation’s scientific and technological enterprise without limitations on the level of participation by any member of the group?

Answer. I believe that freedom and flexibility are vital to the success of ARPA-E. As I noted above, speed, agility, and risk-taking are integral to the core mission of ARPA-E. If confirmed, I plan to work with program managers to foster an innovative spirit that taps into as many scientific and technological brains as possible. I will give these program managers, who are the best in their field, sufficient autonomy to design their own programs within the strategic plans of ARPA-E. Having said that, these managers will also be scrutinized as to the design of the programs and how they manage them. Program managers will be required to take “deep dives” into their program topic and be in close touch with PIs within their programs (multiple site visits per year, getting to know how teams are performing and what are the barriers in the various labs, etc.) and evaluate how they are performing. Program managers will be encouraged to make decisions on when to terminate projects that are not productive and reallocate resources to those projects that show promise.

Question 10. Do you anticipate cost sharing to be a regular requirement for ARPA-E proposals?

Answer. Coming from the University of California system, I am aware of the tight budget situation that makes cost sharing a major concern. I am sympathetic to the burden of cost sharing for universities, national labs, and entrepreneurial businesses. If confirmed, I plan to look into this issue and draw on the lessons learned from the first solicitation to see if any adjustments are necessary.

RESPONSES OF ARUN MAJUMDAR TO QUESTIONS FROM SENATOR STABENOW

Question 1. The American Recovery and Reinvestment Act made significant investments in advanced manufacturing so that we can ensure that the technologies of the future are made right here in the United States. My home state of Michigan is a perfect example of how we can utilize our manufacturing and engineering expertise, highly developed manufacturing infrastructure, and world class universities to provide a home for advanced manufacturing technologies and processes. I understand that ARPA-E is designed to invest in the development of cutting edge technologies, but how do you see the program playing a larger role in manufacturing these technologies? For example, can ARPA-E play a role in developing the advanced manufacturing processes that will be needed to take many of these projects to the next level?

Answer. Yes. In my view, one of the strengths of ARPA-E is its flexibility to look across the energy space to address all sorts of barriers. We know that there are currently challenges regarding mass manufacture of wind turbines, solar panels, batteries, and other technologies. For example, batteries are a significant challenge in broad-scale deployment of hybrid and electric vehicles. Most of the materials in today’s lithium ion batteries were discovered in the US, but the manufacturing is now in Asia. If confirmed, I will look to see how ARPA-E can take the lead in advanced battery technology while also creating a manufacturing base in the US. There is great benefit in co-locating manufacturing and advanced technology development since there needs to be feedback between them. Lessons learnt from how the semi-

conductor industry competed in the 1980s and 1990s could be very valuable for American competitiveness in the global energy market.

Question 2. Following passage of the American Recovery and Reinvestment Act, the ARPA-E program has been widely successful in promoting innovation all across the United States. By investing in technologies that can truly transform our energy sector, the program has received thousands of applications from businesses seeking to demonstrate new clean energy technologies. Many businesses and universities in my home state of Michigan have sought to capitalize on this opportunity and demonstrate that Michigan is home to a large portion of clean energy technology development.

As the agency moves forward on plans for future competitions, I would like emphasize the importance of taking steps to ensure that many of these cutting-edge solutions come from the broadest number of innovators. Given the volume of applications that were submitted, how will you as director of the program ensure that each application is given a fair and comprehensive review?

Answer. I am committed to giving each application due consideration in the process. While I was not part of the initial ARPA-E solicitation, my understanding is that DOE made resources and reviewers available to adequately vet the concept papers submitted.

If confirmed, I will oversee a review process that is open, fair, and transparent. Having been on the receiving end of both good and bad news in the past, I can not emphasize enough how important it is to engage with proposers in a productive and open manner.

It is my understanding that the purpose of the first FOA was to address a broad, pent-up demand for this kind of funding and to identify topic areas of greatest interest to ARPA-E. If confirmed, I plan to create focused programs to solve particular technical barriers. At the same time, I also recognize the value of an option for considering unsolicited proposals in topics not covered by the focused programs. Such an option can help assure that ARPA-E does not miss any truly innovative, game-changing ideas. ARPA-E needs to create a reputation of openness—a “go-to” place for truly extraordinary ideas.

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