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AN OVERVIEW OF THE FISCAL YEAR 2012 RESEARCH AND DEVELOPMENT BUDGET PROPOSALS AT THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION AND THE ENVIRONMENTAL PROTECTION AGENCY

HEARING

BEFORE THE

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
HOUSE OF REPRESENTATIVES

ONE HUNDRED TWELFTH CONGRESS

FIRST SESSION

MARCH 10, 2011

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CONTENTS

Thursday, March 10, 2011

	Page
Witness List	2
Hearing Charter	3

Opening Statements

Statement by Representative Ralph M. Hall, Chairman, Committee on Science, Space, and Technology, U.S. House of Representatives	10
Written Statement	11
Statement by Representative Eddie Bernice Johnson, Ranking Minority Member, Committee on Science, Space, and Technology, U.S. House of Representatives	12
Written Statement	14

Witnesses:

Dr. Jane Lubchenco, Administrator, National Atmospheric and Oceanic Administration	
Oral Statement	15
Written Statement	17
Dr. Paul Anastas, Assistant Administrator, Office of Research and Development (ORD), U.S. Environmental Protection Agency	
Oral Statement	41
Written Statement	43
Discussion	44

Appendix I: Answers to Post-Hearing Questions

Dr. Jane Lubchenco, Administrator, National Atmospheric and Oceanic Administration	68
Dr. Paul Anastas, Assistant Administrator, Office of Research and Development (ORD), U.S. Environmental Protection Agency	84

AN OVERVIEW OF THE FISCAL YEAR 2012 RESEARCH AND DEVELOPMENT BUDGET PROPOSALS AT THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION AND THE ENVIRONMENTAL PROTECTION AGENCY

THURSDAY, MARCH 10, 2011

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
Washington, DC.

The Committee met, pursuant to call, at 10:03 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Ralph M. Hall [Chairman of the Committee] presiding.

ALPH M. HALL, TEXAS
CHAIRMAN

EDDIE BERNICE JOHNSON, TEXAS
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COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

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An Overview of the Fiscal Year 2012 Research and Development Budget Proposals at the National Oceanic and Atmospheric Administration and the Environmental Protection Agency

Thursday, March 10, 2011

10:00 a.m.-12:00 p.m.

2318 Rayburn House Office Building

Witnesses

Panel I

Dr. Jane Lubchenco
Administrator, National Atmospheric and Oceanic Administration

Panel II

Dr. Paul Anastas
Assistant Administrator, Office of Research and Development (ORD),
U.S. Environmental Protection Agency

HEARING CHARTER

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

An Overview of the Fiscal Year 2012 Research and Development Budget Proposals at the National Oceanic and Atmospheric Administration and the Environmental Protection Agency

THURSDAY, MARCH 10, 2011
10:00–12:00
2318 RAYBURN HOUSE OFFICE BUILDING

PURPOSE

On Thursday, March 10, 2010 at 10:00 a.m. the House Committee on Science, Space, and Technology will hold a hearing to examine the Administration's Fiscal Year 2012 budget requests for the Environmental Protection Agency's (EPA) Science and Technology (S&T) Programs and the National Oceanic and Atmospheric Administration (NOAA).

WITNESSES

Panel I

- **Dr. Jane Lubchenco**, Administrator, National Atmospheric and Oceanic Administration

Panel II

- **Dr. Paul Anastas**, Assistant Administrator, Office of Research and Development (ORD), U.S. Environmental Protection Agency

BACKGROUND

OVERALL FY 2011 BUDGET REQUEST FOR NOAA

The President's FY 2012 budget request for the National Oceanic and Atmospheric Administration (NOAA) is $5.49 billion, a 15.8 percent increase above the fiscal year (FY) 2010 levels.

NOAA's core mission and activities include weather forecasting, climate prediction, and management of fisheries, coastal and ocean resources, as well as cross-cutting research to support and advance these operational areas. NOAA carries out this mission through five major line offices:

- National Ocean Service (NOS), responsible for mapping and charting coastal areas and providing other navigation support services.
- National Weather Service (NWS), responsible for weather forecasts and warnings.
- National Environmental Satellite Service (NESS [1]), responsible for development and operation of satellites that monitor and transmit data for weather forecasting, climate prediction, space weather forecasting, and earth and ocean science research.
- Office of Oceanic and Atmospheric Research (OAR), responsible for research in support of most NOAA missions including atmospheric, coastal, and oceanic sciences, climate and air quality research, ecosystem research, and fisheries and marine mammal research.
- National Marine Fisheries Service, responsible for stewardship of living marine resources through the conservation, management, and promotion of healthy ecosystems.

[1] The NESS line office was formerly known as the National Environmental Satellite, Data, and Information Service, NESDIS.

As part of the FY 2012 budget request, the Administration is proposing a major reorganization of NOAA that would include the establishment of a seventh line office. Assets from the Office of Oceanic and Atmospheric Research (OAR), the National Weather Service (NWS), and the National Environmental Satellite Service (NESS) would be transferred into a new Climate Service (CS) line office.

Table 1 shows the primary accounts or line offices of the agency's budget. The FY 2012 budget request includes increases above the FY 2010 enacted levels for Program Support, the National Environmental Satellite Service (NESS), and the Climate Service (CS). The Administration's budget proposes to decrease funding for National Ocean Service (NOS), the Office of Atmospheric and Oceanic Research (OAR), the National Weather Service (NWS) and the National Marine Fisheries Service (NMFS).

Table 1: NOAA FY 2012 Budget Request (dollars in millions)

Account	FY08 Actual	FY10 Enacted	FY11 Request	FY12 Request	FY12 Request versus FY10 Enacted	
					$	%
National Ocean Service*	536.0	578.7	550.6	558.6	(20.1)	(3.5)
Oceanic and Atmospheric Research	398.0	449.1	464.9	212.0	(237.1)	(52.8)
National Weather Service	911.0	999.8	1003.2	988.0	(11.8)	(1.2)
National Environmental Satellite Data Information Service/NESS	955.0	1398.5	2209.0	2015.4	616.9	44.1
Climate Service	0.0	0.0	0.0	346.2	346.2	--
National Marine Fisheries Service**	829.0	1008.2	992.4	997.5	(10.7)	(1.1)
Program Support	446.0	485.9	515.1	524.8	38.9	8.0
Transfers/Rescissions		(24.8)	(50.3)	(144.8)		
Totals:	**4075.0**	**4748.4**	**5554.5**	**5497.7**	**749.3**	**15.8**

* Jurisdiction of the NOS line office is shared with the Resources Committee.
** NMFS is solely in the jurisdiction of the Resources Committee.

Climate Service (CS)

In February 2010, NOAA announced its intention to create a new Climate Service (CS) to provide public and private sector decision-makers with improved and expanded climate-related information. The FY 2012 budget request formalizes this intention, requesting $346.2 million for the CS, which would include assets consolidated from OAR, NWS, and NESS. This proposal represents the largest reorganization of NOAA since its creation in 1970. Specifically, the proposal would move more than half of OAR assets into the new CS, including the Climate Program Office, the Geophysical Fluid Dynamics Laboratory (climate modeling), and most of the Earth Systems Research Laboratory. From the NWS, CS would gain the Climate Prediction Center, the Regional U.S. Historical Climate Network, and the TAO array (monitoring). Finally, from NESS, the CS would gain the data and information centers that house the observational data from satellites, land and sea monitors.

The proposed CS was subject to a National Academy of Public Administration (NAPA) review at the behest of the FY 10 Appropriations. The scope of the study included an assessment of:

- how best to provide information at the global, regional, and state levels over varying timescales;
- the interaction among the government and various users, stakeholders, researchers, and information providers of climate information in both the private and public sectors;
- the development and distribution of products and information that will support decision-making;
- the coordination and alignment of existing programs and resources internal and external to NOAA; and,
- provide estimates on projected funding levels.Although the NAPA study endorsed the concept of a Climate Service, it was quite clear that it did not evaluate the impacts that the creation of a Climate Service would have on the rest of the NOAA research enterprise, and on OAR in particular. The Committee has not yet had the opportunity to hold hearings on the proposed climate service.

National Weather Service (NWS)

NWS provides weather, hydrologic, and climate forecasts and warnings for the United States, adjacent waters, and ocean areas, and maintains a national infrastructure of observing systems that gather and process data worldwide from the land, sea, and air.

The FY 2012 request for NWS is $988 million, a decrease of $11.8 million, or one percent, below FY 2010 levels. The Administration is requesting a $4.7 million increase for the NWS Operations, Research and Facilities (ORF) accounts and $16.5 million decrease for the NWS Procurement, Acquisitions and Construction (PAC) accounts. A substantial amount of the decrease is attributed to the movement of assets to the newly formed CS and the elimination of congressionally directed projects.

As part of the proposed reorganization, NWS would transfer to CS the following assets: the Climate Prediction Center (CPC), the Tropical Atmosphere Ocean (TAO) observation array, and the Historical Climate Network (HCN). The CPC produces operational predictions of climate variability from one-week forecasts to seasonal forecasts. The TAO array is a series of bouys in the Pacific Ocean that transmit oceanographic and meterological data instrumental in NOAA's prediction of El Niño events. The HCN is a network of more than 1200 weather stations across the contiguous United States.

The Administration requested increase in the ORF accounts is within the Local Warning and Forecasts Program for: (1) National Data Buoy Center for operations and maintenance of damaged buoys, (2) Next Generation Air Transportation System (NextGen) development activities, and (3) supercomputing capabilities for more timely and accurate weather forecasts.

The requested increases in the ORF accounts are partially offset by decreases in funding. There are several programs proposed for elimination that are designated by Congress for funding and are routinely eliminated by the Administration as "Congressional earmarks." This includes the National Mesonet Network, a Congressionally mandated program to explore the use of using integrated commercial and government meteorological data to improve forecasting. NOAA maintains that it will still be able to use data collected from existing observational systems and obtain additional observational data from networks that provide data free of charge ($19 million). Another program proposed for elimination includes the Weather Radio Improvement Project (WRIP). NOAA has completed the WRIP program, and has finished replacing weather radios ($5.4 million).

The President's FY 2012 request proposes to continue support in the following areas: complete the acquisition of global positioning system (GPS) radiosondes (i.e. weather balloon instruments) for 102 Upper Air observing stations ($9.0 million); support the initial operational deployment of a 4-dimensional (4–D) Weather Data Cube used for aviation weather ($26.9 million); improve IT security for the national critical space weather system ($11.6 million); and operation and maintenance of the Advanced Weather Interactive Processing System (AWIPS) ($24.4 million), the Automated Surface Observing System (ASOS) ($11.3 million), and the Next Generation Weather Radar (NEXRAD) ($46.7 million). AWIPS is specialized software that assists forecasters in preparation of accurate, timely weather forecasts and warnings. ASOS is composed of the sensors needed to measure and record significant weather conditions. NEXRAD is the radar system that shows patterns and movement of weather conditions.

National Environmental Satellite Service (NESS)

The President's budget request for the National Environmental Satellite Service (NESS) is $2.015 billion, a 44 percent increase over FY 2010 levels. Due to the movement of assets from NESS into the new CS, the Administration request would reduce the NESS Operations, Research and Facilities (ORF) account by $81.3 million (41 percent) relative to FY 2010 levels, and increase the NESS Procurement, Acquisition and Construction (PAC) account by $699 million (58 percent) over FY 2010.

NESS ORF

The ORF budget for NESS is for Environmental Satellite Observing Systems, and contains programmatic funding for management and processing of data received from all of NOAA's ground- and space-based weather monitoring equipment. The requested increases of $5.1 million over the FY 2010 appropriation would support the routine replacement and upgrading of ground based equipment and software and to increase security protocols on NESS computer systems.

NESS PAC

The budget for NESS is dominated by acquisitions for NOAA's two weather satellite systems: the Polar-Orbiting Environmental Satellites (POES), which orbit the earth and provide information for medium to long-range weather forecasts; and the geostationary satellites (GOES), which gather data above a fixed position on the earth's surface and provide information for short-range warnings and current weather conditions. To maintain the continuity of weather forecasting data as older satellites retire, a new series of satellites are under development for both systems.

Increases and decreases in the PAC account reflect different phases of satellite acquisition. For example, there is a proposed decrease of $50.1 million from the FY 2010 budget for the current series of GOES satellites, GOES–R, due to a rephrasing of program resources and continue instrument, spacecraft and ground system development for GOES R and S. Cost overruns and delays have plagued this program. Originally scheduled for launch in 2014, GOES–R has been delayed until 2015, and its projected cost has grown by $5 billion from the original estimate of $6.2 billion. NOAA consequently restructured the program to achieve cost reductions, and obtained independent cost estimates for the program. The Administration now estimates the cost of the new GOES series at $7.62 billion through 2028. Cost savings were achieved by reducing the number of satellites in the series (from four to two) as well as removing one of the satellite's major sensors.

The PAC account also reflects the $687.8 million requested increase for the Joint Polar Satellite System (JPSS). The JPSS total request of $1.07 billion comprises most of the nearly 52% increase of the NESS line office over FY 10 levels. This increase is a sizable portion of the agency's total $750 million proposed growth in FY 2012.

JPSS evolved from a tri-agency effort to develop a satellite system known as NPOESS[2]. NPOESS data and products are considered "mission-critical" for both civilian and military weather forecasting and climatology needs; however, the program had major problems throughout its existence. Since 2002, oversight by Congressional Committees, Government Accountability Office (GAO) reports, and independent review teams have documented problems with satellite instrumentation, cooperation among the agencies involved, and the program's life-cycle cost; GAO's most recent testimony to the S&T Committee indicated that total cost estimates had grown to between $15 billion and $16.5 billion and were not yet stabilized.

Due to these serious management issues, schedule slips, and cost over-runs, the Administration's FY 2012 budget reflects the major restructuring of NPOESS that occurred in 2010. The decision dissolved the integrated program into two separate programs: a military program managed by the Department of Defense, and a civilian program managed by NOAA/NASA. The NOAA/NASA program known as JPSS is responsible for satellites flying in the afternoon orbits while DoD satellites are responsible for the morning orbits. The United States will rely on European satellites for operational weather observations for the remaining late-morning orbit. Satellite procurement will be separated for each program; however, both programs will deliver data to a common ground system, and NOAA will continue to operate all satellites while in orbit.[3]

Part of this program included a research satellite, the NPOESS Preparatory Project (NPP) that was intended to be launched during the last years of the original POES satellites in order to compare instrument functionality and usefulness and to calibrate data coming from the new instruments against the data from existing instruments. Due to the delays this program has experienced, the initial May 2006 launch of NPP has slipped to an October 2011 launch date. Instead of acting as a research tool, NPP has now been designated an operational satellite in order to ensure continuity of data, given that the first JPSS satellite is not schedule to launch until 2016. In addition to procuring these satellite systems, the Administration is requesting $30.4 million to restore high priority climate sensors that were de-manifested from the NPOESS program in 2006 as a result of the Nunn-McCurdy mandated restructuring of the program.

NOAA oversees several satellite systems in addition to GOES and POES. The Deep Space Climate Observatory (DSCOVR), formerly known as Triana, has a request of $47.3 million to initiate refurbishment of the satellite and to develop a Coronal Mass Imager (CME) to maintain continuity of solar wind data used for geomagnetic storm warnings. The total life cycle of DSCOVR is projected to be $85 million. The JASON satellite series is managed in partnership with the European Or-

[2] NOAA, the National Aeronautics and Space Administration (NASA), and the Department of Defense (DoD) collaborated to develop NPOESS. This tri-agency effort was abandoned in February 2010.

[3] NOAA has been operating the Defense Meteorological Satellites for DoD since May 1998.

ganization for the Exploitation of Meteorological Satellites (EUMETSAT). The JASON–3 satellite FY 2011 budget request is a $33 million increase over the FY 2010 level of $20 million to continue the development of this altimetry satellite that will provide data for ocean climatology and hurricane intensity forecasting.

Oceanic and Atmospheric Research (OAR)

The office of Oceanic and Atmospheric Research (OAR) is the primary research arm of NOAA, conducting the scientific research, environmental studies, and technology development necessary to improve NOAA operations. OAR activities are carried out at NOAA and via extramural research activities at 30 National Sea Grant colleges and universities. The proposed formation of the Climate Service would reduce the size of OAR by more than half, to $212 million for FY 2012. The Administration proposes to reduce funding for OAR by $237.1 million, approximately a 53 percent decrease below the FY 2010 $549 million level.

Notable budget changes at the remaining programs at OAR include:

- An increase of $6 million in the Phased Array Radar and Tornado Severe Storm Research.
- An increase of $2 million in Weather and Air Quality Research for wind boundary-layer research to support renewable energy.
- An increase of $1 million in Sea Grant to conduct risk assessment research for coastal communities preparing for and responding to natural hazards and extreme events.
- The Administration requests $11.6 million in funding for the Integrated Ocean Acidification Research program. This work is aimed at enhancing current knowledge to improve adaptive strategies and management of living marine resources impacted by ocean acidification.
- A decrease of $3 million from Unmanned Aircraft Systems.
- A decrease of $1.3 million from the U.S. Weather Research Program (reflecting the completion of some research projects).
- A $19.5 million decrease for Congressionally Directed Programs.

National Ocean Service (NOS)

The National Ocean Service (NOS) protects the National Marine Sanctuaries and advocates coastal and ocean stewardship. The NOS also introduced electronic nautical charts which interface with Global Positioning Systems (GPS) to enhance the safety and efficiency of navigation of U.S. waterways. The President's FY 2012 request of $558.6 million would reduce overall funding for NOS programs by $20.5 million, or 3.5 percent, compared to the FY 2010 level.

The NOS ORF account is reduced by $11 million. The Ocean Resources, Conservation and Assessment account has a proposed net reduction as compared to the FY 2010 enacted budget of $7.4 million. This includes a $8 million reduction in the Ocean Assessment Program (OAP), and an increase of $2.9 million for Response and Restoration oil spill research. The Ocean Assessment Program includes an increase in funding for the Integrated Ocean Observing System (IOOS) Surface Current Mapping of $5 million, an increase of $8.5 million for IOOS Regional Observations for marine sensor technology innovations. The FY 2012 budget request includes a $1.2 million increase for the National Centers for Coastal Ocean Science (NCCOS), and a decrease of $1.2 million for energy licensing and appeals. The NOS–PAC accounts are also reduced by $9 million. This includes a cut in the Marine Sanctuaries Construction ($7.5 million) and a decrease of $2.2 million in the acquisition and construction activities of the National Estuarine Research Reserve System.

Program Support

The Program Support line office supports corporate services and agency management. This includes the Under Secretary's office, the office of the Chief Financial Officer, the Program, Planning and Integration Office, and the NOAA Education Program. Overall, the Administration requests an increase in the Program Support account of $6.2 million, for a total of $301.2 million, a two percent increase over the FY 10 level.

Overall FY 2012 Budget Request for EPA

The President's FY 2012 budget request for the Environmental Protection Agency (EPA) is $8.97 billion, a reduction of 12.9 percent below FY 2010 levels. The Committee on Science, Space, and Technology has jurisdiction over the Science and Technology budget listed in Table 2 below.

Table 2: EPA FY 2012 Budget Request (dollars in millions)

Account	FY08 Actual	FY10 Enacted	FY11 Request	FY12 Request	FY12 Request Versus FY10 Enacted	
					$	%
Science and Technology	785.8	848.0	846.7	825.6	(22.4)	(2.6)
Office of Research and Development		596.7	605.7	584.1	(12.6)	(2.1)

FY 2011 Science & Technology Account: Office of Research and Development

The Administration's budget request for S&T is $826 million. This includes $584 million for the Office of Research and Development (ORD), S&T activities conducted by other program offices (e.g. Office of Air, Office of Water), as well as $27 million requested for S&T activities associated with the Superfund program. In the past, the Superfund S&T funds were drawn primarily from the Superfund trust that was funded by the dedicated Superfund tax. Since the expiration of the tax, this fund no longer exists and all funds must be appropriated from general revenues.

Approximately 71 percent of S&T funding is for EPA's ORD, which is the primary research arm of the agency. Typically, most of the remaining S&T funds go to the Office of Air and Radiation, and a smaller amount to the Office of Water and to the other program offices.

ORD conducts and sponsors both fundamental research in environmental science and more targeted research to inform EPA's regulatory programs. For example, ORD provides scientific information to support and implement the Clean Water Act. ORD also develops the scientific risk information for the agency's Integrated Risk Information System (IRIS), a database of human health effects of certain chemicals. This program is used by EPA, individual states, and other government agencies to determine hazardous waste site clean-up, drinking water, and other health-based standards. ORD develops the scientific underpinning for EPA's air quality standards in areas such as particulate matter and ozone. ORD also investigates the environmental implications of emerging areas such as nanotechnology and endocrine disruptors.

ORD carries out these responsibilities by conducting intramural research at EPA's laboratories, awarding contracts, and supporting fellowships and research at colleges and universities through the Science to Achieve Results (STAR) grant program. The table above provides breakouts of ORD funds among the various research programs at ORD.

Within the context of a decrease in funding for EPA as a whole, the FY 2012 budget proposes funding for a range of intramural and extramural research and development activities.

- $86 million for the STAR Program, a $24.7 million increase over FY 2010 enacted levels, to invest in the next generation of environmental scientists and to leverage wider scientific community expertise on key issues.
- $83.1 million for clean air research and $20.8 million for global change research.
- $5.4 million in for research into electronic waste and green chemistry.
- $4.4 million to study the impact of hydraulic fracturing technology on ground water quality and implications for public health and the environment.
- An increase of $17.8 million for Chemical Safety and Sustainability Activities. A budget request of $16.9 million for endocrine disrupting chemicals research and $ 21.2 million for computational toxicology. Both are important for human health and ecological risk assessment.
- $2 million for a long-term lab study

Table 3: ORD FY 2012 Budget Request (dollars in millions)

Account	Program/Project		FY10 Enacted	FY12 Request	FY12 Request vs. FY10 Enacted	
					$	%
Science and Technology	Congressionally Mandated Projects		4.7	0.0	(4.7)	(100.0)
	Homeland Security: Preparedness, Response, and Recovery	Total Program	32.8	24.7	(8.2)	(25.0)
		Decontamination	10.0	15.6	5.6	56.0
		Safe Buildings	20.9	0.0	(20.9)	(100.0)
		Other Research	2.0	9.0	7.0	350.0
	Human Health Risk Assessment		42.9	42.4	0.5	1.2
	Research: Air, Climate, and Energy	Total Program	111.4	108.0	(3.4)	(3.1)
		Global Change Research	20.8	20.8	0.0	0.0
		Clean Air Research	81.6	83.1	1.5	1.8
		Other Research	9.0	4.1	(4.9)	(54.4)
	Research: Safe and Sustainable Water Resources	Total Program	111.1	118.8	7.7	6.9
		Drinking Water Research	49.1	52.5	3.4	6.9
		Water Quality Research	61.9	66.3	4.3	6.9
	Research: Sustainable and Healthy Communities	Total Program	188.1	170.5	(17.6)	(9.4)
		Human Health Research	54.2	45.4	(8.8)	16.2
		Ecosystems Research	71.7	60.9	(10.8)	(15.0)
		Other Research	62.2	64.2	2.0	3.2
	Research: Chemical Safety and Sustainability	Total Program	77.8	95.7	17.8	22.9
		Endocrine Disruptors Research	11.4	16.9	5.5	48.2
		Computational Toxicology Research	20.0	21.2	1.2	6.0
		Other Research	46.4	57.6	11.2	24.1
	S&T Appropriation Total		**569.0**	**560.0**	**(9.0)**	**(1.6)**
LUST	Research: Sustainable and Healthy Communities		0.34	0.45	0.11	32.4
Inland Oil Spills	Research: Sustainable and Healthy Communities		0.64	0.61	(0.03)	(4.7)
Superfund	Homeland Security: Preparedness, Response, and Recovery		2.2	2.0	(0.2)	(9.1)
	Human Health Risk Assessment		3.4	3.3	(0.1)	(2.9)
	Research: Sustainable and Healthy Communities		21.3	17.7	(3.5)	(16.4)
	Superfund Appropriation Total		**26.8**	**23.0**	**(3.8)**	**(14.2)**
Grand Total			**596.7**	**584.1**	**(12.6)**	**(2.1)**

Chairman HALL. The Committee on Science, Space, and Technology will come to order. Good morning to everyone. We welcome you. This hearing is entitled "An Overview of the Fiscal Year 2012 Research and Development Budget Proposals at the National Oceanic and Atmospheric Administration, and the Environmental Protection Agency." In front of you are packets containing the written testimony, biography, and truth in testimony disclosure for today's witnesses. Our first panel will feature NOAA Administrator Dr. Jane Lubchenco. Our second panel will feature EPA Assistant Administrator for the Office of Research and Development, Dr. Paul Anastas.

I recognize myself for an opening statement.

I want to welcome everyone here today for the hearing on the President's fiscal year 2012 budget request for the National Oceanic and Atmospheric Administration, that is NOAA, and the Environmental Protection Agency, the EPA.

In the first two months of the year, the President made two important praiseworthy announcements. He called for a review of the unnecessary regulations, such as those under which the benefits don't justify the cost, or those not grounded in sound science. Then he announced during his State of the Union speech that he would be willing to eliminate whatever spending we can honestly afford to do without. The President has followed these announcements by proposing a budget with over $1 trillion in deficit spending, and pushing a bevy of job-killing regulations, without heed to current economic conditions. In light of his stated priorities, the President's actions on the budget and regulations are appearing to be empty promises.

The President's fiscal year 2012 budget request for NOAA contains few surprises, with several concerns. The administration has proposed the largest reorganization in NOAA history in order to create a new climate service. As I said at last year's budget hearing, I am not supportive of this change and am concerned that it has not been properly vetted by Congress. I do, however, want to acknowledge to the administrator that I appreciate that this proposal was made through the budget process this year. This is a regular order we were requesting a year ago.

Nevertheless, this Committee has not yet had the opportunity to fully examine the implications of transition in the fundamental climate research in the operational office. Until then, unless Congress reviews and approves the proposal, I don't expect NOAA to continue to operate as it did prior to the February 2010 announcement. There should be no changes in the existing management matrix, no changes in decision-making or reporting lines within the line offices, and no authorities changed under the guise of transition.

Another area of the President's budget that concerns me is the proposed increases for the Joint Polar Satellite System. This Committee has been engaged in the oversight of this program since it was the dysfunctional tri-agency mess subject to recertification under Nunn-McCurdy.

It has been more than a year since the Office of Science and Technology Policy proposed splitting this program into two elements: one controlled by NOAA and NASA, and a separate one con-

trolled by the Department of Defense. In all this time, we still have not seen how the division of this program has worked, and whether or not it will reduce the risk of a potential gap in weather and climate data. Furthermore, we have still not seen the baseline cost estimate of these two separate programs. I look forward to hearing from the Administration on this subject.

Our second panel, we will hear about EPA's fiscal year 2012 research and development budget request. We are all well aware of the great impact that EPA regulatory actions can have. Often overlooked in this debate, however, is agency process and how it affects the quality of underlying science that these regulations are based on. This is the purview of the Committee and an issue I am committed to pursue in further detail.

For example, since our last EPA budget hearing, more information has come to light that the science used to justify the finding that carbon dioxide is a danger to public health or welfare is not as solid as was originally claimed. The numerous admitted mistakes, questionable data sets and lack of transparency in the process has only intensified the questions and doubts that this decision was made as a result of politics instead of science.

Unfortunately, climate is not the only area in which EPA science is a concern. I was very disappointed with the release of the draft hydraulic fracturing study. The questions EPA posed to answer would hardly be helpful to a decision-maker. This study is focused on the impact possibilities of hydraulic fracturing on drinking water, without even looking at the possibilities of such an impact occurring. It seems about as useful as studying the possible impacts of getting hit by a bus without ever even considering the probability of such an event occurring even when existing laws and simple precautionary steps are taken. Accordingly, I look forward to hearing further from EPA on the factors driving its hydraulic fracturing study.

There is a lot of work to be done to put our country back on the right track, and the President's budget request is not the roadmap that will get us there.

[The prepared statement of Mr. Hall follows:]

PREPARED STATEMENT OF CHAIRMAN RALPH M. HALL

I want to welcome everyone here today for this hearing on the President's Fiscal Year 2012 budget request for the National Oceanic and Atmospheric Administration (NOAA) and the Environmental Protection Agency (EPA).

In the first two months of the year, the President made two important praiseworthy announcements. He called for a review of unnecessary regulations, such as those under which the benefits don't justify the costs or those not grounded in sound science.

Then he announced during his State of the Union speech that he would be willing to eliminate whatever spending we can honestly afford to do without.

The President has followed those announcements by proposing a budget with over a trillion dollars in deficit spending and pushing a bevy of job-killing regulations without heed to current economic conditions. In light of his stated priorities, the President's actions on the budget and regulations are appearing to be empty promises.

The President's FY 2012 budget request for NOAA contains few surprises, but several concerns. The Administration has proposed the largest reorganization in NOAA history in order to create a new Climate Service. As I said at last year's budget hearing, I am not supportive of this change and concerned it has not been properly vetted by Congress. I do however want to acknowledge to the Adminis-

trator that I appreciate that this proposal was made through the budget process this year. This is the regular order I was requesting a year ago.

Nevertheless, this Committee has not yet had the opportunity to fully examine the implications of transitioning fundamental climate research into an operational office. Until and unless Congress reviews and approves this proposal, I expect NOAA to continue to operate as it did prior to the February 2010 announcement. There should be no changes in the existing management matrix, no changes in decision-making or reporting lines within the line offices, and no authorities changed under the guise of transition.

Another area of the President's budget that concerns me is the proposed increases for the Joint Polar Satellite System. This Committee has been engaged in the oversight of this program since it was a dysfunctional, tri-agency mess subject to recertification under Nunn-McCurdy.

It has been more than a year since the Office of Science and Technology Policy proposed splitting this program into two elements: one controlled by NOAA and NASA, and a separate one controlled by the Department of Defense. In all this time, we still have not seen how the division of this program has worked to reduce the risk of a potential gap in weather and climate data. Furthermore, we have still not seen the baseline cost estimates of these two separate programs. I look forward to hearing from the Administrator on this subject.

On our second panel, we will hear about EPA's FY 2012 research and development budget request. We are all well aware of the great impact that EPA regulatory actions can have. Often overlooked in this debate, however, is agency process and how it affects the quality of the underlying science that these regulations are based on. That is the purview of this Committee and an issue I'm committed to pursuing in further detail.

For example, since our last EPA budget hearing, more information has come to light that the science used to justify the finding that carbon dioxide is a danger to public health or welfare is not as solid as was originally claimed. The numerous admitted mistakes, questionable data sets and lack of transparency in the process has only intensified the questions and doubts that this decision was made as a result of politics instead of science.

Unfortunately, climate is not the only area in which EPA science is a concern. I was very disappointed with the release of the draft hydraulic fracturing study. The questions EPA posed to answer would hardly be helpful to a decision-maker. The study is focused on the impact possibilities of hydraulic fracturing on drinking water, without ever looking at the probabilities of such an impact occurring. It seems about as useful as studying the possible impacts of getting hit by a bus without ever considering the probability of such an event occurring within existing laws and when simple precautionary steps are taken. Accordingly I look forward to hearing further from EPA on the factors driving its hydraulic fracturing study.

There is a lot of work to be done to put our country back on the right track, and the President's budget request is not the roadmap that will get us there.

I now recognize Ranking Member Johnson for five minutes for an opening statement.

Chairman HALL. I now recognize the Ranking Member, Mrs. Johnson, for five minutes, or whatever time she might require on her opening statement.

I thank you, Ms. Johnson.

Ms. JOHNSON. Thank you very much, Mr. Hall, and let me also wish to welcome the witnesses, Dr. Lubchenco and Dr. Anastas, to the Science, Space, and Technology Committee.

While the two sides of the aisle might not always agree on the appropriate resources and directions for NOAA and EPA, I think that we all agree that good policy begins with good science.

Testifying today are two of the Nation's top scientists, running two of our premier science agencies. Not only is this hearing a venue for Members to ask questions and express concerns, it should serve as an opportunity for our witnesses to convey the importance of what these agencies do for the American people.

From forecasting the weather and assessing the impacts of a changing climate on our economy, to protecting public health by ensuring cleaner air and water, and the development of safer chemi-

cals, in these and in a host of other ways, NOAA and EPA conduct science to benefit our lives every day, in ways often too easily overlooked in the fog of partisan politics.

It is important to note that the unique jurisdiction that this Committee has in EPA and acknowledge that with the Office of Research and Development and all of the Science and Technology activities, EPA is not just a regulatory agency. We must not lose sight of the contribution that science activities at EPA have provided to the public for decades. Our environment does not just get better by itself, it requires all of us working together to protect every American's right to clean air and water, and a healthier environment.

We are here today to discuss the President's fiscal year 2012 budget request for NOAA and EPA. However, it is difficult to discuss the outlook for the next fiscal year when we have not yet determined funding levels for this current fiscal year and assess the full extent of the damage that the lack of a fiscal federal budget is causing.

In these challenging economic times, we need not sacrifice everything for the sake of making cuts. With vision and perseverance, we can be fiscally responsible while still making the necessary investments to keep the American economy competitive and our people and environment healthy.

The President has already made some tough decisions in the 2012 budget request for these agencies. However, the much deeper cuts included in H.R. 1 that passed the House three weeks ago would put these and other agencies at risk of failing to meet their missions.

At the least, we must ask ourselves whether the very negligible effect these cuts will have on the national deficit warrants the devastation it would cause to our core scientific programs, their critical workforce, infrastructure, their capacity to address natural disasters, and protect public health and the environment.

If cuts on the order of those in House Bill H.R. 1 were enacted, thousands of research scientists, graduate students, technical and administrative staff, contractors, and other support staff across the country would be laid off or furloughed; and at a time when we are trying to protect American jobs.

Critical research activities to develop new technologies and methods to protect the public from environmental hazards and monitor long-term environmental change will be stopped or curtailed.

Weather forecasting systems may fail, creating gaps in critical weather data and eroding weather services that every American relies on. We would no longer see the two or three day advance warnings of extreme events, putting lives, property and critical infrastructure at risk.

These cuts don't take us back to 2008; they will turn the clock back and take us back to relying on weather forecasts and capabilities, and environmental protection standards from over two decades ago.

America wants us to be fiscally responsible, but if they can't breathe clean air, and drink clean water, or help communities and industries prepare for harsh weather and natural disaster, what does that really mean?

Dr. Lubchenco and Dr. Anastas, as you testify today, perhaps the most important assistance you can give to this Committee is a real understanding of how the proposed cuts will affect your agency's ability to protect the health and well-being of our citizens and communities, and why you believe the President's request will move our Nation science enterprise in the right direction.

Chairman Hall and all the Members of this Committee, I look forward to working with you in the months ahead, and I look forward to hearing our witnesses.

Thank you, and I yield back.

[The prepared statement of Ms. Johnson follows:]

PREPARED STATEMENT OF RANKING MEMBER EDDIE BERNICE JOHNSON

Thank you, Chairman Hall. I also wish to welcome the witnesses, Dr. Lubchenco, and later, Dr. Anastas, to the Science, Space, and Technology Committee.

While the two sides of the aisle might not always agree on the appropriate resources and directions for KOAA and EPA, I think that we would all agree that good policy begins with good science. Testifying today are two of the nation's top scientists running two of our premier science agencies. Not only is this hearing a venue for Members to ask questions and express concerns, it should serve as an opportunity for our witnesses to convey the importance of what these agencies do for the American people.

From forecasting the weather and assessing the impacts of a changing climate on our economy, to protecting public health by ensuring cleaner and water and the development of safer chemicals—in these and a host of other ways, NOAA and EPA conduct science to benefit our lives every day, and in ways often too easily overlooked in the fog of partisan politics.

It is important to note the unique jurisdiction that this Committee has in EPA and acknowledge that, with the Office of Research and Development and all of the Science and Technology activities, EPA is not just a regulatory agency. We must not lose sight of the contribution that science activities at EPA have provided to the public for decades. Our environment does not just get better by itself; it requires all of us working together to protect every America's right to clean air and water and a healthier environment.

We are here today to discuss the President's fiscal year 2012 budget request for KOAA and EPA. However, it is difficult to discuss the outlook for the next fiscal year when we have yet to determine funding levels for this current fiscal year and assess the full extent of the damage that the lack of a final budget is causing.

In these challenging economic times we need not sacrifice everything for the sake of making cuts. With vision and perseverance, we can be fiscally responsible while still making me necessary investments to keep the American economy competitive and our people and environment healthy.

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If cuts on the order of those in the House-passed H.R.1 were enacted:

- Thousands of research scientists, graduate students, technical and administrative staff, contractors, and other support staff across the country will be laid-off or furloughed, and at a time when we are trying to protect American jobs.
- Critical research activities to develop new technologies and methods to protect the public from environmental hazards, and monitor long-term environmental change will be stopped or curtailed.
- Weather forecasting systems may fail, creating gaps in critical weather data and eroding weather services that every American relies on. We would no longer see the 2–3 day advance warnings of extreme events, putting lives, property, and critical infrastructure at risk.

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Dr. Lubchenco and Dr. Anastas, as you testify today, perhaps the most important assistance you can give to this Committee is a real understanding of how the proposed cuts will affect your agencies' ability to protect the health and well-being of our citizens and communities, and why you believe the President's request will move our nation's science enterprise in the right direction.

Chairman Hall and all of the Members of this Committee, I look forward to working with you in the months ahead.

Chairman HALL. Thank you, Ms. Johnson. If there are Members who wish to submit additional opening statements, your statements will be added to the record at this point.

Let me say, we are going to try to stay with the five minute rule. It is not fair to those at the end. Mr. Sarbanes, for example, has stayed, I think, 2–1/2 hours and didn't get to ask a question last time. I am inclined to give him my time, he is so patient, or give him the award for patience here. Nobel Prize for patience.

I will introduce the first panel witness, and ask the witnesses to be as direct as you can. Please do your best to stay with the five minutes, but if you can't, we are honored to have you here and we will be lenient with the gavel.

At this time, I would like to introduce our first panel witness, Dr. Jane Lubchenco. I hope I am saying that right. People mispronounce Hall every now and then, put an "e" in it where there is an "a", but I don't like that.

Prior to her service as Administrator at NOAA, she served as President of the American Society for the Advancement of Science, a professor at Harvard and Oregon State University, and she was also on the Board of Directors for the National Science Foundation. She was sworn in on March 20, 2009, and this is the third time she has appeared before the Committee. We thank you for being here.

As our witnesses should know, spoken testimony is limited to five minutes, after which the Members of the Committee will have five minutes each to ask questions. Before I recognize Dr. Lubchenco, I want to ask you to please do your best to stay within that. Thank you.

We recognize you now, ma'am.

STATEMENT OF DR. JANE LUBCHENCO, ADMINISTRATOR, NATIONAL ATMOSPHERIC AND OCEANIC ADMINISTRATION

Dr. LUBCHENCO. Thank you very much, Mr. Chairman.

Members of the Committee, Chairman Hall, I greatly appreciate your leadership and your support for NOAA. As you know, we are one of the Nation's premier environmental science and stewardship agencies. Your continued support for our program is appreciated as we work within the Department of Commerce to improve science, products, and services that are vital to supporting America's businesses, communities, and people. At NOAA, our work is everyone's business.

I am honored to be here today to discuss the President's fiscal year 2012 budget request, which promotes innovation in American

competitiveness, and lays the foundation for long-term economic growth, while making responsible reductions.

The budget recognizes the central role that science and technology play in creating jobs and improving the health and security of Americans. I wish in my oral remarks to highlight five lynchpins of our fiscal year 2012 request: key savings, climate services, research and innovation, weather, and satellites.

Savings highlights. As part of the Administration's Administrative Efficiency Initiative, NOAA analyzed its administrative costs and reduced non-essential spending by $67.7 million. We conducted a rigorous review of our programs and activities and identified additional savings. The 2012 request is $5.5 billion dollars, a decrease from fiscal year 2011 request, an increase above fiscal year 2010 enacted, due primarily to our requirements to execute the restructured civil polar satellite program.

The fiscal year 2012 request includes a proposed budget-neutral reorganization that brings together NOAA's existing but widely dispersed climate capabilities under a single line office management structure, called the Climate Service.

The Climate Service, if approved by Congress, would have a budget of $346 million. A key point to keep in mind is that many people think of climate as something that is far down the road, something way in the future. However, the word "climate" generally refers to long-term weather, specifically, anything longer than two weeks. People are anxious to have information to plan for the months and years ahead, and we believe the Climate Service can assist in a meaningful fashion.

The proposed reorganization would also strengthen world class fundamental science for which NOAA is justly known. This Committee has repeatedly said that this goal is important to you. It is equally important to NOAA and to me. Without continued advances in basic science that supports our mission, the quality of our services will degrade.

The climate services we provide demonstrate the intuity of continually improving our scientific capacity. For example, through collaboration with the National Association of Homebuilders and HUD, NOAA developed an air freezing index that the homebuilding industry estimates saves $300 million annually in construction costs, and the equivalent of nine million gallons of gasoline. Advances in science make it possible for us to provide useful information about the months to year timeframe, something that has the potential to be of immense utility to businesses, communities, and military operations.

Parallel to creating the Climate Service, NOAA would strengthen and realign its core research line office. The Office of Oceanic and Atmospheric Research will focus its work to be the innovator and incubator of new science technologies and application within NOAA, and an integrator of science and technology across all of NOAA, consistent with the President's call for science and innovation.

NOAA'S request includes $212 million to continue strengthening core capacities such as our understanding of ocean acidification and its impacts, and promoting conservation and use of America's coastal resources to our renowned Sea Grant Program.

The National Weather Service provides critical information to communities and emergency managers, and it is the Nation's first line of defense against severe weather. The fiscal year 2012 request for the Service is $988 million. This includes a $26.9 million increase to modernize our aviation weather forecasts and warnings to support NextGen developmental activities.

NOAA's satellites provide the data and information for forecasters that are vital to every citizen. They enable smart construction in emergency rescue missions, safe transportation, whether it is on land, water, or in the oceans and Great Lakes. The fiscal year 2012 budget request for the satellite service is $2 billion, which we will invest in multiple satellite acquisition programs for the continuity of critical weather, climate, and oceanographic data. This includes an increase of $687 million for the Joint Polar Satellite System. This program is essential if we are to maintain the quality of our severe storm warnings, provide long-term forecasts, and receive emergency distress signals in a timely fashion.

In closing, Mr. Chairman, I would like to note that I am holding a nickel in my hand here. I believe that this nickel represents one of the best bargains I know of. It costs Americans—each American less than 5 cents a day to run NOAA, and for this nickel, you get the best weather information in the world. This nickel means that our oceans and coasts are healthy and vibrant, and in turn, our coastal communities are more prosperous. This nickel gives mariners the confidence that their distress signals will be received. This nickel allows us to save lives and property when severe storms strike. This nickel helps business owners succeed: from the farmers in the Heartland, to fishermen on the coasts, and everyone in between. This nickel helps keep our homeland secure. At NOAA, our work is everyone's business. We take our work seriously because we know that citizens and businesses depend upon us each and every day.

I look forward to working with Members of the Committee and our constituents to achieve these goals I have laid out through the implementation of the 2012 budget, and I am happy to respond to any questions that the Committee might have.

Thank you very much, Mr. Chairman.

[The prepared statement of Dr. Lubchenco follows:]

PREPARED STATEMENT BY DR. JANE LUBCHENCO, ADMINISTRATOR, NATIONAL ATMOSPHERIC AND OCEANIC ADMINISTRATION

Chairman Hall and Members of the Committee, before I begin my testimony I would like to thank you for your leadership and the support you have shown the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA), one of the Nation's premier environmental science and stewardship agencies. Your continued support for our programs is appreciated as we work to improve the products and services that are vital to supporting America's businesses, communities, and people. I am honored to be here as the Under Secretary of Commerce for Oceans and Atmosphere at NOAA to discuss the President's FY 2012 budget.

Secretary Locke is singularly focused on how the Department of Commerce can help American businesses compete for the jobs of the future. As part of the Commerce Department, NOAA generates value for the Nation by providing the information and services that communities, managers, businesses, and individuals rely on every day to make decisions about their lives and businesses. NOAA touches the lives of every single American; we work 24/7 to keep families safe, property protected, living marine resources vibrant, communities thriving, and businesses strong. NOAA works everywhere, in every state, and from the surface of the sun

to the depths of the ocean. Our research informs our many services and science guides our stewardship of the oceans, coasts, and Great Lakes.

The President's FY 2012 budget request promotes innovation and American competitiveness and lays the foundation for long-term economic growth, while making responsible reductions. In particular, the budget recognizes the central role that science and technology play in stimulating the economy, creating new jobs, and improving the health and security of Americans.

FY 2012 BUDGET REQUEST AND FY 2010 HIGHLIGHTS

Secretary Locke has brought a dedicated focus on efficiency and good management to the Department of Commerce. As part of the Administration's Administrative Efficiency Initiative, an aggressive government-wide effort to curb non-essential administrative spending, NOAA analyzed its administrative costs and reduced non-essential spending by $67.7 million. Beyond administrative savings, NOAA engaged in a rigorous review of its programs and activities and identified additional savings that were achievable. For example, we were able to reduce the cost of operating our current satellite programs, and we restructured our international portfolio of climate research. Further, as a member of the newly established Gulf Coast Ecosystem Restoration Task Force we are working with federal and state agencies to find efficiencies, improve coordination and accountability in restoring Gulf Coast ecosystems.

In short, the FY 2012 budget for NOAA reflects our efforts to focus on program needs, identify efficiencies, and ensure accountability. It sustains core functions and services, and proposes increases for only the most critical programs, projects, or activities necessary to address the growing demand for NOAA's science, services, and stewardship. The FY 2012 request is $5.5 billion, which is a decrease from the FY 2011 request. The FY 2012 request is an increase above FY 2010 enacted due primarily to our requirements to execute the restructured civil polar satellite program. As I will discuss later, this new generation of satellites is needed to replace satellites that will go out of service in the years to come. They are essential for both routine weather forecasts on which the private weather industry depends, and for storm warnings and watches that only the government can issue. The expenditures on satellites are mission critical for NOAA. People's lives and property depend on them. This year 21 people have been rescued because of NOAA satellite tracking, and 91 have been rescued since last October. Beyond weather forecasts, fishermen and recreational boaters count on NOAA satellites to keep them safe in the event of an emergency at sea.

The FY 2012 NOAA budget recognizes that environmental and economic sustainability go hand in hand. We learned through the BP Deepwater Horizon oil spill and other events that we cannot have healthy economies without healthy communities and healthy ecosystems and that good science and stewardship is good business. NOAA's 2012 budget makes the investments needed to save lives and livelihoods, to understand these critical connections, and to ensure sustainable communities, economies, and ecosystems.

Now I will turn to the details of the FY 2012 budget request and outline areas of significant investment.

Climate Service

The FY 2012 budget request includes a proposed budget-neutral reorganization that brings together NOAA's existing widely dispersed climate capabilities under a single line office management structure called the Climate Service. The proposed organization mirrors the structure recommended by the National Academy of Public Administration expert panel that, at Congress' request, completed a study on options for a climate service in NOAA. The principal goal of this budget-neutral reorganization is to better align NOAA's existing assets under a unified leadership to more efficiently and effectively respond to the rapidly increasing public demand for climate services. The Climate Service would provide reliable and authoritative climate data, information, and decision-support services, and to more effectively coordinate with other agencies, partners, and the private sector. And—important to this Committee and to me—the proposed structure would strengthen the world-class science for which NOAA is justly known. Without continued advances in the science that supports our mission, the utility of services will degrade with time. Hence, the success of this organization requires attention to strengthening our core science capacity, strengthening the service-provision capacity and strengthening the connections between the two.

NOAA is continually improving our scientific and technological capacity to develop and deliver a range of science and services. For example, NOAA's improved max-

imum precipitation predictions have been used to develop new standards for dam design that are being implemented around the Nation to improve dam safety and reliability. Similarly, through collaboration with the National Association of Home Builders and the Department of Housing and Urban Development, NOAA developed an Air Freezing Index that the home building industry estimates saves $300 million annually in construction costs and the equivalent of 9 million gallons of gasoline.

The budget-neutral realignment of resources within the current NOAA budget would not change staffing levels, would not require employee relocations, physical relocation of programs or labs, any new facilities, and would not increase the size of NOAA's overhead. The Climate Service headquarters would be located in Silver Spring, Maryland.

The NOAA Climate Service, if approved by Congress, would have a budget of $346.2 million. Of this amount, NOAA proposes $3.0 million to support the Regional Climate Centers (RCC) in FY 2012. This funding will maintain support for RCCs as critical NOAA partners in the development and delivery of regional climate services. The RCCs will be aligned with the six NOAA Climate Service Regions and fully integrated as core components of NOAA's regional climate services partnership. Each center will function as a source of expertise in the region, working to identify stakeholder needs and matching these needs with the emerging science and decision support services flowing from the Climate Service's core capabilities. For example, this work could improve products for farmers, who already rely on NOAA climate data, particularly in El Niño/Southern Oscillation years, to make smart decisions about what variety of seed to plant and the amount of fertilizer to use. These types of forecasts can potentially provide a $500–$960 million per year benefit to the U.S. agriculture industry.

National Weather Service (NWS)

NOAA's National Weather Service (NWS) is the Nation's first line of defense against severe weather. NOAA provides weather, hydrologic, and climate forecasts and warnings for the United States, its territories, and adjacent waters for the protection of life and property and the enhancement of the national economy. More sectors of the U.S. economy are recognizing the impacts of weather, water, and climate on their operations and are becoming more sophisticated at using weather-related information to make better decisions. The NWS provides critical information to communities and emergency managers. In 2010, the United States experienced a number of extreme weather events including the historic winter blizzards in the Northeast early in the year, historic flooding in the Midwest and Tennessee, and the third most active Atlantic hurricane season on record.

The FY 2012 request for NWS is $988 million. The request envisions using cost-cutting and cutting-edge technologies to better support the programs necessary to achieve NOAA's vision of delivering more reliable forecasts, reducing weather-related fatalities, and improving the economic value of weather, water, and climate information.

Weather-related air traffic delays cost the U.S. economy over $41 billion in 2007, according to the Congressional Joint Economic Committee. Two thirds of these delays could be avoided with more accurate and better-integrated weather information for decision-making. To meet the rising demands of the air transportation industry, NOAA is involved in a collaborative partnership with the Federal Aviation Administration (FAA) and other Federal agencies to create the Next Generation Air Transportation System (NextGen). NOAA requests a $26.9 million increase to modernize our aviation weather forecasts and warnings. This funding supports NextGen development activities, allowing for better integration of weather information into decision-making solutions for the FAA—potentially reducing the number of air delays.

Wind shear is hazardous to aviation and critical to hurricane formation and intensity. The Nation's upper air (UA) network enables unmatched ability to detect this wind shear and enables much improved ability to define the jet stream core by providing approximately 78,000 atmospheric profiles (wind, humidity, temperature, pressure and altitude) per year from ground level to up to 60,000 feet. To improve the UA network, NOAA requests a $5 million increase for new GPS radiosondes to provide a 50 percent improvement in wind measurement accuracy and a 6-fold improvement in vertical resolution. With this investment, NOAA will fully fund the purchase of GPS radiosondes for all 102 UA observing stations, ensuring improvements to weather models.

Large maritime data voids exist where no meteorological or oceanographic data are routinely sampled due to poorly maintained buoys. This lack of data makes it difficult for forecasters to make accurate and timely marine warnings and forecasts and to measure the accuracy of their forecasts. NOAA currently operates 101

moored weather observation buoys and 49 coastal marine automated network stations. However, over the last eight years, system performance has trended downward to the current low of 67 percent data availability as of February 2011. This trend will continue downward to 65 percent data availability by 2011 without increased support. NOAA requests a $4 million increase to provide operations and maintenance funding for damaged and destroyed buoys and to comply with new international regulations. Funds will also be used to begin reducing the backlog of deferred maintenance by employing charter vessels to supplement the diminishing availability of U.S. Coast Guard ship time for servicing the weather buoy network.

Finally, the underpinning of NOAA's products and services mentioned previously is the model-based guidance of NOAA's operational high performance computing (HPC). HPC provides models and model-based estimates of both current and future states of the Earth's environment, which are a key component of modern weather forecasts. NOAA requests an $11 million increase towards transitioning NOAA's HPC to a new contract, as well as continuing regular improvements to our numerical weather prediction modeling.

National Environmental Satellite Service (NESS)

NOAA's satellites provide the data and information for forecasts that are vital to every citizen in our Nation. From safe air, land, and marine transportation to construction and emergency rescue missions, we all use satellite products in our everyday lives. In FY 2010, our satellite program saw a major milestone accomplished with the launch of Geostationary Orbiting Environmental Satellite (GOES)–15, the final spacecraft in the latest series. GOES–15 joined three other GOES spacecraft in assisting the Agency's forecasters to more accurately track life-threatening weather from tornadoes, floods, and hurricanes to solar activity that can impact satellite-based electronics, communications, and power industries. In FY 2010, NOAA satellites also provided key support in the rescue of 281 people throughout and near the United States by providing their location to emergency responders.

The proposed reorganization would also affect some programs within the National Environmental Satellite, Data, and Information Service (NESDIS), which would be renamed the National Environmental Satellite Service (NESS), as all three of its Data Centers would be transferred to the Climate Service. The FY 2012 budget request for NESS is $2 billion, which we will invest in multiple satellite acquisition programs for the continuity of critical weather, climate, and oceanographic data. NOAA requests an increase of $687.8M for the Joint Polar Satellite System (JPSS), which is NOAA's responsibility under the former National Polar-orbiting Operational Environmental Satellite System (NPOESS) program. Polar satellites provide critical weather forecasting for the $700 billion maritime commerce sector and provide a value of hundreds of millions of dollars to the fishing industry. The satellites save approximately $200 million each year for the aviation industry in ash forecasting alone and provide drought forecasts worth $6–8 billion to farming, transportation, tourism and energy sectors. Both civilian and military users will use JPSS data and products, which will continue to fulfill NOAA's requirements to provide global environmental data used in numerical weather prediction models for forecasts. On behalf of NOAA, the National Aeronautics and Space Administration (NASA) will serve as the lead acquisition agent for JPSS, which supports the afternoon mission requirements. The Department of Defense will continue the acquisition of early morning orbit assets. NOAA is committed to working with our partners to complete the transition from the NPOESS program and to assure the continuity of Earth observations from space.

The GOES–R series satellites will provide critical weather observations for severe weather events, such as hurricanes, and also provide key enhancements in observational capabilities for climate, oceans and coasts, and the space environment. This program is the next-generation of geostationary satellites and provides mission continuity through 2036. NOAA continues to support the GOES–R program with a rephasing, taking us from a two-satellite program to a four-satellite program with the addition of two optional satellites (GOES–T&U), while still providing continued satellite engineering development and production activities for GOES–R and GOES–S.

An uninterrupted climate record is critical to understanding global sea level rise, which directly threatens coastal communities and ecosystems through increased exposure and erosion, more intense storm-surge and tidal flooding, and loss of natural habitat due to drowned wetlands. Therefore, NOAA is requesting an additional $33.0 million to continue development of the Jason-3 satellite, which will provide continuity of sea surface height measurements, ensuring an uninterrupted climate record of over 20 years. The Jason-3 mission is a joint U.S.–European funded partnership. NOAA requests an $11.3 million increase to partner with the Taiwan National Space Organization for the launch of 12 satellites to replenish and upgrade

the Constellation Observing System for Meteorology, Ionosphere, and Climate (COSMIC) satellite constellation. This program is a cost effective means of obtaining information about temperature and moisture in the atmosphere around the globe, which will improve forecasting accuracy.

In addition, a requested increase of $47.3 million will support, in cooperation with NASA, refurbishing the existing NASA Deep Space Climate Observatory (DSCOVR) satellite and its solar wind sensors and developing a Coronal Mass Ejection Imager. The data and information provided by DSCOVR will support the operations of the Space Weather Prediction Center, which generates accurate and timely 1 to 4 day space weather forecasts and warnings. Space observations of geomagnetic storms are vital to reduce negative effects to power grids, GPS, telecommunications, the health and safety of astronauts, and the viability of satellite systems.

Oceanic and Atmospheric Research (OAR)

The major change as a result of the proposed reorganization to create a Climate Service (described above) is that NOAA would also strategically realign its existing core research line office, the Office of Oceanic and Atmospheric Research (OAR), to strengthen the agency's overall science enterprise and advance the atmospheric and ocean, coastal, and Great Lakes research and applied science goals expressed in the *America COMPETES Reauthorization Act of 2010*. OAR will refocus its work to serve as an innovator and incubator of new science, technologies, and applications, and an integrator of science and technology across all of NOAA.

NOAA is committed to strengthening and integrating NOAA's science enterprise consistent with the President's call for science and innovation. NOAA's request includes $212 million for OAR to continue strengthening core capabilities, such as improving our understanding of ocean acidification and its impacts, and promoting conservation and use of America's coastal resources through our renowned Sea Grant Program, one of our many direct links to universities, citizens, and communities around the Nation. NOAA will also invest in the future by supporting innovation in weather forecasting science that can inform clean, renewable energy generation, which is related to an MOU with the Department of Energy. In FY 2012, NOAA requests $2 million to support research in targeted wind resource regions across the Nation. Funding will advance weather forecast accuracy and quality to allow for more efficient implementation of wind power usage in the United States.

Another core capability at NOAA is exploration. The NOAA Ship *Okeanos Explorer* is among the most technologically advanced research vessels and platforms for ocean exploration in the United States. In FY 2012, NOAA is requesting an additional $1.5 million to advance the operations of the *Okeanos Explorer* with the operation of telepresence technology, which enables scientists, educators, and others to participate and lead ocean exploration missions from remote shore-based Exploration Command Centers; to operate and upgrade the ship's autonomous and remotely-operated vehicles; provide additional scientific days at sea; and reduce our huge knowledge gap of what lies in the deep ocean.

National Marine Fisheries Service (NMFS)

NMFS conserves, protects, and manages living marine resources to sustain marine ecosystems, affords economic opportunities, and enhances the public's quality of life. Rebuilding our Nation's fisheries is essential to preserving the livelihoods of fishermen and related industries. In 2008, U.S. commercial and saltwater recreational fisheries supported 1.9 million full- and part-time jobs and generated $163 billion in sales impacts.[1] In FY 2012, NOAA requests $1.001 billion to support fisheries and protected resource management to ensure an optimal balance between conservation objectives and economic opportunities.

NOAA is making important strides to end overfishing, improve fishery management, and put fisheries on a path to sustainability. Working with the Regional Fishery Management Councils, in FY 2010, four fisheries stocks were rebuilt. Based on estimates, rebuilding U.S. fisheries would increase the current dockside value by an estimated $2.2 billion (54 percent) annually from $4.1 billion to $6.3 billion annually. In FY 2012, NOAA will continue to maximize the potential of the Nation's most economically important fish stocks through sound science and management. NOAA will invest $67 million to expand annual stock assessments to continue to ensure Annual Catch Limits (ACL) are based on the best available science. ACLs and accountability measures (AM) are required under the 2007 reauthorization of the *Magnuson–Stevens Fishery Conservation and Management Act* for all non-exempt

[1] Fisheries Economics of the United States, 2008: *http://www.st.nmfs.noaa.gov/st5/publication/fisheries_economics_2008.html*

fish stocks, including overfished stocks, by the end of 2011 to end overfishing. This investment will help verify that NOAA successfully ended overfishing ensuring ACLs are set at the most optimal level possible so that the return for fishermen is maximized while maintaining the health of the resource.

NOAA will invest $3 million to improve the timeliness and quality of catch monitoring in recreational fisheries to ensure recreational fisheries are not unnecessarily restricted due to a lack of data. This is part of a broader effort to work more closely with the recreational fishing community.

In addition to sound science, robust management strategies are vital to sustainable fisheries. In 2010, NOAA released the National Catch Share Policy, and we will continue to support consideration of catch share management by the Councils. Catch share programs, which include limited access privilege programs and individual fishing quotas, dedicate a secure share of fish to individual fishermen, cooperatives, or fishing communities. In the United States, catch shares are currently successfully implemented in 15 fisheries from Alaska to Florida, and local Fisheries Management Councils are in the process of developing them in several additional fisheries. Catch share programs are difficult and sometimes controversial to implement, and we recognize that some in Congress are concerned about them. But they have yielded significant financial and ecological benefits to the fisheries that utilize this system. Both here and in other countries, catch shares help to eliminate overfishing and achieve annual catch limits, improve fishermen's safety and profits, and reduce the negative biological and economic effects of the traditional "race for fish." This budget includes $54 million to support the voluntary establishment of catch share programs by those Councils that want to utilize this tool to achieve the *Magnuson–Stevens Act* requirements. We want to support those Councils that believe that catch shares are the way to better manage their fisheries but need assistance in designing and implementing them.

In addition to fisheries, NOAA manages protected resources, such as marine mammals and turtles. This requires balancing conservation objectives and economic opportunities, including commercial fishing activities and energy development. Investments in priority research in recovery actions are required to mitigate harm and maximize economic potential. In FY 2012, NOAA will invest an additional $2.5 million dollars to increase NOAA's capacity for protected species stock assessments that provide the foundation of information for decision makers. We will continue supporting the Species Recovery Grants Program with a requested $8.0 million increase to provide grants to states and tribes to conduct priority recovery actions for threatened and endangered species, including restoring habitat, monitoring population trends, developing conservation plans, and educating the public.

Managing fisheries and protected species to their full biological and economic potential requires additional efforts focused on maintaining habitat and ecosystem functioning. NOAA requests $24 million for the Community Based Restoration Program, including a new $5 million effort to address larger restoration projects. NOAA plans to increase fish passage, spawning, and rearing habitat by implementing large-scale ecological restoration in targeted areas such as wetlands. To support the restoration and protection of the Chesapeake Bay, we request a $5 million increase for regional studies in the Bay. NOAA supports the President's Executive Order to restore the Chesapeake Bay by providing enhanced understanding of the relationships between the Bay's living resources and habitat, coordinating protection and restoration of key species and habitats across jurisdictional lines, and supporting a coordinated system of monitoring platforms distributed across the Bay.

National Ocean Service (NOS)

In July 2010, President Obama signed Executive Order Number 13547 that adopted the Final Recommendations of the Interagency Ocean Policy Task Force and established the National Policy for the Stewardship of the Oceans, Coasts, and the Great Lakes—reinforcing the notion that "healthy oceans matter." NOS supports this policy by translating science, tools, and services into action to address coastal threats such as climate change, population growth, port congestion, and contaminants in the environment. A pivotal event in 2010 was the explosion of the BP Deepwater Horizon oil rig on April 20. Within hours, NOAA responded, providing targeted weather forecasts and oil spill trajectory maps and mobilizing personnel and assets to respond to what evolved into the largest oil spill in U.S. history. The Office of Response and Restoration (OR&R) played a critical role in our response and is leading our efforts to assess damage caused by the event. Over half of the

U.S. Gross Domestic Product is generated in coastal counties,[2] and it is expected that the Nation's coastal population will grow to more than 11 million by 2015 so NOS' services will become more vital to the coastal environment and economy.[3] Increasing population density, growing economies, and increased vulnerability to damages from hazards such as sea level rise or storms, habitat loss, and other threats makes the task of managing coastal resources more difficult. The President's FY 2012 Budget includes $559.6 million to enable NOAA to continue delivering a dynamic range of nationwide coastal and Great Lakes scientific, technical, and resource management services to meet the vision of being a Nation with safe, healthy, resilient, and productive oceans and coasts.

Human uses of ocean resources (e.g., ocean-based energy, marine aquaculture, commercial and recreational fishery products, shipping and navigation services, and other activities) need to be managed holistically. In FY 2012, NOAA requests $6.8 million to develop an agency-wide capability to conduct and support Coastal and Marine Spatial Planning (CMSP) in U.S. waters. CMSP will help us manage ocean resources in a systematic way by evaluating competing ocean uses, assessing opportunities and potential cumulative impacts, and working with industry, state and local decision makers and other stakeholders, to explicitly make trade-off decisions. CMSP is designed to focus on up front planning. There are no regulations involved. It does not add another layer of government but is designed to be more efficient, effective, and reduce redundancies in decision making. With the new Ocean Policy we are already witnessing efficiencies in our mapping and data collection across the Federal government, with data and information from the Departments of Defense and the Interior, and from Coast Guard, being integrated into a common database, which will be available to the public in the future.

The Final Recommendations of the Interagency Ocean Policy Task Force include a framework for implementing CMSP across the United States in a manner that respects regional variation of issues and priorities. This initiative will significantly advance the Nation's capability to effectively and transparently match competing human uses to appropriate ocean areas. To further support CMSP and regional ocean governance, NOAA requests $20 million to establish a competitive grants program that will support regional ocean partnerships, such as the Gulf of Mexico Alliance, South Atlantic Governor's Alliance, and the West Coast Governor's Agreement on Ocean Health that are vital for advancing effective ocean management. In addition, a proposed increase of $1 million in our mapping program will significantly improve the accessibility of integrated ocean and coastal mapping data.

The BP Deepwater Horizon oil spill is a stark reminder that spills of national significance can occur despite the many safeguards and improvements that have been put into place since the *Oil Pollution Act of 1990* was enacted. The risk of oil spills remains a concern given increases in marine transportation, pressures to develop domestic areas for drilling offshore, aging infrastructure susceptible to sea level rise and violent storms in U.S. coastal areas, and opening the Arctic to both shipping and oil development. NOAA's OR&R is the lead trustee for the public's coastal natural resources and an international scientific leader for oil spill response, assessment, and restoration. NOAA requests $2.9 million to develop an oil spill research and development program within OR&R to advance response technologies and capabilities, especially in deep water and Arctic environments. With this funding, NOAA will support external grants for essential research to provide useful information, methods, and tools for planners, oil spill responders, and assessment practitioners. Also in support of oil spill response, NOAA requests a $5.0 million increase to implement the U.S. Integrated Ocean Observing System (IOOS®) Surface Current Mapping Plan using high frequency (HF) radar surface current measurements. HF radar provides information vital to oil spill response, national defense, homeland security, search and rescue operations, safe marine transportation, water quality and pollutant tracking, and harmful algal bloom forecasting.

The BP Deepwater Horizon oil spill made it apparent that the economic and social well being of our coastal communities depends on the environmental suitability of our coastal resources. Numerous coastal communities, not only in the Gulf but all along our coasts, are being impacted by the loss of fishing opportunities. In FY 2012, NOAA requests $8 million to create a National Working Waterfronts grant program to assist fishing-dependent coastal communities. These grants will assist distressed or at-risk fishing communities by providing resources for planning, capacity building, and other activities to support economic diversity, resource conservation, and economic capital growth.

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[2] Kildow, J. T., C. S. Colgan, and J. Scorse. 2009. *State of the U.S. Ocean and Coastal Economies 2009*. National Ocean Economic Program.

[3] Population Trends Along the Coastal United States: 1980–2008, NOAA 2004

Program Support

To deliver sound science and services, NOAA must continue to invest in its information technology (IT) infrastructure, the maintenance and construction of NOAA facilities, and the specialized aircraft and ships that complete NOAA's environmental and scientific missions. A requested $9.1 million increase will reduce the risk of cyber attacks by enhancing security monitoring and response capabilities and consolidate our IT infrastructure into a single enterprise network. This budget includes an additional $10 million to support major restoration and modernization projects to address critical facility condition deficiencies and to improve safety and operating conditions in support of NOAA's mission. The FY 2012 request ensures that NOAA's fleet of vessels is able to provide reliable, compliant, and high-quality ship support to NOAA programs through several increases. For example, $3.4 million is requested to support environmental compliance costs, including ensuring that NOAA ships are not contributing to water quality degradation. Efforts to extend and maintain the life of the NOAA ships will be supported through an $11.6 million increase for repair periods.

Also critical to the execution of NOAA's mission is our investment in the future. Students in K–12 we support today become our workforce of the future; undergraduate and graduate fellowship recipients provide immediate dividends; and each and every citizen touched by our literacy and outreach efforts become stewards of our natural resources. These down payments help to fulfill the President's commitment to education. The FY 2012 budget includes $20.8 million for NOAA's Office of Education to implement and manage scholarship programs aimed at fostering competitiveness in science, technology, engineering and math by providing quality educational opportunities.

Conclusion

Overall, NOAA's FY 2012 budget request reflects the commitment that Secretary of Commerce Gary Locke and I have made to the President to out-educate, outbuild, and out-innovate our competitors in support of robust economic job growth. We have made tough choices to cut lower priorities and identify cost-savings measures. The resources that are requested in this budget are critical to the future success of meeting our needs in climate, fisheries, coasts, and oceans. I look forward to working with you, the Members of this Committee, and our constituents to achieve the goals I have laid out here through the implementation of the FY 2012 budget. Thank you for the opportunity to present NOAA's FY 2012 budget request. I am happy to respond to any questions the Committee might have.

Chairman HALL. Alright, thank you very much for your testimony. Again reminding committee rules that we stay within the five minutes.

Chair recognizes himself for five minutes for questions.

First, I would like to ask you, NOAA is requesting, I think, more than $2 billion for the National Environmental Satellite Service, but it is not all just for Joint Polar Satellite System or Geostationary Operation and Environmental Satellite, or better known as JPSS or GOES, arguably, NOAA's two highest priority systems. If you are prioritizing missions in this very difficult economy, why aren't you spending resources on JASON III, which is the satellite that measures sea level rise, climate change observation, while at the same time, warning Congress if we do not spend money on weather satellites there will be a data gap?

Dr. LUBCHENCO. Mr. Chairman, we believe that all of the satellite requests in this fiscal year 2012 budget request are highly important and very useful to the American public. JASON III is a satellite program that is joint with the Europeans, and therefore, saves the United States a considerable amount of money because we pool our resources. Giving communities along coastal regions information about sea level rise is vitally important to their planning for the future. This particular satellite system is essential in providing that high resolution information that enables communities to plan in a way that is smart planning.

Chairman HALL. I thank you for that answer, but you know that you can't have both. I know you need to prioritize within this economy, and we know we can't afford everything, so can't you prioritize it—and I ask you that question with your knowing how I feel about it. I think weather is by any reasonable person more important than sea level change. We can't have everything we want, and I know you want the best for the country, but can't you prioritize a little?

Dr. LUBCHENCO. Mr. Chairman, we have prioritized the items that are in the budget. There were a number of other very important satellite programs that were not included in this request, and so what we have reflected here is, in fact, a prioritization.

The Joint Polar Satellite System to which you refer is, without doubt, one of the most important satellite programs that we have. It is essential for us to be able to have the information it provides to do long-term forecasts, to predict severe storms such as hurricanes, to provide the search and rescue information that—to receive the beacons that search and rescue operations entail, and to provide weather information in general for Alaska. So it is an absolutely critical system. That doesn't mean that Jason is unimportant; it is important for a different reason.

Chairman HALL. I don't agree with your answer, but I respect you for not taking my full five minutes. I don't want you to filibuster me now.

I have another question I hope I can get in five minutes. As you may be aware, my amendment to the Continuing Resolution would prohibit NOAA from using funds to "implement a NOAA Climate Service". It passed 233 to 187 by the Congress formerly established in the House of Representatives, opposite position against a NOAA climate service in fiscal year 2011. You are aware of that, yes or no?

Dr.. LUBCHENCO. Yes, sir.

Chairman HALL. And in my statement on the House Floor, I argued that I was concerned that implementation of the climate service was already underway in the form of significant planning, transition and reorganization.

Can you give me a yes or no answer to that? Is that true?

Dr. LUBCHENCO. Mr. Chairman, before this administration began———

Chairman HALL. Can you give a yes or no to that?

Dr. LUBCHENCO. Planning began the last administration for a climate service, and planning continues, but we have not implemented a climate service because Congress has not approved.

Chairman HALL. Just to reiterate the assurances you wrote to me in a letter this January, "NOAA is not yet implementing the climate service." Is this correct?

Dr. LUBCHENCO. That is correct.

Chairman HALL. And the lines of reporting for daily operations of NOAA have not changed from the structure that was in place January 2010, is this correct?

Dr. LUBCHENCO. Yes, sir.

Chairman HALL. Last question. NOAA will wait for congressional approval before implementing any such climate service. Is this a yes?

Dr. LUBCHENCO. Yes, sir, it is. Absolutely.

Chairman HALL. I thank you. I have eight seconds left. That is just enough time for me to recognize Mrs. Johnson. I thank you for your answers.

Dr. LUBCHENCO. Thank you, Mr. Chairman.

Ms. JOHNSON. Satellite coverage is essential for us to monitor Earth, forecast weather, and protect lives and property. You know, I fly back and forth home just about every weekend, as many other Members here do, and very often, we depend on the forecast to determine whether we can—have to change our plans or go later or land somewhere that is not home. I am wondering—I was told by Mr. Bolden that these satellites were getting rather old, and that while we can't predict the life of them, they are far beyond what had been predicted. And so I am wondering now about the development of the next generation of this polar-orbiting weather satellite.

GAO has indicated that JPSS has an inadequate funding plan, and I am concerned that both the Continuing Resolution made over the fiscal year 2011 budget, and the House passed H.R. 1 will lead to new costs growth and schedule delays that will set the program back even further.

What impact is the 2011 Continuing Resolution budget having on your ability to making progress to keep us safe?

Dr. LUBCHENCO. Congresswoman, thank you so much for asking about the Joint Polar Satellite System. It is a vitally important tool that we have that provides essential information to do a number of things. This program is vital to the American public in many different ways. It is essential—these polar orbiting satellites are essential for our ability to predict severe storms. If we want to be—our ability today to provide a hurricane forecast that are as accurate as they are today with two to three day advance warning are a direct result of the information that we get from the polar orbiting satellites. So too is the information from those satellites to provide long-term weather forecasts. The short-term weather information that we have comes from different satellites, the ones we call geostationary. But the polar orbiting satellite of which we're speaking now is essential for the long-term forecasts, and that is very, very important for the military in making decisions about troop deployments or refueling planes in air. It is also essential for farmers deciding what crops to plant, or when.

So both severe storm warnings and the long-term forecasts depend on these polar orbiting satellites.

Also very important to many individuals, especially mariners, is the ability of these satellites to receive signals from emergency distress beacons. Without this satellite system, we would probably at least double the response time for search and rescue missions, and obviously in an emergency, a matter of minutes is often critically important, and so doubling your response time is certainly problematic.

So for all of those reasons, the polar orbiting satellite system is critically important. We currently need, in this fiscal year, in fiscal year 2011, $910 million to keep this program underway. That is not an insignificant amount. I fully appreciate what a large number that is, but the consequences of not having it are very severe. For every dollar that we do not spend this year on this program,

it will cost us $3 to $5 in the future to build this program back up. If we don't have those resources this year, we terminate contracts, we lose people that have the expertise, and the consequences of that will not be pretty.

Ms. JOHNSON. Thank you very much. My time is about expired. Thank you, Mr. Chairman.

Chairman HALL. Thank you very much. Recognize the gentleman, long time Member of this Committee, very valuable member, Mr. Rohrabacher from California.

Mr. ROHRABACHER. Thank you very much, Mr. Chairman, and let me note that my very first job when I was a go-for in the news business was to read the following into a machine when I arrived in the morning, five o'clock the morning at the news bureau. "Good morning. This is the National Weather Service forecast for Los Angeles and vicinity. Today, the high will be at Civic Center 75 degrees. Low expected tonight at 62. Coastal Orange County, high as well will be 72 degrees, a low of 65—" et cetera, et cetera, et cetera. I appreciated that job, and———

Chairman HALL. Do we have a new reading—another reading of that?

Mr. ROHRABACHER. Well, I thought—I was very proud to give the National Weather Service forecast, and that was very important news, actually. We got all kinds of hits on that—it was a telephone service—and thousands and thousands of people called in every day from Los Angeles to get their weather. I would hope that what you are doing now in your restructuring of NOAA, so that you now have a climate service, that that does not distract from the important work that your organization has been doing in terms of weather.

So I guess maybe what I should ask is will this change of name and structure into the Climate Service—will it in any way distract from the resources? Will you then be transferring resources from weather to spending those resources on things like a human adaptation for the change in climate that may take centuries in order to see that change?

Dr. LUBCHENCO. Congressman Rohrabacher, thank you for highlighting how important the National Weather Service is. It is vitally important to save lives and property, and it is widely recognized as being so. The 122 weather forecast offices we have around the Nation will be delighted to— have heard— your rendition and to recognize their importance. The budget request for the National Weather Service for this year increases the number of very important areas that are essential for the investments in fundamental science that enable us to continue to get better and better at our forecasts. In fact, we have seen significant improvements in our forecasts, but there is ample room for more, and this budget requests a number of items to advance that agenda.

Aviation weather, which is vitally important, is—we have an increase targeted for that for operation and maintenance of our weather buoys that give us vital information about what is happening over the ocean. For weather and climate, super computers. I would highlight those three areas where there are———

Mr. ROHRABACHER. How much money would you expect—all these things I support. That is great. We all do. They are very sig-

nificant to the jobs and well-being of Americans. But when you get to the idea of predicting the climate so that you will have adaptation—and of course, my reading of that is that we are talking about ocean rise, which may take a century or 2 centuries for us to see it. Where is the money coming—how much is being spent on adaptation versus weather, and where is the money coming from if it is not coming from what you were doing in weather?

Dr. LUBCHENCO. Congressman, the creation of the climate service—the proposed creation of the climate service entails an internal reorganization that does not change the basic functions of the different offices that they are currently executing. It puts those offices together in a way that they can be more effective in delivering the kind of—not just short-term, 10-day weather, but longer term weather information that is properly called climate, but that is actually months to years out.

For example, you know that this is a La Nina year, and therefore, we can analyze past La Nina years and———

Mr. ROHRABACHER. Right.

Dr. LUBCHENCO. —predict that under these circumstances, we know that this will be—you know, we can tell you something about precipitation for southern California.

Mr. ROHRABACHER. And that is very important to a lot of people, especially in California. Let us hope that with that type of service that you provide so well now, isn't undercut by some of the more trendy frou-frou things like we have seen—I won't go into detail, but we have seen that here. So thank you very much.

Chairman HALL. Thank you. Gentleman's time is expired. Now I recognize Mr. Miller, the gentleman from North Carolina, the ranking member on Energy and Environment, for five minutes.

Mr. MILLER. Thank you, Mr. Chairman.

Dr. Lubchenco, one of the certainly difficult tasks that the Administration faced is dealing with an oil spill that wasn't supposed to happen, and in some ways the administration equated itself well, and in others, less well. But could you please explain how you are going to work with other agencies to monitor and understand what the effect of the oil has been in the long term? We have heard a lot about how well it is being dispersed, how it is being absorbed, degrading, whatever. What is the plan going forward?

Dr. LUBCHENCO. Congressman, part of NOAA's responsibilities with respect to not only Deepwater Horizon spill, but other oil spills, is to participate actively in the process that is known as the Natural Resource Damage Assessment Process, or NRDA. This is a legal, scientific, and economic process that is done in conjunction with the federal trustees of which NOAA and the Department of Commerce, the Department of Interior, Department of Defense, are the three federal trustees, and there are five state trustees. Those trustees work collectively together to evaluate the impact that the spill had on natural resources in the Gulf, and the public's loss to those natural resources, and build a court case to take, if necessary, to court in order to get the resources to do restoration. NOAA is providing much of the scientific underpinnings for that evaluation of the damage that was done because of the spill to these natural resources and the public's loss to them. That is a process that is well under way. Some damages are very easy to see,

oiled birds, oiled turtles or dolphins. Others are much more difficult to measure directly, impacts of small droplets of oil on fish eggs or fish larvae, for example, or crabs or shrimp.

And so this is a process that necessarily needs to take the appropriate amount of time. We are conducting multiple research expeditions on ship as well as very considerable activities on the shore, and have been pretty much since the beginning of the spill, in order to evaluate the damage that was done.

Mr. MILLER. Dr. Lubchenco, unlike Mr. Rohrabacher, I have never depended for my livelihood on your weather products, but I recognize their importance. Could you tell us how what you do in weather forecasting or weather generally is going to be affected by the proposed cuts that were included by H.R. 1, the continuing resolution that the House passed a few weeks ago?

Dr. LUBCHENCO. Congressman Miller, I don't—the cuts—it is difficult to say the exact consequences of H.R. 1 on specific programs, because we don't have that fine-tuned information. What I can tell you is that it is likely to be very devastating to our ability to continue to provide the kind of weather information that Americans depend upon to save lives, to save property.

The cuts are of a nature that there would be significant hits throughout NOAA's programs, and we have very grave concerns about exactly what those would look like.

Mr. MILLER. Okay. You distinguished in your testimony between climate and weather. Can you tell us how weather forecasting really fits in with climate forecasting, and is it important that we have climate predictions and why?

Dr. LUBCHENCO. Congressman, there really is a continuum between weather and climate. I think Mark Twain famously said that climate is what you expect and weather is what you get. And in fact, it really is a continuum. The ways that scientists go about making predictions and forecasts about either weather or climate entail different types of models. Weather forecasting models are fundamentally different from climate forecasting models. The weather models are very short-term. They are initialized with current immediate conditions. They take into account changes in the atmosphere, they are happening now, and look out a number of days to a week or so. So we have 7- to 10-day forecasts. Those are different types of models from climate models, which are farther out, so 15 days and farther out are a different type of model, which is why we say, you know, distinguish between climate and weather.

Both are vitally important and one of the major research challenges now is to bring those models together so that we have better resolution of what is happening in the near—not just the short-term, but the medium scale that has been very, very difficult because of the need to merge those models. Both are very, very important.

We are getting absolutely inundated with requests for information that is months to years to decades out, not centuries, but people want to plan and know what—water managers, for example, or city planners or farmers are trying to evaluate what should they plan for for next year or for the next year, and it is that type of information where we see a huge opportunity to provide what we call climate services that will help in that type of planning.

Mr. MILLER. Thank you.

Chairman HALL. At this time, recognize Congressman Bartlett, the gentleman from Maryland.

Mr. BARTLETT. Thank you very much. As you know, there is an indisputable fact that atmospheric CO_2 is rising. Nobody disagrees on that. The facts are in considerable dispute. The number of people that believe that because CO_2 is a greenhouse gas that it will warm the Earth, absent other causes, this will cause short-term climate changes and acidification of the ocean. Climate changes could be disruptive. The acidification of the ocean could be catastrophic in the long run. Ultimately, if we really do get warmer, the sea levels will rise.

There are a number of people who think this is all a bunch of hooey, and they keep criticizing us, but I want to point out that there are two other constituencies that have common cause in wanting exactly the same solution that the folks who are concerned about CO_2 footprint want, and that is to move away from fossil fuels to renewables, because it reduces CO_2 released into the atmosphere. One of those other groups are those who are concerned about national security. We have only two percent of the world's oil. We use 25 percent of the world's oil. We import two-thirds of what we use. The obvious solution to that is exactly the same solution that those people have who are concerned about CO_2 increase and climate change and so forth. It is to move away from fossil fuels to renewables.

The third group that has common cause with this are those who understand, as Hymen Rickover did more than 50 years ago that oil is finite. It will run out. The world almost certainly has now reached what we call peak oil, that is, its maximum ability to produce oil. It is about 84, 85 million barrels a day. We are stuck there which is why our economy is in trouble. It is not going to rise. The solution to that problem obviously is to move away from fossil fuels to renewables so that the fossil fuels will last us longer and we will have an energy for our activities now.

I hope that these three groups will stop sniping at each other's premise and lock arms and march forward, because although they have three very different agendas, they have exactly the same solution to these very different problems.

Now for a question. I am on the Armed Services Committee, and obviously we have an enormous interest in climate and weather as we plan. What are you doing to make sure that your efforts are collaborative and you don't have duplicative efforts with the Department of Defense for weather?

Dr. LUBCHENCO. Congressman, we work very closely with the Department of Defense, and in particular, with the Navy on a number of—in a number of different ways. Those include both oceanographic information, weather information, and climate information on all of those fronts. We have active exchanges of information and we—as far as I know, there is no duplication of information. It is nicely complimentary. We keep them informed of what we are doing, they keep us informed, at least to some extent, to what they are doing, and there are a number of venues in which—that exist to keep that flow of information going.

We know from what the Navy in particular, but DoD more generally, have told us is that what we provide to them is essential for their planning purposes, both short-term as well as long-term.

I had the pleasure of visiting the aircraft carrier, the Harry S. Truman, about a year and a half ago now, and was amazed when I walked around inside, the room that had all of the equipment to give them state-of-the-art information about what the conditions were when they were running war game exercises, and a vast number of the computers in the room were showing NOAA information, whether it was oceanographic models that they were running or weather information or whatever, nautical charts. And so we clearly have, even at the scale of a ship, a very tight collaboration and interaction. I think it is a very productive exchange. They are very concerned about this Joint Polar Satellite System and the potential loss of that system to our ability to provide the long-term weather forecast for them that are very important in making decisions about troop deployments, for example.

So although I am sure there is always room for improvement in terms of interactions, I think we have a very productive interaction and exchange with the Department of Defense, but I would highlight the Navy in particular.

Mr. BARTLETT. Thank you, and I yield back.

Chairman HALL. Thank you. Chair now recognizes the gentleman from California, Mr. McNerney.

Mr. MCNERNEY. Thank you, Mr. Chairman. Thank you, Dr. Lubchenco, for coming here this morning.

One of the things that I am concerned about is the reliability—the long-term reliability and the short-term reliability of the existing satellites, and how important this program is to making sure that we have reliable information.

I hope I am not beating a dead horse, but could you comment on that?

Dr. LUBCHENCO. Congressman, are you referring specifically to the Joint Polar Satellite System, or satellites in general?

Mr. MCNERNEY. No, the Joint Polar Satellite System.

Dr. LUBCHENCO. There currently are polar satellites that are in space now that provide—there is one satellite that provides us with much of the information I described earlier that is absolutely essential for severe weather forecasts, for long-term weather forecasts, for search and rescue, and for weather in Alaska. These satellites orbit the poles and give us a very different type of information from a different type of satellite system, which are geostationary satellites.

Those geostationary satellites, there is one that sits pretty much over the East Coast and sees the eastern half of the country, there is one that sits over the West Coast, and they stay in place and constantly see the same place. They are very high up. The polar orbiting satellites orbit at a much lower orbit, and are essential to tracking what is coming across the Pacific, for example, or following storms as they are developing. POES,the current satellite that is up there will not—it has a finite life span, and this Joint Polar Satellite System is to build the satellite and the instruments to replace that satellite when it is no longer functional.

The current C.R. has already resulted in a delay in that program of around 12 months. Additional delays because of lack of resources will delay that program even further. What that means is that down the road, we will inevitably have a gap where we will not have the ability to do severe storm warnings as we do today.

Mr. MCNERNEY. So you are saying that this is inevitable at this point, that we will absolutely have a gap because of the longevity of the current polar satellites?

Dr. LUBCHENCO. It is highly likely we will have a gap, and the longer we wait, the longer that gap gets. If you consider that for each dollar that we don't spend this year on this program, it will cost $3 to $5 to bring that program up. Even those additional resources will not close that gap, so there is great urgency in addressing this problem.

Mr. MCNERNEY. Thank you. Another thing I would like to ask is about the need for a federal clearinghouse for climate data. What I would like to see is a lack of overlap or lack of duplication in that regard. Do you see NOAA becoming a key player or a key—a central player in terms of providing data to federal agencies and other agencies that are interested in climate data?

Dr. LUBCHENCO. Congressman, we currently serve that function. We house much of the climate data and make it all publicly available. We routinely do peer reviews and quality checks to ensure that it is of the highest quality. We share that information very broadly.

Last year, we reorganized the information that is available through our website to create a more user-friendly way to access all the data and information that we have that concerns climate. There is ample opportunity to improve in that regard, and we will continue to do that, and the requests in the current budget are in part designed to help move that ahead.

Mr. MCNERNEY. Has there been any criticism of the objectivity of that data or the accuracy of that data?

Dr. LUBCHENCO. Every investigation of those programs has concluded that it is very well run, that the data are trustworthy. They are, in fact, widely considered to be the gold standard.

Mr. MCNERNEY. Thank you, my time is up. I yield back.

Chairman HALL. Chair recognizes gentleman from Maryland, Dr. Harris.

Mr. HARRIS. Thank you very much. Thank you, Dr. Lubchenco, for coming before the Committee.

I have four questions I am going to ask.

First is when I look at the chart of the request, the fiscal year 2012 request is about 35 percent more than the fiscal year 2008 request, is that right? Fiscal year 2008 is $4.07 billion, fiscal year 2012 is $5.49 billion.

Dr. LUBCHENCO. That is correct.

Mr. HARRIS. Okay. So it is—so what you are asking for is the American people, at a time when everybody is tightening their belt, we are tightening everybody's belt, you want 35 percent more, okay? And I will go through the justifications in your testimony.

Let me talk a little bit about some of that spending, because one of it goes to a satellite called Discover, which in my understanding is going to spend tens of millions of dollars to put an 11-year-old

satellite bus. You know, you got to put new sensors on it, but you know, technology—why would we choose that path, spending tens of millions of dollars to refurbish an 11-year-old satellite bus instead of doing what I understand is available, which is letting a private company launch the same sensors and just buy the information? I mean, why are we doing something that a private company can do?

Dr. LUBCHENCO. Congressman, the Discover satellite has been essentially kept in good shape, and the analyses that we did suggest this is the most cost-effective way to get critically important information, by refurbishing it and then flying it.

Mr. HARRIS. Can you provide me a copy of that analysis?

Dr. LUBCHENCO. Yes, sir.

Mr. HARRIS. Specifically versus going to a private———

Dr. LUBCHENCO. Yes, sir.

Mr. HARRIS. Okay, thank you very much.

Let me go on to one other issue—two other issues that regard the fisheries. One is this idea of catch shares, because I think there is, again, tens of millions of dollars going into establishing catch shares. My understanding in talking with fishermen in Maryland, we have fishermen both in the bay and in the ocean, that one of the results has been to force smaller fishermen basically out of business. They just put them out of business. They can't afford to buy the catch shares to make a living that they would have to otherwise, so they end up selling them to larger corporations, literally corporations who then go and just hire fishermen to catch. So we are kind of putting the—I hate to say mom and pop fishermen, but mom and pop fishermen kind of out of business as small business owners. Is that, in fact, what does occur? I don't say all the time, but is that occurring? Is that what we have been observing to occur where we have established catch shares?

Dr. LUBCHENCO. Congressman, thanks for raising that issue because I think it is a common misconception about catch shares. Any particular catch share program depends on the way it is designed, and much of our focus now is helping to ensure that they are designed in a way that reflects the wishes of the fishermen in the area, and I think there is broad recognition that preventing consolidation is highly desirable. We are very strong champions of and believe that we need a diverse fleet, and that the small boat fishermen are a vital component of that.

Mr. HARRIS. But my question is, is that—has that been observed, the fact that the smaller boat fishermen, in fact, are driven out of the business as primary owners? I mean, they may end up working for one of these corporations that hold the catch share licenses, but is that—you know, I met with a group who were put out of business in the scallops fishery off the Maryland coast. You know, I sat across the table from him so I know it exists. I mean, what is the experience nationally, though? Does that occur? Is that one of the things that has occurred? I know you are concerned in minimizing it, but is that———

Dr. LUBCHENCO. In some catch share programs that were not well-designed there have been individuals who have not been allocated a share. I think it is important to realize that fishermen don't have to buy a share. They are given a share that is based on their

past fishing history. But the rules of design for a catch-chare problem are determined by the fishery management councils on which fishermen sit, and so they have the opportunity———

Mr. HARRIS. I understand some fishermen sit on it. I understand that, and again, it just kind of politicizes what is going on in the private sector.

Finally, there is a request for a $5 million increase for regional studies in the Chesapeake Bay. Are these grants? Who are going to get these? And second one is, you know, it says we are going to understand the relationship between some of the things that have to do with cleaning up the bay and the next panel will have someone—I am going to ask specifically about TMDL's, but don't you do the research before you establish the policies? I mean, what are we studying here with this $5 million and who is that money going to?

Dr. LUBCHENCO. Congressman, I frankly don't recall that specific program and I would be happy to get that information to you. I know that we collaborate closely with other agencies as part of a larger focus on the Chesapeake, but I will get you information on exactly what our request is.

Mr. HARRIS. Thank you. In light of the GAO study that reports on multiple duplications, I would love to see that, and I thank you, Mr. Chair.

Chairman HALL. Thank you. At this time I recognize the gentleman from Oregon, Mr. Wu.

Mr. WU. Thank you, Mr. Chairman, and I would also like to thank the gentlelady from Maryland for her courtesy in permitting me to ask a couple of questions, and also then fit in a few constituent meetings.

Dr. Lubchenco, thank you for your service to our Nation. We in the Pacific Northwest are very proud of your service. We followed your career earlier at Oregon State. It is a fine academic background, and we are very proud of your national service now.

In particular, I would like to comment that in my studies of the catch share program, my fishermen are generally in favor of implementing a catch share program and I would like to thank you, and I would like to thank Secretary Locke for making some adjustments so that our catch share program in the Pacific Northwest can be implemented sooner, which is what my fishermen would prefer to have happen.

Secondly, with respect to this satellite program that has been the subject of some discussion, I would just like to insert in the record that as the former chair of the Subcommittee with jurisdiction over that satellite program, I have developed more knowledge of that satellite program than I had ever hoped—even as someone who is very interested in satellites, that most importantly, this is a program that has had a track record in three administrations. Not one, not two, but three administrations, a good half of the Clinton administration, all of the Bush administration for eight years, and now a little bit of run time in the Obama administration. While I have not agreed with all of the judgments made by each of the three administrations, I believe that the data from that satellite is necessary to establish some data independence from nations which may or may not always share data with us, but we hope that it is

a sharing program and that data would permit us to participate in that sharing.

I would like to ask you, Dr. Lubchenco, about a specific budget item in the NOAA budget, and that is that the NOAA budget has a specific proposal to create a structure for the NOAA Climate Service, and that this structure involves creating a new line office by performing a programmatic reorganization of existing resources. One of the primary line offices that is proposed to transfer over there is the Research and Program Resources from the Oceanic and Atmospheric Research Office, or OAR, and OAR is the research enterprise of NOAA's basic and innovative research. This is very, very important.

Dr. Lubchenco, how do you plan to balance the need to provide climate services based on good climate research, balancing that with the need to ensure OAR does not lose its current basic and innovative science-driven research?

Dr. LUBCHENCO. Congressman Wu, it is nice to see you. Thank you very much for your nice comments. The Catch Share Program in the West Coast was seven years in the making and has really benefited from considerable input by fishermen up and down the West Coast for this—the ground fish ITQ, and I am very pleased that it has the support that it has, and that the fishermen are telling you that they are pleased with it. I too have met with them a lot, and they are saying we can finally see the light at the end of the tunnel, and we are anxious to get underway with this program.

You mentioned the Joint Polar Satellite System, which obviously is very, very high priority for us. We—Secretary Locke and I heard you and other Members of Congress loudly and clearly when we first came in, and you said this is a flawed program, fix it. And I am very proud of actions that we have taken with the White House to put this program on a path to success. What is critical now is that we have the funding to be able to deliver on this new path, and I appreciate your attention to it, because you recognize how vital it is.

On your question with respect to the climate service, this is indeed an internal reorganization that is proposed. It would not change the research that anyone at NOAA is doing. It simply makes the research and services pieces be more tightly connected, so that they can be more effective in providing climate information, by way of services and data, to the American public. It does not undermine research at NOAA. That is a high priority of mine, to strengthen scientific research, and I pledge to do everything I can to continue to have research be very strong in every line office. But we are looking to the Office of Oceanic and Atmospheric Research to be the leader in innovation and integration of research. Thank you.

Chairman HALL. Gentleman's time has expired. At this time recognize Mrs. Adams, gentlelady from Florida.

Mrs. ADAMS. Thank you, Mr. Chair, and thank you, Dr. Lubchenco.

Before I get started, I want to also reiterate what my colleague said about Catch Share. My fishermen too are concerned about that, and they have brought it to my attention, and I have met

with several of them. They are worried about being put out of business by larger groups, and along that line, I would like to talk to you for a moment about an issue which is an incredibly urgent matter, and it is something that I find very troubling. You are probably aware of—in July of '08 your agency issued a letter to the South Atlantic Fishery Management Council that the South Atlantic red snapper stock is overfished and undergoing overfishing. This is a massive problem for the State of Florida. The decision is costing thousands of jobs in Florida, and again, it is about jobs in the economy, and throughout the country, and will potentially decimate a $13 billion industry. I have heard from fishermen in my district, and across the state, that NOAA's efforts to manage the fish populations are hurting fishermen in the name of incorrect and insufficient science—scientific data.

Now, I was there at one of the meetings, and heard one of your people, one of your representatives, say that it was flawed. As recently as February 17, Roy Crabtree, the Southeast Regional Administrator for NOAA's Fishery Service said, "The latest science suggests that the planned area closure is not necessary for the red snapper population to continue to improve." NOAA website says, "NOAA is an agency that enriches life through science." Could you explain what science you are using to enrich the lives of fishermen in Florida with these rules to help—halt fishing red snapper, and beyond that, how are you even able to pay for this science when in your own budget request you are decreasing the amount of money being spent on the research?

Dr. LUBCHENCO. Congresswoman, the fisheries, especially for the red snapper to which you refer, are vitally important ones. I fully appreciate how important they are to the economy, not only of Florida, but to the region generally. We are required by the Magnus and Stevens Reauthorization Act to use the best available information to make our determinations about the status of different stocks, and to set catch limits accordingly.

Mrs. ADAMS. Can you please be very succinct? Because I have more questions, and I do want some answers. But your own people are saying your data is flawed. So if your data is flawed, and they recognize it, why are you implementing it without further research? Just quickly, shortly.

Dr. LUBCHENCO. Congresswoman, the initial determination was based on information that was available. New information became available that is more current, and said that the closure is no longer needed. And so we are doing exactly what we have been told by Congress to do, which is to update decisions based on new information when it becomes available, and that is exactly what we have done.

Mrs. ADAMS. So are you going to halt the closures?

Dr. LUBCHENCO. Yes. It is no longer needed because we have new information, and we have announced that.

Mrs. ADAMS. Okay. I had another question. I am trying to get back to it. There is just so much to ask in so little time. There was something in your testimony a few—I think it was last year's testimony, I am trying to get to it, about the acidification of the ocean, and I can't find it now, so I guess I will wait, and I will come back around when we have more questions.

Chairman HALL. Are you finished? Okay. Thank you. Chair recognizes the gentle lady from Maryland, Mrs. Edwards.

Ms. EDWARDS. Thank you, Mr. Chairman, and thank you, Dr. Lubcheco. It is good to see you again, and I just want to let you know how much we really do appreciate all of the work of the fine Federal workers———

Dr. LUBCHENCO. Thank you.

Ms. EDWARDS. —at NOAA, and the work that they do for us. I want to ask you for a minute, again, about the impact of some of the—both—some of the budget considerations that are floating all around Capitol Hill, and particularly the continuing resolution that passed out of the House. And I know we are—continue to work on that, but I wonder if you could share with us what it would mean in real terms, in terms of staffing, for NOAA, some of the budget cuts that are projected for the agency. And can you confirm that you would have to absorb the severe cuts that are planned in the budget with personnel actions like furloughs?

Dr. LUBCHENCO. Congresswoman, thank you for recognizing our Federal workers. We greatly value our folks at NOAA and know what a spectacular job they do day in and day out. Because we are about halfway through this fiscal year, the longer we go without having clarity about what our budget is, the more challenging it is to make adjustments for the remaining part of the year.

It is premature to say exactly what those consequences to Federal workers will be. Obviously there are—lots of speculation, and even that speculation is very challenging to workers who have great uncertainty about what is down the road for them. So the uncertainty itself is problematic. But because—we are in the process of doing various scenarios, various planning, as are all agencies, but it is hard to be specific until we know exactly what the bottom line is and, you know, what the specific constraints are. I can tell you that it is looking like it would be very, very significant, very serious.

Ms. EDWARDS. I mean, the reality is it wouldn't be—I mean, you can't very well cut programs. I mean, obviously we need to continue things like the weather service and other services, and so that only leaves people. But that is just my conclusion. I want to ask you, you know, about the end of this fiscal year, as we are entering hurricane season, even today, in this region we are, you know, I pulled up my notice from the weather service that tells us that I had better be on the lookout for floods in my neighborhood, and in neighborhoods all throughout this region. Those are things that we couldn't know if we didn't have the weather service, if we didn't have NOAA. It is certainly—those are certainly things that we couldn't know if we didn't have satellite coverage.

And so can you describe for us what some of these—the longer term implications are of these budget considerations when it comes to leaving a gap? I mean, my understanding is that, with the cuts that are being proposed, there is potential for a 100 percent gap in satellite coverage over the long term. And what that means to agriculture, to commerce, to moving goods all around the—this country is pretty—energy, pretty significant. And so I wonder if you could describe from your testimony, when we vote to cut fund-

ing for NOAA, we are essentially voting to expose people to risk. Their lives, their businesses, their property and all the rest.

Dr. LUBCHENCO. Congresswoman, the bread and butter services that we provide to Americans each and every day depend on those satellite systems. They depend on the Federal workers. They depend on the other observing systems, whether they be buoys or anything else, and those are very much at risk with some of the budget cuts that are being discussed. The kinds, the quality of weather forecasts that people take for granted today, we would not have that should there—should we not have funding for this Joint Polar Satellite System. There would inevitably be a gap. You cannot close that gap with more money, and we would not have severe storm warnings. We would not have maritime forecasts for shipping. We would not have long term weather forecasts. Search and rescue times would be increased very significantly. Each and every one of those is a problem. All of them together would be very, very significant impact.

Ms. EDWARDS. Thank you very much. And I will just close, and I—again, I want to really say thank you very much for the work that NOAA does. It is incredibly important to our lives, to our economy, to all of our communities. And I hope that, in Congress, we actually recognize the danger and the jeopardy that we put in peoples' lives and their businesses and their communities when we willy-nilly cut the important science investigation, research, personnel and programs of the—of NOAA. So thank you. Thank you, Mr. Chairman.

Chairman HALL. Chair recognizes the vice-chair of this Committee, Mr. Sensenbrenner.

Mr. SENSENBRENNER. Thank you very much, Mr. Chairman. Dr. Lubchenco, at a December 2, 2009 hearing on "The Administration's view on the state of climate science" before the former House Select Committee on Energy Independence and Global Warming, Representative Inslee asked you if there was anything about the CRU e-mails that affect ocean acidification at all. You replied, "Congressman, I haven't read all of the e-mails, but I have seen nothing in them in those that I have read about ocean acidification. It is really not an area that is something that that particular research group was focused on."

Your response to Mr. Inslee indicated that you had read at least some of the e-mails, yet on page nine of the enclosure to the DOE Inspector General response, it is stated, "Dr. Lubchenco told us she could not be sure whether she had seen any of the CRU e-mails or received a briefing from her staff on the results of NOAA's CRU e-mail review prior to testifying before the House Select Committee." Now, can you please explain this apparent discrepancy? Had you or had you not read any of the CRU e-mails prior to December 2, 2009 hearing?

Dr. LUBCHENCO. Congressman, to the best of my knowledge, I had read some of them, but certainly not all of them.

Mr. SENSENBRENNER. Then why did you tell Mr. Inslee one thing and the Inspector General another?

Dr. LUBCHENCO. When I was responding to the Inspector General's staff, I said I could not recall if I had read them or not.

Mr. SENSENBRENNER. Well, the thing says "Dr. Lubchenco told us she could not be sure whether she had seen any of the CRU e-mails or received a briefing". Now, I think you—what you have said is consistent, but the fact that there was doubt about this issue, doesn't that indicate that you really weren't concerned about the Climategate scandal that the e-mails exposed?

Dr. LUBCHENCO. I was concerned about the Climategate e-mails, but they—there were a large, large number of e-mails involved, and I simply did not have time, or think it appropriate for me to take time, to sit down and read through each and every one.

Mr. SENSENBRENNER. Well, why not? Because if the e-mails were correct, it indicated that the fix was on to come up with a certain conclusion on what the science of global warming was, to the exclusion of scientists that had contrary views.

Dr. LUBCHENCO. Congressman, as I think you are aware, every single investigation has indicated that there was no manipulation of the climate information or the climate———

Mr. SENSENBRENNER. Well———

Dr. LUBCHENCO. —data.

Mr. SENSENBRENNER. —that depends upon how the investigations were put together. You know, certainly the e-mails indicated that, when there was a suggestion that people be fired in scientific journal—from scientific journal editorial boards, that whenever there was a contrary viewpoint, the people on the other side, you know, basically denigrated the scientific credentials of those who came up with that. And none of those internal investigations actually did the type of peer review that is needed for those of us who are not scientists to be able to reach a conclusion.

Now, you know, it seems to me that what you have just testified to indicates a very callous lack of concern over the consequences of what the e-mails said, because apparently folks, and I am not sure whether you were one of them or not, had already decided the fact that the e-mails were to be, you know, completely denigrated and not even look for an investigation. Now, you know, maybe all this came out of a White House science advisor's office, because when he was at MIT his name was on those e-mails. I don't think you have really blown away the cloud of doubt on it, and I thank you for your answer, and yield back the balance of my time.

Chairman HALL. Thank the gentleman. Recognize Mrs. Fudge, gentlelady from Ohio, five minutes.

Ms. FUDGE. I have no questions, Mr. Chairman, thank you.

Chairman HALL. Chair recognizes Mr. Smith, the Chairman of Judiciary, for five minutes.

Mr. SMITH. Thank you, Mr. Chairman. Dr. Lubchenco, I would like to address my first question to you, and it is related to the BP Deepwater Horizon oil budget report of last year. You are on record, and individuals in your office are on record, as not wanting to distinguish between oil that was dispersed chemically and oil that was dispersed naturally. And I have to say to you that a lot of people feel that that was an intentional effort to give the Administration more credit than maybe they deserve by blurring the lines between those two different kinds of dispersals. Can you—you are welcome to respond to that, but I think any reasonable person would say that if you are trying to blur the distinctions between

the two, that is going to give the Administration more credit, rather than being scientifically accurate.

Dr. LUBCHENCO. Congressman, I completely agree with you that it is important to distinguish between oil that was chemically or naturally dispersed, and, in fact, NOAA is on record for continuing to want to do that, and the oil budget report that was released, in fact, did make a distinction between those two types of———

Mr. SMITH. Right, but aren't you on record in e-mails with your Deputy Administrator as opposing distinguishing the two, or you are not?

Dr. LUBCHENCO. No, sir.

Mr. SMITH. Okay.

Dr. LUBCHENCO. The two processes by which that happen are very different———

Mr. SMITH. Right.

Dr. LUBCHENCO. —and it is important—oil that was shooting out of the Macondo well——— is naturally dispersed because of the physical turbulence that is right where it is coming out. And use of chemical dispersants———

Mr. SMITH. Right.

Dr. LUBCHENCO. —also broke up oil into small microscopic droplets———

Mr. SMITH. Um-hum.

Dr. LUBCHENCO. —and we believed it was very important to distinguish what oil—what fraction of oil came from naturally versus chemically dispersed, and, in fact, that is what was in the report, both the initial report that was released on August 4, as well as———

Mr. SMITH. Right.

Dr. LUBCHENCO. —the much more lengthy technical documents that provided all the background information. That went into even greater detail when it was released in November.

Mr. SMITH. What percentage was chemically dispersed and what percentage was naturally dispersed?

Dr. LUBCHENCO. The final report indicated—our initial estimates were that eight percent was chemically dispersed. That was later revised upward, with more information, to 16 percent of the total amount of oil that was spilled. The 4.9 billion—million barrels, plus or minus ten percent, 16 percent of that was chemically dispersed.

Mr. SMITH. All the government efforts were responsible for 16 percent of the dispersal, and the rest was natural? 84 percent natural?

Dr. LUBCHENCO. I am sorry, around one-quarter of the—all of the oil that was spilled was dispersed. Of that———

Mr. SMITH. Right.

Dr. LUBCHENCO. So 16 percent of 100 percent was chemically dispersed. So of—this—I am sorry, this is confusing.

Mr. SMITH. No, no, I———

Dr. LUBCHENCO. Of the quarter—of the total that was dispersed———

Mr. SMITH. Right.

Dr. LUBCHENCO. —more was dispersed chemically than naturally. And I can give you the precise numbers, if that would be useful to you.

Mr. SMITH. Okay. Appreciate that. Thank you. Thank you———

Dr. LUBCHENCO. Thank you.

Mr. SMITH. —Mr. Chairman.

Chairman HALL. All right. Mr. Sarbanes, my gosh, I am glad to see you. Recognize you for 12 or 15 minutes, whatever you need.

Mr. SARBANES. Thank you, Mr. Chairman. I am going to wait until the next panel, but I do understand from my staff that you were thinking of having me nominated for the Nobel Prize for patience, which my children, particularly my two teenage sons, would have great amusement at hearing. So—but I will not be———

Chairman HALL. It would be a lot better than a bunch of them that have been recognized. So I thank you, Dr. Lubchenco, for your testimony, and I thank the Members for their questions. I thank you for hanging so close to the five minute deal. Members of the Committee may have additional questions, Dr. Lubchenco, and we will ask you to respond to those in writing. The record will remain open for two weeks for additional comments from Members. And you are excused, and we will move to our next panel, and we thank you for your very valuable time.

Dr. LUBCHENCO. Thank you, Chairman Hall, and Members of the Committee. I greatly appreciate your attention to our budget.

Chairman HALL. Okay. We will move now to our second panelist, Dr. Anastas from EPA, and I welcome you, Dr. Anastas. Prior to his services as Assistant Administrator, Dr. Anastas was the Director of the Center for Green Chemistry and Green Engineering at Yale University. He was Chief of the Industrial Chemistry Branch and EPA's Office of Prevention, Pesticides and Toxic Substances.

This is also the third time you have appeared before the Committee, and I am pleased that you could be here, and I thank you for being here. As our witness should know, spoken testimony is limited to five minutes, after which the Members of the Committee will have five minutes each to ask questions. And we ask you to do your best, but your importance tells us that we will have some leeway there if you want to finish answering a question. But try and stay as close to five minutes as you can. I think if I were you, I would want to answer them and then wind it all up. How about—who is next here? Dr. Anastas, we recognize you now for your first five minutes.

STATEMENT OF DR. PAUL ANASTAS, ASSISTANT ADMINISTRATOR, OFFICE OF RESEARCH AND DEVELOPMENT (ORD), U.S. ENVIRONMENTAL PROTECTION AGENCY

Dr. ANASTAS. Thank you very much, and good morning, Chairman Hall, Ranking Member Johnson, and the Members of the Committee. My name is Paul Anastas. I am the Assistant Administrator for the Office of Research and Development at the U.S. Environmental Protection Agency, and the science advisor for the agency. I am a trained synthetic organic chemist from Brandeis University, and prior to my current position, I was on the faculty at Yale University and the Director of the Center for Green Chemistry and Green Engineering at Yale. It is a pleasure to be with you here this morning to discuss the President's fiscal year 2012 budget for the Office of Research and Development at the EPA. As the Members of this Committee know, the EPA is not only a regulatory agency,

EPA is a science agency. I am happy to discuss the excellent science that is taking place at the EPA.

As millions of Americans are cutting back and spending less, they expect the same good fiscal sense out of their government. The EPA research and development budget reflects this responsibility and the hard choices needed to support both the fiscal health of our nation and the research needed to protect the health of the American people and the environment. EPA research is unique. In the environmental science community we conduct both intramural and extramural research that spans across the entire spectrum of scientific disciplines in support of EPA's mission. And while there are other agencies that focus on environmental issues and other agencies that focus on public health, the EPA is the agency, and the Federal government deals with both human and environmental health, and the intersection of these two areas.

The President's 2012 budget includes $584 million for the Office of Research and Development, a decrease of $12.6 million. While this decreased budget reflects the tough choices that are needed in today's fiscal climate, it allows the EPA to continue conducting the research and development necessary to protect all Americans. We will continue to address complex environmental challenges of the 21st century by pursuing the latest science with the most cutting edge research tools available. We will focus on efforts to understand the environmental threats we face and on the innovative approaches that promote synergy between human health and environmental protection that catalyze economic growth.

With the 2012 budget, ORD will do more with less. We will work to strengthen the planning and delivery of our science by realigning our research programs so that they are integrated and transdisciplinary. This strategic internal realignment will help us conduct the best possible science to address today's transdisciplinary environmental challenges. EPA will also enhance its outreach to the research community through its Science and Technology to Achieve Results Program, the STAR Program. This investment compliments our internal EPA expertise by tapping into the expertise of academia and engaging the broader scientific community. Excellent research that, I may add, is taking place in most of the districts of the Members of this Committee.

The 2012 budget request also supports high priority research areas that are of national importance. For example, the budget supports work on computational toxicology, an area that is revolutionizing the way that we assess chemicals and their potential toxicity to humans and the environment. Computational toxicological tools can help us get critical information more efficiently and at a lower cost. The budget also supports research in the field of green chemistry, an area focused on the design of chemicals that are environmentally benign and less hazardous to people. Green chemistry practices have demonstrated co-benefits in both environmental protection and economic growth.

The 2012 budget includes a focus on innovative aging water technologies to address the nation's drinking water infrastructure. Through collaborations with strategic partners, both large and small business, universities and local governments, we will work to develop new cost-effective drinking water strategies.

STEM fellowships in science, technology, engineering and math are also the focus of the 2012 budget. We recognize the importance of teaching, mentoring, and encouraging the next generation of scientists and engineers who will protect our environment into the future. Our STAR Fellowships Program will help ensure maximum intellectual capability and creativity are applied to today's environmental challenges. And finally, the 2012 budget supports air monitoring research, which is critical to the development of 21st century technologies that can improve measurement data and address emerging air quality questions.

To conclude, I believe EPA has a strong tradition of excellence in science. Today our expertise and capabilities leave us well positioned to take environmental protection to an even greater level of effectiveness, even during this time of tough fiscal choices. For decades we have worked to protect human health and the environment by reducing air pollution, reducing water contaminants, and by cleaning up hazardous waste sites. In 2012 and beyond we have the opportunity to align our research in ways that can strengthen this legacy. Thank you for the opportunity to appear before you today, Chairman Hall.

[The prepared statement of Mr. Anastas follows:]

PREPARED STATEMENT BY DR. PAUL ANASTAS, ASSISTANT ADMINISTRATOR, OFFICE OF RESEARCH AND DEVELOPMENT (ORD), U.S. ENVIRONMENTAL PROTECTION AGENCY

Good morning Chairman Hall, Ranking Member Johnson, and other Members of the Committee. My name is Paul Anastas. I am the Assistant Administrator for Research and Development at the United States Environmental Protection Agency. It is a pleasure to be here with you this morning to discuss EPA's FY 2012 President's Budget for the Office of Research and Development (ORD).

As millions of families are cutting back and spending less, they expect the same good fiscal sense out of their government. The EPA research and development budget reflects the hard choices needed for our nation's short- and long-term fiscal health, while at the same time allowing us to maintain critical research needed to protect public health and the environment.

ORD is unique in the environmental science community because we conduct intramural and extramural research across the entire spectrum of disciplines necessary to support the mission of EPA. In addition to the cutting edge science that we have traditionally pursued, we will invest in research on innovative technologies and promote synergies between environmental protection, public health protection and the pursuits of economic growth and job production. As science advances, EPA is working to address the increasing complexity of the 21st century.

The President's 2012 Budget includes $584 million for EPA's Office of Research and Development, a decrease of $12.6 million from the FY 2010 enacted budget, to support research and innovation into new and emerging environmental science. With this investment, we will focus on enhancing and strengthening the planning and delivery of science by restructuring our research and development programs to be more integrated and cross-disciplinary. By strategic internal redirections, EPA will enhance its outreach to the broader scientific community through its Science to Achieve Results (STAR) program, which funds competitive research grants across a broad range of environmental science and engineering disciplines. This investment will bring innovative and sustainable solutions to environmental science challenges by engaging the academic research community. This request also supports high-priority research of national importance in such areas as:

- Computational Toxicology, which is revolutionizing how chemicals are assessed for potential toxicity to humans and the environment by conducting innovative research that integrates advances in molecular biology, chemistry and innovative computer science to more effectively and efficiently prioritize chemicals, including potential endocrine disruptors, based on risks.
- Green chemistry to develop innovative approaches and tools that inform the design of chemicals throughout their life cycle.

- Innovative drinking water technology to address the Nation's aging water infrastructure by advancing new technologies and working with strategic partners to help bring new cost-effective technologies to the market.
- Science, Technology, Engineering and Mathematics (STEM) fellowships to focus the best scientific minds in the environmental field to focus on our hardest problems and develop the next generation of scientists and engineers that will provide the solutions to our Nation's environmental challenges
- Air monitoring research to provide 21st century technologies to improve measurement data to address emerging air quality questions.

Conclusion

In conclusion, we have a strong tradition of excellence in science at EPA-one that we are well positioned to build upon to take environmental protection to the next level. For decades, we have protected human health and the environment by reducing air pollutants and water contaminants, cleaning up hazardous waste sites, and many other significant actions. In 2012 and beyond, we have the opportunity to strengthen this legacy.

I look forward to working with the Committee to address current and emerging environmental problems that will help our Agency protect the environment and human health. Thank you for the opportunity to appear before you today.

Chairman HALL. Thank you for your testimony. Reminding Members that committee rules limit questioning to five minutes, the Chairman at this point will open the round of questions, and I recognize myself for five minutes.

Doctor, your office has released a draft study plan to investigate the relationship between hydraulic fracturing and drinking water, right?

Dr. ANASTAS. Correct.

Chairman HALL. I am concerned about the scope, design, and objectivity of this study. I understand that the EPA Science Advisory Board is hearing from stakeholders this week regarding similar concerns.

Dr. ANASTAS. True? The Science Advisory Board is reviewing the study plan this week.

Chairman HALL. Can you commit to me that you will give strong and thorough consideration to all stakeholder comments filed on this study, and that you will proceed with it in an objective and transparent manner?

Dr. ANASTAS. We always will take———

Chairman HALL. This is not what you always do. Will you tell me you are going to do that this time?

Dr. ANASTAS. As always, we will———

Chairman HALL. Yes. Do you know how to say yes———

Dr. ANASTAS. I do.

Chairman HALL. —to me?

Dr. ANASTAS. As a matter of fact———

Chairman HALL. You never have.

Dr. ANASTAS. —end of my sentence.

Chairman HALL. Okay. All right. I understand that this study is expected to take a couple of years. Will you also commit to providing opportunities for public and stakeholder input, including from State regulators, industry and academic community on study activities after it has been initiated? Yes or no?

Dr. ANASTAS. Yes, we—yes.

Chairman HALL. Okay. All right. I will get to the next question. It will be much easier, probably, than that one. How will the proposed study take into account whether current State and Federal

regulations are capable of effectively managing and addressing drinking water issues related to the hydraulic fracturing? Right now it seems to me that you are ignoring State regulations.

Dr. ANASTAS. Chairman Hall, this is such an important topic. Let me just say one important thing about it. We do not presuppose the results of a study before it is completed. This is a study to understand what the potential impacts are, and it would be inappropriate and unscientific in order to presuppose what the results of that study is going to be. This is to determine whether or not there are impacts from this important area.

Chairman HALL. Well, if potential concerns are not examined in the context of current rules and practices, how is the study going to have any value in terms of informing key decision makers, like the States?

Dr. ANASTAS. Key decision makers are going to be involved, engaged, in this—have been engaged and will continue to be engaged in the formation of the study design, and as we go forward with it. But this is a research study that we are not presupposing the outcomes of the potential impacts, if any, on this important area.

Chairman HALL. A lot of your planned study focuses on the possible impacts of hydraulic fracturing———

Dr. ANASTAS. Correct.

Chairman HALL. —with very little focus on the probability of those impacts occurring if current State level regulations are followed. With a million wells hydraulically fractured, and over half a century of history, how do you justify not incorporating well established risk assessment and characterization methodologies into this study in order for decision makers to quantify and better respond to any risks that are identified?

Dr. ANASTAS. It would be impossible to calculate the probability of an event happening if we don't first determine whether or not a risk—whether or not an event, an impact, actually can happen. So while I understand the nature of your question, it is a follow up consideration after we determine if there are potential impacts.

Chairman HALL. I recognize Mrs. Johnson for her five minutes.

Ms. JOHNSON. Thank you very much. Dr. Anastas, I am a native Texan. We are a stubborn group, and we don't care too much about what people think, but I want to applaud your office for looking out for our future. The Office of Research and Development budget request highlights the Administration's goal to strengthen the future scientific work force by increasing funding for fellowships to students through Science and Technology to Achieve Results. That is the STAR grant, and the fellowship program. How is the Office of Research and Development leveraging the work of STAR grantees to make progress on the agency's research priorities, and what impact would the House passed 2011 funding bill have on your research programs, and which programs would be terminated or severely crippled?

Dr. ANASTAS. Well, thank you very much for recognizing the important role that our STAR fellowship program and our STAR grants program plays. It is critical to complement the excellence and the expertise in the Office of Research and Development by tapping into the expertise in the broader scientific community. And that is research, as I mentioned in my opening statement, taking

place in the universities and research institutes in the districts of many of all of you.

In addition, the STAR fellows are our investment in the next generation of scientists. These fellows, which go through a very competitive process in order to get these fellowships, often become environmental professionals at universities, at the State level, and yes, even at the EPA, and so it is an extremely important role that they play. I would just say that, while we recognize that the proposed budget cuts are broad and severe, it is difficult, with the level of detail currently, to know exactly which programs would be curtailed or need to be eliminated. But it—it is important that, when we look at the foundation, the scientific foundation of how we protect our air, water, and land, that the proposed budget allows us to continue that important research, and some of the cuts being proposed would be—would severely impact that.

Ms. JOHNSON. Now comes the question that reflects on where I am from. The Administration's budget request highlights the Sustainable and Healthy Communities Research Program, which develops innovative approaches to help communities increase their environmental sustainability and resilience more efficiently and effectively. How will EPA ensure that lower income communities are able to participate in this program?

Dr. ANASTAS. One of the things that has been seen over the past years is that the impacts on low income communities are disproportionate to the population in general. There is study after study that shows that this is an important consideration. And what we need is the scientific basis for understanding, not just assessing the risk chemical by chemical, but the cumulative impacts on these disproportionately impacted communities from a variety of chemicals, a variety of different substances.

And so one of the things that this budget includes, and one of the priorities of this Administrator, is focusing on environmental justice in disproportionally impacted communities. So what that looks at is the new scientific tools. As a matter of fact, this past year we held a groundbreaking symposium on the basic research, the basic scientific tools, around environmental justice, and are in the process of developing those types of technical guidance documents for the models, the tools, the scientific tools that are necessary for these types of analyses.

Ms. JOHNSON. Thank you very much. My time is about over.

Chairman HALL. The gentlelady yields back and I recognize the gentleman from California, Mr. Rohrabacher.

Mr. ROHRABACHER. Thank you very much, Mr. Chairman. I am sorry, I have had to run back and forth today between two very significant hearings, and so I will hope that the questions I have in mind are not repetitive of some of the points you may have made in your opening statement, but I will be reading your opening statement in its total this afternoon.

I would like to ask about the EPA's finding of CO_2 essay, a pollutant, and thus a danger to human health. This is something that many of us are deeply concerned about, because we find that to be, at least after looking at the justification of that, to be a stretching of the definition of human health to the point that it opens up broad new areas of controls over peoples' lives than what people

really believe does—what human health was all about, and—originally.

That report—the technical support document in backing up that report relied heavily on the intergovernmental panel on climate change. In fact, 50 percent of the sources on this support document either were directly from the IPCC or relied on the IPCC. Do you think that you can rely that much on people—scientists that are not necessarily familiar to you personally to do something as dramatic as claiming the powers that then flow from this decision?

Dr. ANASTAS. The technical support document that you refer to does rely on a number of sources. Certainly relies on the reports out of the National Academies and the National Resource Council of this———

Mr. ROHRABACHER. Um-hum.

Dr. ANASTAS. —country, the—several studies from the National Academies.

Mr. ROHRABACHER. And some of the National Academy studies rely—if you read them, rely on the IPCC research that was then given to them.

Dr. ANASTAS. There are both original, as well as———

Mr. ROHRABACHER. Okay.

Dr. ANASTAS. —assessments in synthesis. There are also the studies from the U.S. Global Change Research Program, as well as the IPCC.

Mr. ROHRABACHER. Okay. Well—let me put it this way. After the disclosure of the Climategate e-mails, many of which talked about suppressing dissent, many of which talked about manipulating graphs, and as we know, one important graph by Mr. Hansen over at NASA eliminated an entire—what they call a hockey stick, an entire description of the mini-Ice Age and ended up saying that there wasn't a mini-Ice Age. With all of that—the shenanigans that were indicated by these e-mails, you still think that we can rely upon people who suppress dissent, manipulate graphs and actually limit—and manipulate computer input?

Dr. ANASTAS. I think it is always important to ask the kind of questions that you are asking, Congressman. What I think we have seen is the—whether it is reviews from universities, whether it is reviews from—even the House of Commons in the UK, that investigation after investigation on whether any of these concerns have changed the science or the scientific conclusions, the answer is definitively no. But I can't say it better than the National Academies said it this past year, and I will quote, "A strong credible body of scientific evidence shows that climate change is occurring is caused largely by human activities and poses significant risks for a broad range of human and natural systems."

Mr. ROHRABACHER. And that climate change is something that now the EPA has expanded a definition of human health to include climate change. Mr. Chairman, I would, at this point, like to submit for the record a list of 10 quotes from the EPA Climategate documents, the e-mails that were made public that indicate that those involved in—the research centers being depended upon were engaged in manipulation of information, of suppressing dissent, and other unscientific activities.

Chairman HALL. Without objection, they are admitted.

[The appears in Appendix II:]

Mr. ROHRABACHER. Thank you very much, Mr. Chairman, and I appreciate this chance to get a chance to talk to you.

Chairman HALL. Chair now recognizes the gentleman from California, Mr. Miller.

Mr. MILLER. I have never been confused—have you listened to the way I talk? You think I am from———

Chairman HALL. I have suffered from the way you talk.

Mr. MILLER. I would have thought you would have been comforted by the way I talk.

Chairman HALL. But you are a great lawyer. I want to hear from you.

Mr. MILLER. Thank you. Thank you, Mr. Chairman. I am Miller of North Carolina. One of the issues that this Committee and the Oversight Subcommittee has looked at in the last few years has been the clusters of rare cancers in rural areas, the clusters of rare birth defects in lightly populated areas, that has to have been caused by the environmental exposure. There really is no other explanation, but it is very difficult to tell exactly what it is that led to it. The EPA has had for some time now the IRIS Program, the———

Dr. ANASTAS. Yes.

Mr. MILLER. —registry of chemicals that are considered to have a public health effect, or may have a public health effect. The risk assessment for those, which has come under great criticism, although there are thousands—at least hundreds, certainly, and perhaps thousands of new chemicals entering the market every year, IRIS has really done—produced two or three new assessments a year. And the GAO has had the IRIS Program on the high risk watch for programs that simply are failing, and the apparent reason is the interference with the White House Office of Management and Budget. OMB is specifically—OIRA, the Office of Regulatory———

Dr. ANASTAS. Information and Regulatory Affairs.

Mr. MILLER. There you go, what you said. And we have been promised reform of that, and what is the status of that reform? Were you—or what steps are you taking to get IRIS off the high risk watch list? What are you doing to make sure that there is not political interference by OMB, by OIRA, by industry or by the agencies that themselves use chemicals that have public health consequences?

Dr. ANASTAS. First of all, thank you very much for the question, and the chance to address this topic, because it is—it goes to the core of the scientific integrity that this President and this Administrator insists upon. The IRIS program is extremely important and was on the high risk watch list because of its importance and because of necessary changes that needed to take place. The changes that have taken place are a reformed IRIS process that Administrator Jackson put in place in May of 2009.

Since that time, the number of IRIS assessments that have been produced exceeds the number of assessments from the previous four years combined. We made significant investments in fiscal year 2009 to the base of that program, an increase of 25 percent in personnel and 40 percent of the budget back in 2009. Because

of those—the reforms of the process, because of the reforms of the—and the advancements made, we believe that IRIS is on the right path to being a—to being the type of solid program that we can all be proud of. But we agree that a program of this importance, it is appropriate to have the level of scrutiny that the GAO is saying to keep it on the high risk list.

Mr. MILLER. Thank you. Mr. Chairman, Mr. Rohrabacher moved into the record, without objection, quotes regarding the e-mails from East Anglia. Those have been examined closely by several scientific bodies. The British House of Commons had an inquiry that produced a report that found that there was overwhelming scientific evidence of anthropogenic, in other words, man caused, human caused climate change, and cleared the—or University of East Anglia. That was by scientists. In addition, there was a Penn State inquiry as well that found the same thing. I do not have those reports with me, but I can gather them pretty quickly, and I would like to move those into the record as well.

Chairman HALL. You don't have anything from Libya?

Mr. MILLER. I did not understand you, sir.

Chairman HALL. I say, without objection, they will be admitted.

[The appears in Appendix II:]

Mr. MILLER. Okay. Thank you. I am sorry, I do have one, which I will provide now, and I will provide the other later.

Chairman HALL. Okay. I thank you. Now we recognize Dr. Harris from Maryland.

Mr. HARRIS. Thank you very much, Mr. Chairman, and thank you, Doctor, for appearing for us. I have to tell you, I don't always listen word for word for what—our wonderful Chairman when he introduces witnesses, but he did use that word organic chemist in there. And to a physician who went through pre-med, it still strikes fear in our hearts. Anyway—so congratulations, being an organic chemist. Anyone who has been there will know what I am talking about.

Doctor, you know, you mentioned—I am going to follow up from the gentleman from California. You know, you gave the quote there that said, well, you know, there are going to be significant impacts, but you and I both know what significant means, to a scientist means P less than .05 at any amount, okay?

And we are going to get into TMDLs in a second, but with regards to CO_2—see, that is the problem. I mean, look, I know that the temperature is increasing, and I know that CO_2 probably has a little bit to do with it. The question is, can we make a significant—have a significant effect by spending trillions of dollars doing it? So that—in my mind, that is the question. It is not whether there—we could significantly affect it. Sure, we probably can. We can probably make that much change, or that—I don't know, and it is all based on modeling.

I am going to segue into TMDLs, the total maximum daily loads out of tributaries, very important to the Chesapeake Bay. I just need to know, did your office have anything to do with developing the modeling for TMDLs?

Dr. ANASTAS. The Office of Research and Development works very closely with the Office of Water in developing underlying

science. It is the Office of Water that then is involved with the determinature of the———

Mr. HARRIS. Thank you. So let me get into that, because you say the underlying science, but my understanding is that the Chesapeake Bay Watershed model—and, look, I have done scientific research. My understanding of science is you go out, you make some observations, and you collect data from a group of observations, and you comment on those observations, and then postulate about the possible meaning of those observations.

This Chesapeake Bay Watershed model is a computer model. I mean, it is modeling, and most people who know computers know you can kind of program it to get whatever results you kind of want. So it is based on—I mean, I think that is true. That is what my kids tell me. It is—so what you have got is you have got a model based on urban point sources that then have to have something called the scenario builder application applied to it to actually go and to look at agricultural non-point sources, and then come up with a justification for TMDLs.

Now, I am just going to ask you do we have any evidence, real evidence, in any water shed anywhere that implementing a TMDL regulation of this magnitude, because this will cost tens of billions of dollars in the Chesapeake Bay Watershed. I have one county alone, $1.87 billion in that county. They would have to double or triple their property taxes to pay for it. Similar to the CO_2 speculation—I will call it speculation because we really don't know what that curve looks like, except we do know it is flatter than postulated originally.

Given that speculation, are we, you know, how do you call that science if what you are doing is you are creating a computer model that doesn't work on real data and has no real data, in terms of efficacy, to prove that it is worth the investment of tens of billions of dollars? I mean, is this really just based on a computer model?

Dr. ANASTAS. Thank you very much for the question, Dr. Harris. This is an important point. The Office of Research and Development plays an important role in looking at what the different contaminants are, what the different substances are that might cause adverse consequence to the environment, to the ecosystem, et cetera. The modeling that you discuss is something employed by the Office of Water in making regulatory determinations.

I will suggest, just as a general comment on modeling, that validation of models is an essential and important part of the utilization of any model. And so, when we take a look at this model that is being used by the Office of Water to make these determinations, certainly sensitivity analysis modeling validation is crucial. And one of the other, I think, very important points to make is some of the basic research that is being developed is how do we look at the various approaches, for instance, in the Chesapeake Bay, of comparing the traditional—what is called gray infrastructure, or constructed facilities, to help purify the water with green infrastructure, the natural ways that the ecosystem does it, and———

Mr. HARRIS. Sure. I understand, Doctor, and I just don't—I only have three seconds left, so I am just going to ask, is there validation, and could you share that validation? Is it based on real obser-

vations, and if it is, could you—are you willing to share that with my office, what conclusions you came up with, or validations?

Dr. ANASTAS. I will be more than happy to go and take that question back to the Office of Water and get that information.

Mr. HARRIS. Thank you very much. I yield back, Mr. Chairman.

Chairman HALL. Thank you, Doctor. Now recognize the gentleman really from California, Mr. McNerney.

Mr. MCNERNEY. Well, thank you, Mr. Chairman. I was wondering if you were going to say I was from North Carolina, I appreciate that you didn't. Anyway, I have some very direct questions here.

How do you think the continuing resolution that was passed would affect the agency's ability to prevent another Love Canal or similar type of occurrence?

Dr. ANASTAS. The role of the Office of Research and Development is to provide the scientific basis for the actions that are taken, the scientific basis for the decisions that are made. So we know that, in general, the types of cuts that are being proposed would significantly impair the ability of our research programs on air, water, land, but it is difficult, with the current level of specificity, to know exactly which would be impacted at this time.

Mr. MCNERNEY. Well, one of the complaints that the majority has about the Environmental Protection Agency is that it will cost jobs, but I think that that is a false choice. We can have jobs, and we can have clean air, and we can have clean water. In fact, we have to have clean air and clean water to have jobs. So—and also, I think there is an effect that many jobs were created because of the Clean Air Act. Could you comment on that?

Dr. ANASTAS. It is an excellent point, because we have heard this discussion about the tradeoff between jobs and that, and we know we are all concerned about job growth, especially at this time. When we take a look at the accomplishments that have taken place since the founding of the EPA, the dramatic improvements to air quality, the purification of the water at the same time that our gross domestic product has increased 207 percent over that time. When we take a look at the study required by the Congress on the effect of the Clean Air Act that you mentioned, that—the Clean Air Act would result in $2 trillion of benefits over the course of the life of the—since the passing of the Clean Air Act amendments, and a 30 to one return on the cost of those regulations. That is dramatically—that is a dramatic return on return on investment.

Mr. MCNERNEY. Well, that is certainly dramatic. Another thing is that the, again, the CR's effect on the EPA's ability to promote stem education, science, technology, engineering, mathematics. Would this discourage students from getting into those fields, this kind of a CR, and also does it drive current practitioners out of the fields—of those fields?

Dr. ANASTAS. Our STEM fellowships are one of the real gems that we are very proud about. It allows students to be involved in this area, and it is extremely competitive. We are able, because of the popularity of this particular program, to only fund a small percentage of those students who apply for it. But those students who compete successfully are the cream of the crop, true excellence, and

are the vanguard of the scientists who will inform the environmental protection into the future.

Mr. MCNERNEY. So—I mean, it sounds to me like the majority party is willing to risk our ability to protect our communities from toxic waste, the—they are willing to risk the creation of new jobs, and they are willing to put—or prevent scientists from going into the field, and all because of a few—not a few, but many misguided e-mails sent by a few scientists in East Anglia. Thank you. That is the last of my question.

Chairman HALL. I thank you. At this time we will recognize Mrs. Adams, the gentlelady from Florida, who will be given some excess time. She didn't get all of her answers last time, but we recognize you for five or five d a half minutes, or something like that.

Mrs. ADAMS. Thank you, Mr. Chair.

Well, quite honestly, I have just been listening, and I heard you say it was 31—30 to one return.

Dr. ANASTAS. Yes.

Mrs. ADAMS. Do you have what those 30 are? I mean, can you provide that to—my office?

Dr. ANASTAS. Oh, would be happy to. As a matter of fact, this is a report that is required by Congress to be put out on the effectiveness and the costs and the benefits of the Clean Air Act. Would be happy to provide that, and what the number is in the Clean Air Act amendments, which are largely known to be among the most expensive regulations that the EPA puts out, also have the highest return, as I mentioned, $30 in benefits for every $1.

Mrs. ADAMS. Correct, but I—as a new Member, I would love to see that, if you———

Dr. ANASTAS. Be—-

Mrs. ADAMS. —get it to my office.

Dr. ANASTAS. —happy———

Mrs. ADAMS. You know, I was listening to Congressman Smith, and when he was asking about the Deepwater oil spill, and I am sure you heard the discussion that was being had. And one of the things that—the Doctor said something about—she mentioned this Gulf seafood and everything else, and there has been some discussion on whether it is safe to eat, whether it is not safe to eat. It has been ruled that it is safe to eat, but listening to discussion this morning, I wondered if the American people that were listening were wondering if that was now true, based on her comments.

But I noticed that there has been, you know, there has been crossover between agencies, and—related to the August 4 Deepwater Horizon budget report, titled "What Happened To The Oil?" An e-mail from EPA Deputy Administrator Bob—I———

Dr. ANASTAS. Perciasepe.

Mrs. ADAMS. There you go. Summarizes comments made by you, Al Venosa and Greg Williams, opposing the idea of distinguishing between oil that is in the ocean naturally or dispersed via—versus the chemical dispersions—I will say Bob, not real good with his last name, states, "The physically dispersed versus chemically dispersed has a logical basis. However, that is different from saying it is accurate." He also stated, "EPA feels that the evidence is currently not sufficient to enable us to distinguish accurately chemical from physical dispersence mechanisms." And, you know, blurring the

lines between, as Mr. Moore said, what was chemically dispersed and what was naturally dispersed. Do you believe the Administration, and specifically the Administrator that just was here before you, was trying to give the information that the Federal response was greater than it was actually needed?

And I just want to note something. There was an e-mail to Bob from her that said, "Chemically dispersed is part of the Federal response, and naturally dispersed is not, and there is an interest in being able to sum up the Federal response efforts."

Dr. ANASTAS. So—thank you for the opportunity to speak to this important question. Couple of things. One, NOAA took on the very difficult scientific question of estimating the current state at the time of where the oil was going, and the natural scientific discussions about the approaches were an important discussion. The one thing———

Mrs. ADAMS. I asked a question, though, and that was———

Dr. ANASTAS. Oh, I am—I———

Mrs. ADAMS. —was the Administration trying to give the impression that Federal response was greater than it actually was?

Dr. ANASTAS. No. Let me explain why. Even with that first draft, it would be the exact opposite. If you wanted to demonstrate that the government response was more needed or more effective, the assumptions would have been exactly reversed. The revision—the later revisions and refinements of the data increased the amount of chemically dispersed oil. And so the first———

Mrs. ADAMS. So you don't believe that chemically dispersed———

Dr. ANASTAS. —in an understatement.

Mrs. ADAMS. So you don't believe—because, I mean, when I interpret this e-mail, and it says, because naturally dispersed is not part of a Federal response, we need to, you know, there is an interest.

Dr. ANASTAS. In that first draft that you are discussing, naturally dispersed was portrayed as being higher———

Mrs. ADAMS. Okay. Why are there no EPA scientists listed on the August 4 BP Deepwater Horizon's oil budget report, titled "What Happened to the Oil?" There were earlier drafts of the report listed, and at least one, Dr. Venosa was on that one.

Dr. ANASTAS. Dr. Venosa was asked to comment on the report after it was drafted. Dr. Venosa, it is my best understanding that he was not involved with the drafting of the report, but asked to comment on it after it would, I believe, be———

Mrs. ADAMS. So why are there no other EPA scientists on there?

Dr. ANASTAS. They weren't involved with the drafting of the report. Commenting on the report after it is drafted probably isn't the best way to include somebody as an author.

Chairman HALL. Gentleman's time expired. Recognize Mrs. Fudge, the young lady from Ohio, five minutes.

Ms. FUDGE. Thank you very much, Mr. Chairman.

Dr. Anastas, on this Committee we talk a lot about innovation and technology development, and much of what we hear in this Congress about the EPA relates to regulatory work and how regulations kill jobs and hurt our economy. Last week, during a hearing with DOE, I asked Secretary Chu about how the Clean Air Act has helped compel new developments in clean technologies. Secretary

Chu explained that regulations have helped spur a variety of new technological developments.

In fact, I have a Department of Commerce report that states that the environmental technology and services sector have experienced dramatic growth since the passage of the Clean Air Act, and by 2008 had generated approximately $300 billion in revenues and supported nearly 1.7 million jobs.

I just want you for—again, for the record, to talk about the impacts of the Clean Air Act on jobs and the economy, and how do EPA regulations and scientists spur innovation.

Dr. ANASTAS. Thank you for the opportunity to speak to this topic, because I certainly believe that some of the most—among the most important jobs that we can have is jobs that do contribute to protecting Americans' health, protecting Americans' environment. And you are correct in saying not only has that emerging area of environmental technologies, as you cited, been a $300 billion market, but globally it is projected to be a $700 billion market, which would allow for some of the technologies built here in America to be an export in a growing market.

Perhaps one of the most exciting areas of innovation is how we start thinking about our understanding of what causes us concern for environmental and public health, such as some of the chemicals that we use every day, you know, the basis of our society and our economy. And in addition to getting the deep insight about what makes some of these chemicals cause the problems for our health and for our environment, we are able to take this insight and turn it into design of next generation substances that both increase performance, increase profitability and are good for humans and the environment. This is the area of green chemistry that is recognized by the Presidential Green Chemistry Challenge Awards, with leaders in industry, small business and academia showing that they can use innovation to make themselves more profitable, while being environmentally beneficial.

Ms. FUDGE. Thank you very much, Doctor. Thank you for your testimony, and I yield back, Mr. Chairman.

Dr. ANASTAS. Thank you.

Chairman HALL. Thank you. This time recognize Vice-Chairman of the Committee, Mr. Sensenbrenner.

Mr. SENSENBRENNER. Thank you very much, Dr. Anastas.

Dr. ANASTAS. Thank you.

Mr. SENSENBRENNER. I want to go back to Mr. Rohrabacher's line of questioning———

Dr. ANASTAS. Um-hum.

Mr. SENSENBRENNER. —and I just want to reiterate some figures. With the technical support document released on December 7, 2009, there are 35 references from the IPCC and the Climate Change Science Program. There are an additional 43 references for the individual chapters or summary within those 35. There are five more studies that were incorporated into Chapter Seven of the 2007 Working Group One IPCC report, which again, is 35 mentioned—one of the 35 mentioned above, and there are further 29 reports from either the National Academy of Science or from government agencies.

Now, the total of that is, out of the 146, 77 came from inside the government, or from the IPCC, or the Climate Change Science Program, and 69 outside. So a majority of the studies were from government or government related, because the IPCC is a UN group. Do you agree that this is a high amount of dependence on the IPCC?

Dr. ANASTAS. I think it is important to recognize that the IPCC—and as I—I believe I have the figure that there is 619 contributing authors of scientists from different universities, from different research institutes that contribute to the IPCC.

Mr. SENSENBRENNER. Well, I am asking you whether you think it is a high amount of dependence upon the ICC—IPCC and related sources.

Dr. ANASTAS. I think what we are talking about———

Mr. SENSENBRENNER. Yes or no?

Dr. ANASTAS. No.

Mr. SENSENBRENNER. Okay. What are you doing about ensuring that the EPA's policies are based on a diversity of sources for scientific input into its decisions? This doesn't look very diverse to me, where it is 77 from inside and 69 from outside.

Dr. ANASTAS. The contributions to these assessments are from the primary scientific literature conducted by research institutes and universities. This is what makes up these assessments. So the diversity is not on the assessments themselves, it is where those assessments compile their primary scientific literature, the primary research.

Mr. SENSENBRENNER. There have been a lot of mistakes that have been, unfortunately, discovered, the worst of which was when the Himalayan glaciers would melt. It has gotten so bad that the government of India doesn't rely on the IPCC, even though its chairman is an Indian citizen, and they have one of their institutes outside of New Delhi. So, you know, I think there is at least one government that wants to reach independent conclusions from the IPCC in determining what they are doing.

Now, let me ask you, sir, since you are the principal science advisor to the Administrator, how can you assure us that the data relied on meets all basic EPA data quality standards?

Dr. ANASTAS. One of the things that the Administrator said to me when she approached me about taking this position was her commitment to scientific integrity and her insistence that I always do everything in my power to ensure scientific integrity. What we have is a framework for preserving that scientific integrity. It involves everything from insisting on peer review of the scientific analyses that are conducted, and it says———

Mr. SENSENBRENNER. And I am sorry, Dr. Anastas, but, you know, there was one report that was in one of the IPCC documents that was written by, you know, some student that appeared in a scientific magazine, it might have been "Nature", or somebody else with absolutely no peer review. Now, have you gone back and look at how much of this stuff was vigorously peer reviewed and how much simply slipped through the cracks and was published as gospel by the IPCC without any peer review?

Dr. ANASTAS. Of the thousands of scientific studies that are published in the peer review literature that contribute to these assess-

ments, the data that is relied upon by the agency not only looks at peer review, we also look at review by a science advisory board. We also get input from such bodies as our Board of Scientific Counselors. The structure of preserving scientific integrity is something that is———

Mr. SENSENBRENNER. Um-hum.

Dr. ANASTAS. —of paramount importance to me, and of paramount importance to this Administrator.

Mr. SENSENBRENNER. Well, I, you know, as you know, I disagree with this Administration on the job killing global warming thrust that I think has been sufficiently discredited. Even the last Congress defeated it. But let me suggest you put the wagons in a little bit tighter circle, because you will hear more about this. And I yield back.

Chairman HALL. I thank the gentleman. Finally I recognize Mr. Sarbanes from Maryland.

Mr. SARBANES. Thank you very much, Mr. Chairman. Thank you for being here, Mr. Anastas. Just on the climate change issue briefly, before I ask a question on another line, as I understand it, the mistakes that the IPCC has made along the way are ones that have been acknowledged, that they have recognized, that when you lay them against all the rest of the information and analysis and assessment that has been done, really pales in comparison to the very good work that has been done there. And I just want to commend you and the EPA for being careful in responding to criticism of the IPCC to make sure that you don't sort of throw the baby out with the bath water.

And, frankly, having scientists acknowledge that a mistake may have been made here or there, but that the overall weight of the evidence and analysis is still very, very powerful and compelling, I think, frankly, will give it more credibility going forward, and I commend the agency on trying to make those distinctions, because that is how you need to proceed in order to make important recommendations with respect to policy relating to climate change. So I just did want to acknowledge that.

I wanted to get back to the Chairman, when he initiated the questioning on this round, did refer to the fact that the EPA will be taking a look at this hydrofracking issue, and I am glad that that is the case. The folks in Maryland and the Chesapeake Bay Watershed, our radar is starting to go up on this issue as we see what is happening with the development of the Marcellus Shale. Frankly, my perspective is that the industry is moving faster than is prudent in this region right now. There is a kind of a pell-mell quality to the way they are moving. If the promise of this is what it is described as by the industry, and certainly there is profitability in it, from what I can gather, it is all that it is being touted as, then certainly we can afford to make sure that we are proceeding in a careful manner, that it is being done right, and that it is being based on science.

What I was curious about is whether the study that will be conducted by the EPA will be taking a look at the impact with respect to waste water, the impact of that being released into tributaries within the Chesapeake Bay Watershed, the potential now for there to be radioactive elements. There is one concern now that is being

looked at. Are those all things that will be within the boundaries of the study?

Dr. ANASTAS. Thank you very much. This is an important—another important topic that is so appropriate. When the American people raise these types of concerns, when their representatives in this Congress raise the concern to call on the EPA to carry out this study, I think it is so important. Will this study be focusing on the so-called radionuclides in the water? Yes, that is definitively and explicitly part of this study. Will this study be focusing on the impacts of drinking water and the vast number of questions that we are looking at around drinking water and water quality? Yes. Can this study answer all of the questions that we would like to have addressed, because there are quite a few that we have been informed about through this engagement with the stakeholders, with the industry, with the scientific community? This is a study that is going to be responsive to the charge from Congress, and this study will inform other research questions and important questions that I think need to be addressed.

Mr. SARBANES. Thank you. And then I wanted to just quickly touch on a third topic. My colleague raised the issue of the TMDLs, and———

Dr. ANASTAS. Um-hum.

Mr. SARBANES. —I understand that, you know, the plan going forward with respect to TMDLs obviously has to rely to some degree on the modeling that was mentioned. My perspective is also that the kind of data we have available to us now is much more extensive and robust than we have ever had before, and also that we can take it down to a level of particularity that wasn't available before so that, in doing these models, building these models, we do have a robust data source out there that can help promote the accuracy of it. And then, again, as is always the goal here, inform our policy going forward.

I did just want to put in a plug for the idea of citizen stewardship———

Dr. ANASTAS. Um-hum.

Mr. SARBANES. —with respect to the health of the Chesapeake Bay, and, frankly, connecting the efforts of ordinary citizens to the TMDL goals. And what I mean by that is I think there may be an opportunity going forward to quantify the contribution of the ordinary homeowner to improving water quality in the Chesapeake Bay. So, for example, if somebody meets a particular standard that may be set with respect to reducing the impermeability of surfaces and so forth, that can count towards a TMDL obligation. I look forward to working with you on that. And I yield back. Thank you very much for your indulgence, Mr. Chairman.

Chairman HALL. Thank you very much. You were worth waiting for. Chairman recognizes Mr. Palazzo, gentleman from—Minnesota?

Mr. PALAZZO. Mississippi, Mr. Chairman, but—almost spelled close. Not———

Chairman HALL. Not very far off.

Mr. PALAZZO. It is a lot warmer in Mississippi.

Chairman HALL. Both start with an M.

Mr. PALAZZO. M-i. Well, my colleague from Florida started out—she mentioned something—and I haven't been tracking all the testimony today, and talking about Gulf seafood. And I, for one, being from the Gulf states, South Mississippi, I am the only Congressman in Mississippi that borders the Mississippi Gulf Coast, and I have to say our seafood has been tested more than any time in our history. It has to be the safest seafood in America, if not the world, because of the testing process. And our Gulf seafood is not only safe, but it is the best in the world. And I am just going to tell you how it is, and if you don't believe me, come on down to the Mississippi Gulf Coast, enjoy our seafood, our golf, our beaches, our entertainment and our hospitality that is only found in the South.

Doctor, I appreciate you coming out here today. A major concern of constituents in my district is the overreach of the EPA restricting business growth and development. I am concerned that regulation is adversely affecting job growth in my district, in our country. One example of such overreach is the EPA's recent expansion of the interpretation of its authority under the Clean Air Act to regulate CO_2 emissions, which threatens to cost out economy seven trillion in lost GDP by 2029, according to The Heritage Foundation, and hundreds of thousands of jobs.

By comparison to this anticipated economic loss due to overregulation by the EPA, what will be the net private sector economic gain, if any, from the $584 million investment stated in your testimony, which basically went—research and innovative technologies and promotion of synergies between environmental protection, public health protection and the pursuits of economic growth and job production by the Office of Research and Development?

Dr. ANASTAS. One of the things—if I could just say, at first, especially over the course of this year, I got a chance to spend a lot of time down on the Gulf Coast, and specifically in our Gulf Coast Resource Program down at Stennis. And every time, I can tell you, I ate a lot of that Gulf Coast seafood, and it was delicious and wonderful, and I would do it again. So———

Mr. PALAZZO. Great.

Dr. ANASTAS. —thank you very much. One of the things that we focus on at the Office of Research and Development is certainly not only using our traditional expertise of understanding the nature of the problems that we are confronting, but how those problems will lead to solutions, providing the basic information, the basic insights that are going to be crucial to the innovations that our private sector will make, very fundamental issues of chemistry and molecular science and ecosystems biology. Tying these—this understanding of how to be both proper—profitable, creating jobs, while at the same time being environmentally protective I think is essential to the mission of the agency as a whole, as this Administrator has said.

Mr. PALAZZO. What exactly are these deliverables on the investments? What, and if, are the job numbers that will be created?

Dr. ANASTAS. Oh, as a matter of fact, there are several examples out of our Small Business Innovative Research Program. We have companies that have just recently been recognized by the Small Business Administration on technologies, one small business now employing—has grown to over 1,000 employees, and looking at a range from energy efficiency to water technologies. We have a stu-

dent program that founded businesses where they are looking at water technologies, where they have both patents, as well as creating jobs and engaging in export. So there is a range of programs that have resulted in innovations.

Mr. PALAZZO. Are the pursuits of economic growth and job creation, is that a taxpayer, you know, because the EPA is taxpayer funded, is that a mission of the EPA?

Dr. ANASTAS. This is—getting the synergies—in other words, accomplishing our mission and ways that we think about how it can be beneficial, mutually beneficial, and not in any way decreasing our shared desire to have job growth and economic growth.

Mr. PALAZZO. Well, I think a lot of people in my district believe that not only the EPA, but a lot of the regulatory agencies are going to kill and hurt vibrant industries that are currently in existence today in search of unproven, unpredictable jobs in the green market. It is almost as if there is a lot of people in the Federal agencies running around with solutions, and they are just in search of a problem. So please be careful moving ahead, because I know we depend on a lot of those jobs.

Dr. ANASTAS. I think you are making an extremely important point. What we are not looking to do is to drive any particular approaches, any particular products. That is the business of the private sector. What is the business is providing the science that can be used in order to make sure environmental protection and economic growth are synergistic and working hand in hand.

Mr. PALAZZO. My time is up. Thank you. Thank you, Mr. Chairman.

Chairman HALL. And I ask unanimous consent to the letter dated March 10, 2011 from Debra L. Swackhamer, chair of the EPA Science Advisory Board, addressed to Mrs. Johnson and to me, be included in the record. This is at their request. They couldn't appear. Is there objection? Chair hears none.

[The information follows:]

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON D.C. 20460

OFFICE OF THE ADMINISTRATOR
SCIENCE ADVISORY BOARD

Re: Written Statement of Deborah L. Swackhamer, PhD, Chair of U.S. Environmental Protection Agency Science Advisory Board to the Subcommittee on Energy and Environment, Committee on Science, Space, and Technology, U.S. House of Representatives

March 10, 2011

The Honorable Ralph Hall
Chairman, Committee on
Science, Space and Technology
U.S. House of Representatives
Washington, D.C. 20515

The Honorable Eddie Bernice Johnson
Ranking Minority Member, Committee on
Science, Space and Technology
U.S. House of Representatives
Washington, D.C. 20515

Dear Chairman Hall and Representative Johnson:

Thank you for the opportunity to provide a written statement for the record to present my views on the FY2012 President's request for the US EPA Science and Research budget. I am Professor and Charles M. Denny, Jr. Chair in Science, Technology, and Public Policy at the Hubert H. Humphrey School of Public Affairs and Professor of Environmental Health Sciences in the School of Public Health at the University of Minnesota, and serve as the current Chair of the U.S. Environmental Protection Agency Science Advisory Board (SAB).

The SAB has been working with EPA since 2007 to review their research and science program directions and annual budgets in a systematic manner, and has a long history of commenting on the President's annual budget request for EPA's Office of Research and Development (ORD) in regard to how well it aligns with and supports the science plan and mission of the EPA. We have shared these comments with the Congress and with the EPA Administrator in the past and will share them again this year. The comments that follow are informed by a meeting of the EPA SAB Budget Work Group that recently met in Washington, D.C. on March 3-4, 2011. An expanded report that reflects these comments will be provided to Administrator Jackson in a few weeks following approval of the full SAB.

Over the last 6-12 months the EPA has realigned its research organization from 16 project-areas, defined by specific problems and media-type, into four integrated programs and two cross-cutting areas (Human Health Risk Assessment and Homeland Security Research). Motivation for this consolidation and realignment of programs reflects an emphasis on integrated transdisciplinary research, multi-pollutant exposures, and sustainability. These are not new programs, but represent a new way of thinking about programs. Considerable synergies will be realized in combining research into the four programmatic areas: Air, Climate and Energy; Safe

and Sustainable Water Resources (water quality plus drinking water); Sustainable and Healthy Communities; and Chemical Safety for Sustainability. We strongly commend ORD for a dramatic response to SAB recommendations concerning its realignment of research areas and dedication to transdisciplinary research for protecting human health and the environment.

ORD's realignment is ambitious and moves EPA research in a new and bold direction. ORD is moving from a *risk management paradigm*, which has guided and influenced research over the past two decades, towards a *sustainability paradigm* and that effort is welcome. It is consistent to the public health approach of prevention rather than a medical approach to treating disease after it occurs, and recognizes that environment and health are an interconnected system. We recognize that this is a significant challenge, and the Agency must consider how to translate research results from this new approach into science-informed environmental decisions.

The President's FY2012 budget request recommends a 13 % decrease in EPA's budget, a 2.6 % cut to Science and Technology programs within EPA, and a 2.1 % cut to EPA ORD. Overall, we recognize the difficult budget environment with which the nation is dealing in FY2012, and although we consider these planned cuts to EPA's budget to be extremely unfortunate, we understand that they may be necessary to reduce overall government spending. We understand the relative priority given to ORD in this budget, but we also recognize that Agency cuts do not come from fat, but rather from the marrow of its activity and mission. EPA research is addressing the nation's most critical science and technology priorities to assure that policy and regulatory actions needed to protect health and our natural environment will be based on strong science. We cannot ignore threats to our air quality, ecosystems, and climate change for long before they will significantly reduce the health of our people and the vitality of our economy and ecosystems.

In the President's FY2012 budget request, ORD has received a budget reduced by 2.1 % relative to the FY2010 enacted budget. We applaud EPA for making strategic investments and disinvestments in addition to realigning research programs, and not just cutting programs evenly across the board. While largely supportive of these choices, we are not in complete agreement with some of them, and caution that there are consequences of some of the reductions.

The FY2012 President's budget request includes significant reductions to homeland security (-25 %, $8.1 M), human health research (-16.2 %, $8.8 M), ecosystems research (-15.1 %, $10.8 M), and air/climate/energy research (-3.1 %, $3.5 M). Waste clean-up undergoes a substantially reduced budget (Hazardous Substances Superfund, –16.7 %; Inland Oil Spill programs, -3.9 %).

Reductions in homeland security were made largely because the emergency response science products and tools for water and wastewater treatment plants and buildings under threat of a chemical, biological, or radiological attack have reached a mature stage of development. However, at a minimum, funds should be directed to the dissemination of EPA's knowledge and software products to the states and communities. These products could help make our nation's water infrastructure more sustainable in the event of either terrorist attack or natural disasters.

A consequence of reductions in human health research makes it impossible for EPA to conduct major epidemiological studies. Future budgets need to provide for more high-quality

epidemiological studies to better understand exposures, especially for susceptible and vulnerable populations, and dose-responses of hazards so as to develop regulations to protect public health using the best possible science. Reductions in ecosystems services research will slow programs for valuing species, and research on the prevention of environmental degradation through utilization of behavioral science.

Funds for ORD research on Air, Climate and Energy decline about 3 %. Relative to other budget cuts, this is modest, and it indicates that certain research programs like biofuels ($2.2 M) and mercury-in-air regulations ($2.4 M) are completed and are no longer in the budget. But there are cuts in resources to the Clean Air Research Program for source-receptor and dose-effect research that investigate human exposure to air pollutants and resulting health effects in the nation's major cities ($ 0.150 M) which is a high priority, and also cuts in research on the effects of climate change on estuaries ($0.625 M). Funds for the modeling and development of State Implementation Strategies will be reduced ($ 0.762 M) and Small Business Innovation Research programs ($0.247 M) that would have met the priorities of the Agency and created jobs. The CERES organization (2011) estimates that the National Ambient Air Quality Standards alone will result in the creation of 1.5 million jobs over the next five years. The country needs clean energy and clean air as well as jobs, and the former can provide the latter.

Budgets for climate change research must be strengthened, not weakened, because we are already living with climate change (e.g., melting ice, more intense storms and frequent floods) and it is likely to increase in coming years. Sensitive populations suffer the most from chemical exposures exacerbated by a warmer, wetter climate (childhood asthma); and environmental injustice is also linked (e.g., roadside air pollution). We cannot change our genes, but we can change our environment. Clean air and safe water is the statutory role of EPA.

The largest increases for ORD in the President's FY2012 budget request include new funds for Chemical Safety and Sustainability (+22.9 %; $17.8 M), especially endocrine disruptors research, and for Safe and Sustainable Water Resources, SSWR (+ 6.9 %, $7.7 M). We especially applaud the $4 million increase to the STAR Fellowship program (+ 40%), which is a Presidential Science Technology Engineering and Math (STEM) initiative. In the SSWR program, we recommend an increased focus on viewing water and wastewater holistically as an integral part of the overall water cycle. This systems approach is in concert with EPA's changing role from purely a regulatory agency, to one which participates in and promotes Sustainable and Healthy Communities.

The requested budget for Chemical Safety and Sustainability appears justified given the ambitious goals of the newly aligned program. The realignment changes will allow the EPA to streamline its work and be more effective in achieving public health and environmental protection. The EPA has needed to develop more robust transdisciplinary research directions, and the articulation of ORD's realignment for Chemical Safety and Sustainability is a good step in this direction. By leveraging the talents and expertise of existing ORD staff within disciplines to work with each other toward common new research goals, the EPA will be able to successfully implement true multi-disciplinary research. We support the investments in endocrine disrupting chemicals research (+$7 M), the new green chemistry and design for the environment initiative (+$5.4 M), and next-generation computational toxicology tools (+$2 M), and support the net reductions gained by efficiencies.

We agree with the requested reallocation of funds and increase in the FY 2012 budget for Safe and Sustainable Water Resources. Realignment of Drinking Water and Water Quality programs into integrated water resources and water infrastructure will increase efficiency and foster transformative research that focuses on entire watersheds for both ecological and human health. It is clear that by implementing this alignment and integration that the EPA is responding to recent recommendations and suggestions of the SAB and other external advisory groups.

We are very supportive of the $6 M requested increase to develop innovative new tools and information research in the development of green water infrastructure, especially in the face of nationally restricted financial resources. First and foremost, given the tight integration of larger watersheds with urban water resources, larger watersheds need to be explicitly studied. Only in this manner can specific program goals be obtained that focus on innovative solutions to reducing and managing groups of chemicals and pathogens and nitrogen and phosphorus pollution.

The new paradigm in wastewater management is to view wastewater not as a waste, but rather as a resource that can provide water, nutrients, and energy to meet social, economic, and environment needs. This paradigm fits within ORD's focus of sustainability and a systems approach, and it links management of wastewater with issues of food production, land use, water quality, and energy production. It also provides opportunities to advance science in understanding the direct and indirect energy use in public infrastructure, as well as understanding risk associated with use of non-potable water.

We are very supportive of the $4.2 M increase in funding to assess the potential public health and environmental risks associated with hydraulic fracturing. While the funding is sufficient for this fiscal year, we encourage the Safe and Sustainable Water Resources program to ensure that new case studies are conducted that expands the knowledge gained from this initial program. Proposed funding levels for 2012 are likely insufficient for the out-years.

We understand the requested $2 M reduction in the Beaches Program as it draws to a conclusion. However, these studies are still critical and we would like to encourage the program to provide a phased reduction approach that maintains the high quality of research and management guidelines that has already emanated from this program.

The President's FY2012 budget includes a slight reduction (about $ 0.5 M) in the Human Health Risk Assessment program relative to the 2010 enacted budget. While EPA appears poised to maintain its strategic research and meet its stated priorities, it will be difficult for EPA to keep abreast of the "-omics" revolution (genomics, proteomics, metabolomics) and be able to use the latest biotechnology to protect public and environmental health. The budget changes since 2010 do not appear to be sufficient for innovation and modernization of risk assessment for the Agency. As ORD moves from a risk management paradigm to a sustainability paradigm, increased resources are needed. The program should begin incorporating this new science information into IRIS assessments as well as cumulative risk assessments.

Finally, the President's budget request includes no explicit research in social, behavioral, and decision sciences. The funds for the National Center for Environmental Economics (not part of

ORD) is funded at a mere $1 M. Sustainability is a challenge grounded in the human dimensions of a coupled human and natural system: humans are the driving force of environmental changes both good and bad, and human institutions and behavior will have to change if a transition toward a sustainable economy is to be achieved. It is accordingly striking that EPA's requested budget accords so little explicit attention to research on the human elements of coupled systems. The fragments of social science research continue to be eaten away due to declining budgets. A long-term dataset, the Pollution Abatement Cost and Expenditure survey series, is a casualty of these cuts, limiting our ability to understand the economic implications of environmental regulation. This is a serious loss because of the length of time needed to collect data on industries making long-term capital investments in response to globalization and national economic shifts, as well as environmental regulations. The National Center for Environmental Economics retains a function as an internal consultant group, available for studies in the Office of Policy and elsewhere within the EPA. This is a potentially important function, not only for EPA's immediate responsibilities, but as a way to maintain awareness within EPA of the perspectives and utility of understanding the human dimensions of environmental problems. Yet social science has no explicit place within the four national program areas around which ORD is being reorganized. The neglect of social science is a problem of long standing, on which the SAB has commented repeatedly through the years. A time of politically frightening budget deficits is not a moment for a sweeping vision of investment in the social sciences. But people and the institutions that shape human behavior – including markets and informal norms, as well as the regulations and laws that fall within EPA's legal responsibility – are central to sustainability. All of ORD's four new integrated program areas acknowledge research issues ranging from decision analysis to risk communication to behavior change, and dedicated resources for behavioral and social sciences is essential for their success.

I greatly appreciate the opportunity to provide comments for your consideration.

Sincerely,

Deborah L. Swackhamer, Ph.D.
Chair, U.S. EPA Science Advisory Board

Chairman HALL. Thank you, Dr. Anastas, for your very valuable testimony, and the Members for their questions, and we have done real good at staying within the five minute range this time. The Members of the Committee may have additional questions for you, Doctor, and we will ask you respond to those in writing, if you will, and the record will remain open for two weeks for additional comments from Members. I have some questions that I want to send you and ask for an answer, and would like to have that answer within two weeks, if we could get it. And you are excused, and we thank you, and the folks with you for your time.

Dr. ANASTAS. Thank you, Chairman Hall.

Chairman HALL. We are adjourned.

[Whereupon, at 12:31 p.m., the Committee was adjourned.]

Appendix I:

Answers to Post-Hearing Questions

ANSWERS TO POST-HEARING QUESTIONS

Responses by Dr. Jane Lubchenco, Administrator, National Atmospheric and Oceanic Administration

Questions submitted by Chairman Ralph Hall

Q1. There has been a lot of discussion about what a climate service would look like. Certainly, NOAA's proposal is not the only way a climate service could be structured. Please describe why you chose this format over the four others suggested by the NOAA Science Advisory Board.

A1. Yes, there has been significant analysis and discussion both internal to NOAA and among external groups about the best organizational structure for a climate service in NOAA. The breadth of expertise and interests represented and the time that was afforded for these discussions was tremendously beneficial to the formulation of NOAA's proposed reorganization. The Department of Commerce and NOAA have taken such discussions and the ideas they have generated very seriously. In response, NOAA has worked with some of the brightest minds on institutional planning and administration, service delivery, stakeholder involvement, and climate science to develop, evaluate and integrate the many ideas that have arisen from these discussions into the proposed reorganization contained in the President's FY 2012 budget proposal.

The idea of creating a Climate Service in NOAA is not new. The concept first surfaced in the early 1970s and later gained prominence in NOAA during the George W. Bush Administration. NOAA and external groups have been engaged in efforts ever since to further develop this idea and improve climate science and services. The proposed Climate Service would better respond to our constituents' growing demands for accessible and authoritative climate information by consolidating NOAA's existing world-class climate capabilities in one Line Office—a single point of access to NOAA's climate science, information, and products. For example, this proposed change would provide a clear point of access to the burgeoning private sector climate industry that is emerging around NOAA's climate information, in much the same way that the roughly $1 billion weather industry has grown up around NOAA's weather data. The proposed reorganization is also budget-neutral; a clear good government solution for science, services, and the American taxpayer. It would allow NOAA to operate more efficiently and effectively to better meet growing public demands for climate information with the climate science and service funding we are appropriated.

NOAA's proposal to create a Climate Service took great care to consider and reflect recommendations from numerous prominent studies and external groups, including the NOAA Science Advisory Board (SAB) and more recently the National Academy of Public Administration (NAPA) study that was requested by the Commerce, Justice and Science Subcommittees of the House and Senate Appropriations Committees, to provide recommendations for how NOAA should be better organized to deliver reliable and timely information on climate to a variety of stakeholders.

From 2008 to 2009 the NOAA SAB and its Climate Working Group (CWG) undertook an effort to compare and contrast specific options for the development of a National Climate Service—a broad enterprise of agencies, including NOAA, and organizations comprised of users, researchers and information providers. The CWG established four Tiger Teams and a Coordinating Committee to evaluate the pros and cons of each option. This effort resulted in the June 5, 2009, SAB report entitled *Options for Developing a National Climate Service*.

The four options evaluated in the report were:

1. Create a national climate service federation that would determine how to deliver climate services to the nation
2. Create a non-profit corporation with federal sponsorship
3. Create a national climate service with NOAA as the lead agency with specifically defined partners, and
4. Expand and improve weather services into weather and climate services within NOAA.

In evaluating these four options, the SAB's report concluded that each option had significant strengths and weaknesses and that no option was viewed as an ideal option for a National Climate Service. The report did not make specific recommendations as to how NOAA should reorganize its own internal climate capabilities. Among its findings, however, the SAB clearly stated:

> "The current NOAA organization is not well-suited to the development of a unified climate services function. Greater connectivity between weather and climate functions and between research, operations and users is required."

The SAB also recommended that the successful development of a National Climate Service hinges on collaboration between the research and user community, and an internal reorganization of NOAA that enables greater connectivity of weather and climate functions. NOAA's proposal was designed to specifically address these and numerous other findings and recommendations from the SAB's insightful work.

More recently, the SAB CWG winter 2011 report further reinforced NOAA's proposal for a dedicated Climate Service Line Office, stating:

> The lack of action in several areas highlighted in the previous reviews speaks loudly to the need for a new line organization for climate services. These responses clearly illustrated the considerable inertia that exists within the present system and the difficulty in moving from a matrix managed program to a line organization. Let there be no mistake: there is a tremendous amount of world-class climate research being performed within the agency. Yet, transitioning such high quality research into a service-oriented and operational setting is quite another matter. There are some fairly major systemic challenges that need to be confronted going from a loose federation of somewhat independent NOAA organizations to a functioning climate service. Short of a Climate Service line organization with budgetary authority, the CWG believes it will prove very difficult to effect change if NOAA's approach to climate services continues in a matrix structure or manner. (SAB CWG Winter 2011 Report)

In the end, NOAA's proposal to consolidate components from several Line Offices to create a Climate Service Line Office as outlined in NOAA's current FY 2012 budget request was developed after great deliberation and consideration for its impacts and opportunities across the agency, in particular on NOAA's science. NOAA used input from the Congressionally-requested NAPA study and analysis of organizational options for a Climate Service within NOAA, the SAB CWG, and other internal and external input, to guide the development of its Climate Service proposal. NOAA's reorganization proposal closely aligns with NAPA's final recommendations, such as the inclusion of the National Weather Service's Climate Prediction Center, and recognizes the importance of having a temporary leadership position for change management in the new organization.

The proposed Climate Service Line Office structure reflects NOAA's response to the needs of numerous demands for climate services, so that the agency can: 1) promote integration of NOAA's climate science and service assets; 2) heighten the accessibility and visibility of NOAA's climate services for our partners and users; and 3) allow NOAA to more efficiently address user and partner needs compared to our current distributed structure. To make this new organization successful, it will encompass a core set of longstanding NOAA capabilities that have proven success, including climate observations, research, modeling, predictions and projections, assessments, and service delivery infrastructure. NOAA has proposed that the Climate Service be a Line Office, providing a single point of entry for people to access NOAA's climate science and service assets, and enabling improved information sharing and more productive partnerships with federal agencies, local governments, private industry, other users, and stakeholders.

NOAA's proposed reorganization also maintains the highest standards of scientific integrity for all NOAA science and seeks to strengthen and integrate science across the agency. The proposed Climate Service Line Office will enable better transition of high quality climate science into usable services. It will also be an opportunity to refocus OAR's efforts to incubate solutions to tomorrow's long-term science challenges, integrate an agency-wide science portfolio, and drive NOAA science and technology innovation. In addition, the OAR Assistant Administrator will serve as vice-chair of the NOAA Research Council. Further, as leader of the central research Line Office, the OAR Assistant Administrator will become the senior advisor to the NOAA Chief Scientist. Of critical importance, none of NOAA's climate or other research capabilities are diminished by this proposed reorganization, and we do not anticipate any marked change to the balance of internal vs. extramural funding, pending appropriations.

Q2. Arguably, the Climate Service is providing information to assist decision-makers with adaptation choices.

a. Is the research moving from OAR into the Climate Service only adaptation research?

b. Or does it include basic, physical science research as well?

A2. (a&b) The proposed Climate Service would include basic, physical science research as well as adaptation research. In total, the proposed Climate Service would consolidate many of NOAA's existing climate science and service components currently dispersed across the agency into one Line Office. That said, select climate-related programs and research would remain in OAR and other Line Offices because climate is an issue that intersects all of NOAA's mission areas.

As proposed in the PB FY 12, OAR would transfer the Geophysical Fluid Dynamics Laboratory, the Climate Program Office, and three divisions of the Earth System Research Laboratory—Chemical Sciences Division, Physical Sciences Division, and Global Monitoring Division—to the proposed Climate Service. The proposed transfer would not result in deviations from the core missions or activities of these programs.

Virtually all of the climate adaptation research in OAR is conducted by the Climate Program Office through its Grants Program, in particular the Regional Integrated Science Assessment Centers (RISAs), based on the U.S. Global Change Research Program working definition of "Adaptation Science." The Global Change Research Program defines adaptation science as "integrated scientific research that directly contributes to enabling adjustments in natural or human systems to a new or changing environment and that exploits beneficial opportunities or moderates negative effects."

Creating a single Line Office would establish a stronger position for NOAA to strategically guide its climate research, monitoring, and assessment work in a coordinated fashion. It also would create an easy to find, single point of entry for people to access NOAA's climate science and service assets, and enable improved information sharing and more productive partnerships with federal agencies, local governments, private industry, and other users and stakeholders.

As mentioned above, this reorganization proposal would maintain the highest standards of scientific integrity for all NOAA science. In doing so, the proposal would preserve the OAR as NOAA's core research and innovation hub, a key NAPA recommendation, and would seize on the opportunity to strengthen science across NOAA by strategically renewing OAR's forward looking research agenda. In proposing to house much of OAR's climate research in the proposed Climate Service Line Office, NOAA would both be able to better transition its high quality climate science into usable services and seize upon the opportunity to refocus OAR's efforts to incubate solutions to tomorrow's long-term science challenges, integrate an agency-wide science portfolio, and drive NOAA science and technology innovation.

c. How will NOAA ensure that the pressures of a service organization will not force the focus of the research in one direction over another?

A2c. To ensure that the pressures of the service aspect of a Climate Service would not force the focus of the research in one direction over another, a climate senior scientist is included in the reorganization proposal. This new position would ensure sound business practices that embrace a "co-production of knowledge," wherein climate science informs, but does not prescribe, decision-making, and decision-making informs climate science, but does not prescribe research priorities. In addition, NOAA is in the process of seeking confirmation for a Chief Scientist and the OAR Assistant Administrator will serve as the senior advisor to the NOAA Chief Scientist once on board.

In contrast to the National Weather Service model, where science and service (or operations) are housed in separate Line Offices, NOAA does not envision a service delivery component for the Climate Service that is remotely on the scale of the NWS with its 122 local forecast offices and other regional infrastructure. In fact, the research and science component of the proposed Climate Service is expected to continue to be much larger than its services component; NOAA plans to leverage the service delivery infrastructure of the NWS and other partners like NOAA's Regional Integrated Sciences and Assessments (RISAs), Regional Climate Centers, state climatologists, Sea Grant extension, Coastal Services Centers, National Marine Sanctuaries, and other parts of NOAA.

The proposal to bring climate science and services together under one Line Office provides a tremendous opportunity to integrate science and service delivery without detracting from a commitment to pursue, fund, and sustain basic climate research and science. Science is an essential component of all NOAA responsibilities, and underpins the agency's ability to provide quality services, based on sound science.

Americans depend on NOAA's climate information to make smarter choices at home and in their communities and businesses. NOAA's climate information (e.g. forecasts of conditions from two weeks to seasons to decades out) continues to be at the forefront of this improved decision making. Similar to information about

weather, information about the climate is not new or controversial. Throughout history, as well as today, people around the country and the world use climate information—long-term forecasts on the order of two weeks to seasons to decades- to inform major decisions from agriculture to national defense to energy production. For example, electricity providers use climate data to determine anticipated user demands for heating and cooling power and set electricity prices. Additionally, home insurance companies use climate data such as the "normal" temperature and precipitation to calculate your insurance premium. These are just a few examples of how NOAA's climate science currently translates into applicable services for Americans. High quality climate science is at the core of climate services. Housing both science and services under one organizational structure will allow NOAA to better transition research findings into usable information and services that help businesses and communities make better economic decisions and safeguard lives and property.

Climate science and service must go hand in hand in order to develop products and services that can evolve and be initiated rapidly when needed, in response to scientific information as it emerges. The continuous advancements in climate science demand a close proximity to the service, not only so that those advancements can constantly improve products (science push), but also so that the users can be asking new questions of the science (user pull).

Related to this issue, the NOAA Science Advisory Board's (SAB) 2009 report, Options for Developing a National Climate Service, found:

> "The current NOAA organization is not well-suited to the development of a unified climate services function. Greater connectivity between weather and climate functions and between research, operations and users is required."

The SAB also recommended that the successful development of a National Climate Service hinges on collaboration between the research and user community, and an internal reorganization of NOAA that enables greater connectivity of weather and climate functions. NOAA's proposal was designed to specifically address these and numerous other findings and recommendations from the SAB's insightful work.

NOAA scientists and their academic and governmental partners, both nationally and internationally, have long been involved in cutting edge climate system research and have contributed greatly to advancing the scientific understanding about the climate system. NOAA is committed to ensure this basic research does not get diluted and remains a priority as part of the climate service. This Administration is committed to the honest and open conduct of science. One of my first actions as NOAA Administrator was to appoint a scientific integrity team at NOAA. Their charge was to review the state of science and scientific integrity at NOAA, to actively assist OSTP in developing recommendations that would strengthen the integrity of science in government, and to draft a scientific integrity policy for NOAA.

Q3. In your testimony, you cite "a rapidly increasing public demand for climate services." Please provide the Committee a listing and description of all requests to NOAA for climate services from State and municipal governments as well as private sector stakeholders.

A3. NOAA's climate capabilities have significantly matured and markedly grown in sophistication over the past 40 years to the point where Americans who depend upon this essential information to make decisions for their family, business and community balance sheets are now demanding more data, increasingly complex products, and advanced scientific study.

The following statistics demonstrate the tremendous increase in demand via incoming requests through a number of NOAA's user interfaces.

1. Direct requests from users for climate related data and information services: From fiscal year 2009 to 2010, NOAA saw an increase of 11 percent in direct requests (includes individual requests via phone calls, emails, and other direct correspondence) from 26,000 to 29,000 individual requests.
2. Climate related data provided from data centers: NOAA saw an 86% increase in climate related data provided from data centers in FY 2010 compared to FY 2009—from 806 terabytes to 1500 terabytes (or 1.5 petabytes). To put this in context, your favorite Kindle or other electronic book download averages about 800,000 bytes. So, in calendar year 2010, NOAA served up a total of at least 1.9 billion Kindle books worth of climate data, roughly 867 million more Kindle book equivalents than in 2009.
3. In calendar year 2010, NOAA's National Climatic Data Center (NCDC) Comprehensive Large Array data Stewardship System site served over 5 times as much climate related data as in calendar year 2009—from 43 terabytes to 253 terabytes.

4. From FY 2009 to FY 2010, web-hits for NOAA climate services experienced a 57% increase in climate related data and information website hits—from 906 million to 1.4 billion hits. This does not include hits to our new Climate Portal that launched in February 2010 and currently hosts over 27,000 visitors every month. Because of the huge numbers involved it would not be practical to provide documentation of each request. We can however, provide statistics as to the origin of the requests related to the domain name of the user request. Our statistics indicate the following approximate distribution over the past two years.

   .com — 15%
   .edu — 9%
   .gov — 12%
   .mil — 1%
   .net — 24%
   .us — 7%
   Foreign — 13%
   Unresolved — 19%

Such demands come in from multiple interfaces across multiple Line Offices within NOAA, and we are unable to track all in a comprehensive manner. Housing NOAA's climate programs in one Line Office could allow us to more effectively track and analyze the nature of these requests. Within this increasing demand are requests from a breadth of economic and industry sectors, including both governmental, private sector, and non-governmental stakeholders. Specific examples of these types of requests that were received include:

- In the first days of the Fukushima Nuclear Plant situation following the recent Japanese earthquake and tsunami tragedy, the White House Office of Science and Technology Policy requested long-term historical climate data for numerous locations in Japan. This preliminary analysis established a historically-based likelihood for springtime winds by direction and speed, as well as the likelihood of rainfall events of varying intensities. Both of these factors are important climatological considerations when assessing the potential distribution of airborne hazardous material.
- An agricultural expert in Wilkes County, NC requested daily high and low temperatures for the 2010 growing season from April 1st, 2010 thru October 31, 2010 to calculate the growing degree days or temperature above 50 degrees fahrenheit in the Wilkes County area. He is researching growing degree days and length of growing season for a possible vineyard in the Yadkin Valley, American Vitacultural Area.
- Public Service/Utility Commissions around the country downloaded NOAA's Climate Normals, which include spatial and temporal averages of climatological variables (e.g., temperature, precipitation, etc.) that describe base climatic conditions. Utilities subsequently use this information in formal processes to determine the rate that each utility is allowed to charge its customers.
- Municipalities around the country accessed NOAA's U.S. Snowfall Climatology information, which includes historical information about the severity of extreme snowfall events and return period probability. This information is used to develop annual municipal snowfall removal budgets and results in efficient planning and cost savings.

Overall, as much as one-third of U.S. gross domestic product depends on accurate weather and climate information, and American communities and businesses are using NOAA's climate information to make smart investments to manage their risks and reap economic benefits. For example, through an effort with the National Association of Homebuilders, NOAA provided climate data to help the home building industry establish the most cost-efficient insulation standards for protecting building foundations from frost. According to industry estimates, this information is said to save roughly $330M in annual building construction costs and annual energy cost savings of 586,000 megawatt hours.

NOAA's climate forecasts, from seasonal precipitation and drought outlooks to weekly on-the-ground assessments of the U.S. Drought Monitor, are also helping firefighters in Texas to prepare for and respond to a record wildfire season. And NOAA's improved maximum precipitation predictions have been used to develop

new standards for dam design that are being implemented around the Nation to improve dam safety and reliability.

These are just a few examples of how the importance of NOAA's climate services to decision makers is fueling an increased demand for more data, increasingly complex products, and advanced scientific study. Throughout NOAA's efforts to develop the proposed Climate Service reorganization, the agency has consulted with and benefited from the input and advice of a wide array of external partners and stakeholders across public and private sectors. The unanimous conclusion of internal and external scientists and decision makers is that establishing a single management structure for the agency's core climate capabilities is required if the agency is to rise the meet the Nation's growing need for increasingly sophisticated information.

In the conduct of the National Academy of Public Administration's research for its report to Congress, "Building Strong for Tomorrow: NOAA Climate Service," a survey found:

> The themes that the Panel heard often and found compellingly stated were: strong support for the concept of creating a NOAA (or a National) Climate Service; the need to improve federal interagency coordination of resources and service delivery; the importance of partnerships with the public and private sectors; a need for more localized and more accessible research; the potential positive impact of using innovative service delivery technologies and tools; and the importance of supporting a user community that is large and diverse. (Building Strong for Tomorrow: NOAA Climate Service, pg 16).

The Academy report's survey results were based on over 40 interviews with current and former government officials, and external stakeholders; three roundtable discussions with over 50 key NOAA climate constituents, including federal agency partners, state and local government leaders, and academics and other subject matter experts; and lastly, a national Online Dialogue that solicited ideas about how to structure and operate a NOAA Climate Service from June 14 to June 28, 2010.

The Academy's report, resounding as it is in its response, is one of a vast array of expressions of support for NOAA's proposed reorganization. Below are a number of additional examples of external stakeholder feedback for the need for climate services:

> *"Our organizations, representing hunters and anglers across the country, are very concerned about the impacts of climate change on fish and wildlife, and we recognize that providing good information to resource managers will be critical to helping ecosystems, fish, and wildlife adapt to the coming changes in climate."*
>
> *"While the broad implications of climate change are becoming better understood, the need for more regional and local understanding of future climate impacts is urgent. The federal government's investment in observing, researching, modeling, and developing tools to respond to the impacts of climate change will be significant, and the ability to disseminate that information to states, municipalities, and non-governmental organizations, while responding in turn to their specific information needs, is critical. NOAA's climate service can play an important role in gathering, analyzing, and presenting that information to those in need of it."*
>
> Randi Swisher, President, American Fly Fishing Trade Association; Tom Franklin, Director of Policy and Government Relations, Theodore Roosevelt Conservation Partnership; and Steve Moyer, Vice President for Government Affairs, Trout Unlimited
>
> *"WGA supports the establishment of a NOAA Climate Service, and we commend the leadership and work of NOAA to make the climate service a reality". Western Governors Association*
>
> *"As climate adaptation becomes an increasingly important strategic path, the new climate service will provide essential information to the public and private sectors. The insurance industry is heavily dependent on public data and information related to climate, and the creation of a NOAA Climate Service with new data services will greatly enhance the industry's analysis of climate and extreme event weather risk."*
>
> Frank W. Nutter, President, Reinsurance Association of America

"Addressing climate change is one of our most pressing environmental challenges. Making climate science more easily accessible to all Americans will help us gain the consensus we need to move forward. The new NOAA Climate Service is a welcome addition to our national climate change capabilities. It will help bring people together so we can also bring about an economic recovery by more rapidly modernizing our nation's energy infrastructure."

Jim Rogers, President and CEO, Duke Energy

"Establishing a NOAA Climate Service demonstrates that the Administration and NOAA understand there is a real need to deliver climate services in this country. This is a giant leap forward in meeting this need. NOAA plays a central role in many aspects of climate science including climate modeling, observations, and assessments, and has a major role to play in the efforts to establish a more coordinated and integrated government-wide National Climate Service. The creation of a new NOAA Climate Service will allow it to be a more effective partner with other federal agencies, the private sector, and the research and academic community, in that effort."

Dr. Rick Anthes, President, University Corporation for Atmospheric Research

"NOAA's proposed climate service would be a welcome and critically needed asset to the public health community, both in the U.S. and around the world. Every key sector of the public health community, from first responders to those who provide food and medical supplies and services, would draw on the information. Forecasting air quality, drought, natural hazards and climate-sensitive diseases all impact public health. Better predictive tools, monitoring and other resources will inform our decision-making and advance our efforts to get further ahead of the curve. Lives can be saved as a result."

Georges C. Benjamin MD, FACP, FACEP (Emeritus), Executive Director, American Public Health Association

"I was delighted and thrilled to learn of the commitment by the Administration to form the NOAA Climate Service. I have been a long time supporter of this vision and it is very gratifying to see it accomplished. NOAA has worked for many years to become proficient in climate science, climate observation, and data management. Additionally, with vast experience in producing world-class weather forecasts, extension of these skills to climate is a natural step and will go far in improving the foundation for rational science based policy making. My thanks and congratulations to the hardworking NOAA team members who over many years have made this event possible."

Honorable Conrad C. Lautenbacher, Ph.D.,Vice Admiral (U.S. Navy Ret.) Vice President, Science Programs, CSC, ATG, Under Secretary of Commerce for Oceans and Atmosphere and NOAA Administrator, 2001–2008

"I am very excited by today's announcement regarding formation of the NOAA Climate Service. Working in tandem with the highly skilled work force from the National Weather Service, the NOAA Climate Service will enhance NOAA's ability to deliver world class climate services and to address the wide variety of issues related to climate change.

"NWSEO intends to work closely with the Obama Administration, NOAA's leadership and the NOAA Climate Service to effectively launch this new venture. We look forward to forging a close working relationship with the NOAA Climate Service, which will effectively utilize the skills of NWSEO's members and satisfy America's needs to better understand and to predict climate change."

Dan Sobien, President, National Weather Service Employees Organization (NWSEO)

These are examples of the broad array of support for NOAA's proposed Climate Service from stakeholders; and many more are listed at: http://www.noaa.gov/climateresources/testimonial.html. As a final example of feedback that has been received, attached please find a letter the Department received from a diverse and distinguished group of business leaders including Microsoft, Deloitte, and Governor Jim Geringer.

Q4. After the Nunn-McCurdy recertification and restructuring in 2006, it was realized that providing satellite coverage in all three orbits would be financially impossible within the budget the National Polar-orbiting Operational Environmental Satellite System (NPOESS) had at the time. The strategy was then changed to rely on the Europeans to cover the late-morning orbit, but to use instruments provided by NOAA. It is our understanding that these instruments, whose total design life is eight years, were delivered to the Europeans more than nine years ago.

a. Has NOAA conducted a risk analysis of using data from the European satellites using instruments that are beyond their design life?

A4. (a) Yes, NOAA continues to employ an active risk mitigation program by conducting annual activation checks on the NOAA-supplied instruments [1] on the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) Metop-B and -C satellites. NOAA-provided instruments have been designed for a three-year mission once in-orbit. Prior to launch, these instruments are maintained in a controlled environment and placed in a storage container before integration onto the Metop spacecraft. After the instruments and spacecraft are integrated, they go through a rigorous test program to verify their flight readiness prior to receiving the go-ahead to proceed to launch. If an anomaly arises as a result of this testing, the instrument is de-manifested from the spacecraft so that additional testing can take place at the instrument level by the manufacturer. If applicable, component or subsystem refurbishment or replacement upgrades are completed before re-integrating onto the spacecraft. NOAA has also funded a spare parts program for each of the instruments.

NOAA and NASA engineers are present at the facility when spacecraft testing occurs. For example, the Metop-B AVHRR Instrument is currently progressing through its annual recalibration test program, with NOAA and NASA personnel on-site during this testing. On a parallel track, the NOAA/NASA Instrument Team also have personnel on-site participating in readiness reviews and training for the upcoming mechanical testing of the Metop-C satellite in Toulouse, France.

NOAA believes that there are sufficient engineering processes in place to ensure that the instruments on Metop will perform as designed.

b. If something happens to the NPOESS Preparatory Project (NPP) or the VIIRS instrument, and the Europeans have trouble with these older instruments, it could cause the loss of data from two orbits. What is the operational impact of such a data loss?

A4. (b) The operational impact of losing all data from both the European satellite in the mid-morning and NOAA satellite in the afternoon polar orbits would be catastrophic to the Nation. Observations from the microwave and infrared sounder instruments on these satellites are critical to the accuracy of National Weather Service forecast models. Without these data, model forecast accuracy will revert to 1970s levels. The ability to accurately predict weather events 3–5 days in advance will be severely degraded.

The operational impact of losing the imager data from both the European and NOAA polar orbiting satellites is also significant. The Advanced Very High Resolution Radiometer (AVHRR) on the current NOAA and European satellites provides many products used by NOAA and its customers to monitor and predict changes to the atmosphere, oceans, and land.

AVHRR is the primary source of observations for the NOAA global sea surface temperature product, used in atmosphere predictions and ocean models, hurricane forecasting, fisheries management, and many other applications. In the high-latitude regions of the globe, including Alaska, where NOAA geostationary satellites have limited coverage, AVHRR is the primary source of satellite data for use in weather forecasts and warnings to the public. AVHRR detects volcanic ash plumes, which are hazardous to aviation, and can be carried thousands of miles from their source. It is also used for wildland fire detection and response activities, and as input for warnings to the public on smoke and other unhealthy air advisories. AVHRR is also an input to the NOAA global vegetation index product, and is used by the U.S. Department of Agriculture, the U.S. Geological Survey, and the U.S. Agency for International Development for drought monitoring and other land products.

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[1] The NOAA provided instruments are the Advanced Very High Resolution Radiometer (AVHRR/3), the Advanced Microwave Sounding Unit (AMSU–A), the High Resolution Infrared Radiation Sounder (HIRS/4), and the Space Environment Monitor (SEM).

Current NOAA and European Metop polar-orbiting satellites carry a Space Environment Monitor (SEM) to measure the impacts of the space weather environment on the satellite and its sensors. The SEM suite of instruments provides us with the ability to determine if the magnitude of solar events, such as geomagnetic storms, will be detrimental to telecommunications and power grids. In the future, the Metop and the Defense Weather Satellite System (DWSS) will carry SEM, from which NOAA will leverage their data needs.

NOAA and European satellites also carry a Search and Rescue Satellite Aided Tracking (SARSAT) antenna/transmitter and on-board storage system to receive and relay distress signals from mariners, aviators, and other users who have activated their beacons. Without this capability on NOAA and European polar-orbiting satellites, the ability to locate distressed individuals in a timely manner is reduced, leading to an increased risk of injury or death.

Finally, NOAA and European satellites carry a Data Collection and Relay Service, called Argos. The system consists of an antenna/transmitter and on-board storage system to receive signals from remote platforms, such as ocean buoys, remote weather stations, and endangered animal species. In many cases, Argos is the only way to monitor changes, such as the pre-cursor changes to the ocean environment in remote locations, which signal the start of an El-Nino or La-Nina event.

The operational impact of losing all data from both the European satellite in the mid-morning and NOAA satellite in the afternoon polar orbits would result in loss of capability across the global weather community. The lack of information and data would affect each and every U.S. citizen. NOAA would be unable to provide advance warning of extreme weather conditions and events, which would impact military planners, airport planners, emergency managers, environmental disaster responders, Alaskan mariners and pilots, coastal residents, and fisherman. Across the Nation and throughout the global weather community, NOAA's ability to provide weather information needed to make decisions to protect lives and property would be compromised.

Q5. Although the Nunn-McCurdy requirement of recertification only applied when the Department of Defense provides funding to a program, NOAA and NASA have each been directed to provide a baseline for the National Polar-orbiting Operational Environmental Satellite System (NPOESS) in two separate laws. Public Law 109–155 and Public Law 110–161 require NASA and NOAA to perform this baselining. Even with the dissolution of the NPOESS program into the Joint Polar Satellite System, or JPSS, it would not remove the requirement of rebaselining.

a. Where is NOAA in the process of this task?

A5. (a) NOAA notes that the NPOESS Program was explicitly excluded from the reporting requirements in section 112(a)(3) of Public Law (PL) 110–161. However, going forward, NOAA will comply with the provisions of PL 110–161 for the JPSS program.

The JPSS program planned to establish a formal baseline for both the JPSS Program and the first mission, JPSS–1, by the 4th Quarter of FY 2011. This plan was made with the assumption that the program would receive the President's requested FY 2011 funding. The delay in receiving FY 2011 funding created uncertainty in the program and led the program to focus much of its existing resources on fielding and testing the ground system in support of the NPP mission (scheduled for launch in October 2011), which NOAA plans to use to support its operational weather forecasting mission. The additional FY 2011 funds that NOAA has redirected to JPSS (please see the Department's spend plans submitted on June 15, 2011 for more details) combined with receipt of the FY 2012 appropriation of $1.070 billion, will allow the program to ramp up work on JPSS instruments and spacecraft; however, the funding delays have prevented the JPSS program from completing the program baseline as planned.

b. When can we expect to see a full life-cycle accounting of the JPSS program compared to the original NPOESS program?

A5. (b) Due to the postponement of JPSS formulation into FY 2012, the program will not have a full life cycle baseline until the 3rd Quarter of FY 2012. The program is currently re-planning the formulation phase of JPSS based upon the final FY 2011 appropriation, and should have an updated schedule this summer.

Q6. NOAA has provided a 90% certainty of a forthcoming data gap if funding is not provided for JPSS. Please provide a description of how this figure of 90% certainty was attained, including assumptions, calculations, and procedures used to generate the estimate.

A6. There is now at least a 90% probability of a gap since the requested increase of $677.8 million for the JPSS Program was not provided in the FY 2011 Continuing Resolution Appropriations Bill (P.L. 112–10). This gap probability was derived by using a series of probability runs that are common in the satellite community. The number is derived by taking the probability of selected components still fully functioning at their end of design life (called wear-out probability) and forms an overall probability of the mission still performing at the same period. Only the critical (those which perform the key parts of the mission) sensors and the spacecraft (the electronics and communications part of the mission) are considered. For NPP and JPSS, NOAA used the spacecraft and the following sensors, Visible/Infrared Imager/Radiometer Suite (VIIRS), Advanced Technology Microwave Sounder (ATMS), and Cross-track Infrared Sounder (CrIS) in its assumptions.

The critical sensor wear-out probabilities are multiplied by the space craft wear-out probability over time to form a wear-out curve. This is combined with a random probability of success (done by running thousands of simulations) and plotted against time (data are derived in monthly increments) to get the probabilities in question.

Q7. As you know, the Space Weather Prediction Center's critical solar wind and storm prediction satellite, the Advanced Composition Explorer (ACE), is currently failing. NOAA and the President's budget request have indicated that the former NASA environmental observation satellite, Deep Space Climate Observatory (DSCOVR), is to be selected as its replacement.

a. What other options have been considered beyond DSCOVR and in what way is DSCOVR better suited to meet the Nation's important space weather prediction needs?

A7. (a) NOAA considered three options for the follow on to the Advanced Composition Explorer (ACE) satellite. One option was to refurbish the existing Deep Space Climate Observatory (DSCOVR) satellite. The second option was to build a new government procured satellite with a government procured launch vehicle. The third option was a potential commercial data buy. A joint-agency, Office of Science Technology Policy (OSTP)-requested study determined that refurbishing the existing DSCOVR satellite is the most favorable option on the basis of cost, risk and schedule. An independent NOAA–Air Force analysis concurred with this finding.

The Nation is currently at risk for a gap in solar wind measurements because the existing assets have been operating well beyond their design lives.[2] This is a serious concern given the need for reliable warnings of geomagnetic storm conditions that can negatively impact global military operations, communications, the nation's electrical grid, aviation, and other activities. Based upon the extensive interagency analyses regarding the most favorable approach for addressing this concern, NOAA has partnered with NASA and has the highest confidence in the schedule, costs, and risk assessments associated with the DSCOVR refurbishment option. The DSCOVR satellite, which will be positioned at the Sun-Earth Lagrangian Point (L1), already has space weather sensors that have been thoroughly tested by NASA and, after refurbishment, could be made flight worthy. Steps for this refurbishment are well understood. Further, the L1 point is located approximately one million miles inside the Earth's orbit around the Sun and is the ideal location for a solar winds monitoring platform. The DSCOVR satellite bus has been stored under carefully regulated climate controlled conditions for the last ten years. It can be launched in FY 2014 if NOAA receives the $47.3M requested in FY 2012 to begin refurbishment and the U.S. Air Force receives the FY 2012 funds of $134.5 million it requires to support the launch and launch services for DSCOVR.

While refurbishing DSCOVR for this purpose is the prudent and appropriate next step to address our solar wind monitoring needs, NOAA continues to assess the potential of commercial services for the future and will solicit commercial participation in the DSCOVR project for the purpose of assessing the performance of the commercial business case in association with an operational space weather warning project in order to assess future commercial viability.

b. Congressional staff have requested a report from the Office of the Federal Coordinator for Meteorology (OFCM) that was submitted to OSTP regarding the other options for ACE's replacement. Can you assist the Committee in the procurement of that document?

A7. (b) We have informed OSTP of the Chairman's request for a copy of the study.

[2] NASA Solar and Heliospheric Observatory (SoHO, also at L1) has been operating for 16 years, and the Advanced Composition Explorer (ACE) has been in orbit for 14 years.

Q8. The National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling Staff Working Paper titled, "The Amount and Fate of the Oil" notes that "in late April or early May 2010, NOAA wanted to make public some of its long-term, worst-case oil trajectory models, which were based upon flow rates of up to 50,000 bbls/day, and requested approval to do so from the While House's Office of Management and Budget. The Office of Management and Budget did not grant NOAA's request."

a. Please explain OMB's authority to approve or deny NOAA's request to release worst-case oil trajectory models?

b. What was OMB's official role within the National Incident Command (NIC) hierarchy?

c. Did OMB supersede the U.S. Coast Guard's role within NIC?

A8. (a–c) OMB did not prevent release of information regarding oil spill trajectory models, nor did it supersede the U.S. Coast Guard's role within the National Incident Command. Consistent with its traditional coordination role for Executive Branch agencies on legislative, budget, and regulatory matters, OMB coordinated interagency review of materials related to the oil spill, including NOAA's report on the potential threats to U.S. coastlines that might result before a relief well stopped the flow. OMB worked to help ensure that the information conveyed to the public was as clear as possible and reflected input from the relevant agencies, as well as the latest response efforts. The report was released on July 2, 2010. As NOAA concluded in its letter to the National Commission on the BP Deepwater Horizon Spill and Offshore Drill, "I believe the end product was consistent with the highest professional standards and best available scientific data."

Q9. The budget for the Office of Oceanic and Atmospheric Research (OAR) includes a reduction of $3 million for the Unmanned Aircraft Systems (UAS) research program. This program seems to be the innovative, transformative research that you describe as being OAR's new mission and seems to have the potential for long term benefits at very little upfront cost.

a. Where do these aircraft come from and how much does NOAA pay for them?

A9. (a) The NOAA UAS Program has conducted a wide variety of scientific UAS demonstrations using high, medium, and low altitude platforms and payloads. Generally, these demonstrations are conducted in partnership with other Federal agencies, universities, or private industry who own UAS assets. During the last three years, the NOAA UAS Program has utilized approximately 75% of its annual program budget to sponsor field demonstrations with partners. The NOAA UAS Program contributes approximately $200,000–500,000 per demonstration through university grants or interagency agreements. One exception was a NOAA contribution of $3.5 million plus personnel and payload support for a three-year partnership with NASA to demonstrate the scientific capabilities of the high altitude Global Hawk UAS. NOAA generally provides in-kind contributions such as personnel support or ship services to field demonstrations conducted with private industry. NOAA has also purchased five small low altitude short endurance UAS for an approximate total of $800,000. The results of these numerous demonstrations have identified promising UAS technologies which could improve NOAA observations for high impact, polar, and marine monitoring.

b. This program seems to be the definition of a win-win scenario, so why is it being cut?

A9. (b) In FY 12, NOAA requested a decrease of $3 million to reflect the planned completion of the High-Altitude Long-Endurance (HALE) UAS testing and demonstration program. Currently, the UAS Program is drafting its Strategic Plan, to be completed by the end of FY 11. OAR and NOAA hope to reemphasize and renew an even greater focus on innovative and transformative research by identifying emerging R&D priorities to enhance U.S. competitiveness; promoting U.S. leadership in oceanic and atmospheric science in the applied use of such knowledge; and advancing ocean, coastal, Great Lakes and atmospheric R&D, including transformational research, consistent with NOAA's mission.

Q10. It is the Committee's understanding that OAR is currently using less than $2 million of the $13 million annual Information Technology R&D appropriation for the integration and conversion of commodity 64-bit Graphic Processor Units (GPUs) into "massively parallel fine-grain" supercomputer boards to run weather and climate models up to 30 times faster.

a. Can you provide more detail and specificity regarding GPU potential for increasing NOAA high-performance computing capability and reducing hardware costs through this innovative initiative?

A10. (a) The use of Graphics Processor Units (GPU) is showing great promise as an innovative and cost effective approach to increasing the computational capability for NOAA, especially for geophysical (weather and climate) models. In order to effectively use GPU systems to run geophysical models, however, a completely new approach to programming these models is required. This is because most current models have been designed to run on computing systems with a relatively smaller number of powerful processors, with each processor making complex calculations over one data point (for example: one spatial point out of many points across a geographic region) at the same time. This type of computing system differs from GPU systems that are highly parallel, or comprised of a large number of significantly less powerful, relatively less expensive, processors that are programmed to simultaneously execute the same calculation over different data points. Because geophysical models themselves are highly parallel—i.e., require many of the same relatively smaller calculations to be run on vast numbers of data points—GPU systems are proving to be a good fit and able to provide extraordinary speed and savings as compared to existing systems. This additional speed allows for additional computing capability over the same time period.

NOAA's Earth System Research Laboratory in collaboration with industry has been researching a programming approach for GPUs that scientists could use to develop geophysical models. Recent research has demonstrated that a full atmospheric model runs 30 times faster on a GPU system, as compared to a standard single CPU. The cost performance comparison for a GPU versus a standard multicore cluster has yet to be determined. By pursuing research needed to run weather and climate models on GPUs and other similar technologies, NOAA is advancing transformative research and technology development at the cutting edge of cost and performance innovation in support of its operational weather and climate supercomputer acquisitions.

b. What is the optimal annual level of funding to most rapidly research and develop this technology and maximize performance?

A10. (b) Answer: NOAA's Information Technology appropriation has kept NOAA at the forefront of cost effective and state-of-the-art supercomputing. With the exciting new potential for massively parallel fine grain computing, NOAA is assessing the possibility of reprioritizing some of its developmental efforts, particularly at its three supercomputer development centers (National Center for Environmental Prediction (NCEP), Geophysical Fluid Dynamics Laboratory, and Earth System Research Laboratory) to pursue the use of GPUs and other similar technologies for their respective weather and climate models.

c. What level of annual funding starting in FY 2011 is required to make much more affordable GPU high-performance computing capability available for the next planned NOAA supercomputer infrastructure procurement or acquisition?

A10. (c) In FY 2011 and previous years, about $2 million of NOAA's Information Technology appropriation has been used to develop the basic approach needed to use GPUs for an atmospheric model (ocean and other geophysical models are similar enough that they can use the same software frameworks).

Q11. Since the announcement of the NOAA Climate Service proposal in February, 2010, have offsite trips, travel, conferences, workshops and/or retreats been used to make transition and reorganization decisions and do Climate Service planning, development, strategy, vision, and implementation?

a. How many meetings outside the Washington DC metro area have there been?

A11. (a) NOAA's climate research, information and services staff and capabilities are distributed throughout the United States in numerous labs and centers. In order to ensure NOAA's climate vision, strategy, and priorities reflect the breadth of its expertise, it continues to be critically important for the agency's key climate scientists and managers to be brought together in person from time to time. Particularly, as NOAA developed its reorganization proposal and the draft Vision and Strategic Framework, it was more critical than ever that NOAA hear from scientists and managers across the agency to ensure that these developments benefit from their insights, expertise, and experience.

Since NOAA's announcement in February 2010 of the intent to create a Climate Service in NOAA, there have been a total of five meetings outside the Washington, DC metro area focused on developing NOAA's reorganization proposal, which is con-

tained in our fiscal year (FY) 2012 Budget Request currently before Congress for approval, and writing the draft Vision and Strategic Framework document. The majority of these meetings have been held in locations where NOAA has facilities (one in Boulder, CO and two in Asheville, NC), and the others were held in a central location (Chicago, IL) relative to the NOAA scientists and managers who participated.

b. How many NOAA employees have traveled and attended these gatherings outside the Washington, DC metro area?

A11b. A total of approximately 81 NOAA employees have traveled to one or more these five meetings. The number of employees who traveled to each meeting is listed below.

1. Boulder, CO. 65 travelers.
2. Asheville, NC. 12 travelers.
3. Chicago, IL. 13 travelers.
4. Chicago, IL. 23 travelers.
5. Asheville, NC. 23 travelers.

c. How much has all such travel cost?

A11. (c) Total travel costs (e.g., airfare, lodging, per diem, ground transportation, and miscellaneous) for these meetings were approximately $117,517.61.

d. Please submit a listing of all the trips, conferences, workshops, retreats, and other sessions, their itineraries, who attended, and how much each cost NOAA?

A11. (d) Meetings listed below were attended by climate scientists, subject matter experts, lab and center directors, headquarters staff, and administrative staff, including representatives across all NOAA Line Offices.

1. Boulder, CO. Travel cost: $ 61,979.60; no facilities cost.
2. Asheville, NC. Travel cost: $ 12,433.93; no facilities cost.
3. Chicago, IL. Travel cost: $ 17,542.00; facilities cost: $16,486.32 (for both Chicago meetings).
4. Chicago, IL. Travel cost: $ 29,784.55; facilities cost included in item 3.
5. Asheville, NC. Travel cost: $ 12,263.85; no facilities cost.

Questions submitted by Representative Randy Neugebauer

Q1. In your written testimony you specifically mentioned that your budget proposal makes responsible reductions. As I am sure you are aware, we are currently facing a $1.6 trillion deficit this year and a national debt over $14 trillion. Even if you make choices within the budget to cut certain programs, you are still drastically increasing spending in other areas. How can any budget that, in total increases funding by nearly 16 percent over Fiscal Year 2010 levels be considered fiscally responsible?

A1. The Fiscal Year 2012 President's Budget request is the result of a rigorous bottom-up review. NOAA continues to be as efficient as possible in performing its mission and is also committed to controlling costs by proposing planned reductions for FY 2012. The reductions to lower priority programs were made out of necessity and many of those cuts, under different budget conditions, NOAA would not support. In addition to the program cuts, a large reduction is $67.7 million in administrative costs. These reductions are a key component of the President's Administrative Efficiency Initiative and were identified by consolidating activities, identifying more efficient acquisition vehicles, and cutting back on travel.

Most of the proposed budget increase for FY 2012 is related to NOAA's on-going satellite acquisitions, critical assets for many of NOAA's programs and services. $687.8M of the $749.3M increase is associated with NOAA's Joint Polar Satellite System (JPSS). With the transition from the National Polar-orbiting Operational Environmental Satellite System (NPOESS) program to JPSS, NOAA is now solely responsible for acquiring polar satellites for the afternoon orbit and ground system development, activities that were previously shared with the Department of Defense.

NOAA's satellites, including JPSS, are critical to our Nation's infrastructure and economy and provide 98% of the input to the Nation's prediction models. They ensure the safety and viability of the maritime commerce sector. They allow coastal

managers to safely evacuate millions of residents during hurricane season. They give our farmers the long-term weather information that they need to know when and what to grow. They provide our military and homeland security leaders with critical information to keep our Nation safe and deploy troops overseas.

The U.S. weather satellite program has been in place since the early 1960s and is now threatened by funding uncertainty. Funding decisions made now will determine the long-term costs and the quality of essential weather services provided by NOAA to the American public as early as 2016.

Delivering satellites and their data services on time maximizes the public benefit, allows the government to execute acquisitions at the lowest cost, and demonstrates NOAA priorities are focused on its most critical assets to protect lives and property.

Q2. What practices will you put in place to ensure that scientific objectivity will not be compromised in favor of more agenda-driven research practices within the Climate Service, as included in FY 2012 budget proposal?

A2. Science guides all of NOAA's activities, and the proposed Climate Service would be no exception. NOAA holds itself to the highest standards of data quality and transparency, and as a science agency is well positioned to provide trusted information on climate variability and change.

This Administration is committed to the honest and open conduct of science. One of Dr. Lubchenco's first actions as NOAA Administrator was to appoint a scientific integrity team at NOAA. Their charge was to review the state of science and scientific integrity at NOAA, to actively assist the Office of Science and Technology Policy (OSTP) in developing recommendations that would strengthen the integrity of science in government, and to draft a scientific integrity policy for NOAA.

NOAA's first priority is to maintain the highest quality climate science while being responsive to user needs. The principal goal of the proposed Climate Service is to make the scientific data and information about climate easily accessible in order to help people make informed decisions in their lives, businesses, and communities.

The National Academy of Public Administration (NAPA) endorsed this approach in their study and recommended that NOAA bring its research, observation and monitoring, and service development and delivery capacity into a single Line Office. NAPA noted that, "It would undermine the whole concept of an integrated NOAA Climate Service if these research assets were not an integral part of the new line office." The National Academies of Science have also stated that a decision support initiative for climate should be "closely linked" to its research element. (Informing Decisions in a Changing Climate, 2009).

NOAA would also use the proposed reorganization as an opportunity to strategically realign its existing core research Line Office, the Office of Oceanic and Atmospheric Research (OAR), to strengthen the agency's overall science enterprise. OAR would refocus its work to serve as an innovator and incubator of new science, technologies, and applications for its missions, and an integrator of science and technology across all of NOAA. The OAR Assistant Administrator would serve as vice-chair of the NOAA Research Council. Further, as leader of the central research Line Office, the OAR Assistant Administrator would become the senior advisor to the NOAA Chief Scientist.

Questions submitted by Ranking Member Eddie Bernice Johnson

Q1. The President's budget request includes a $2 million increase for research related to wind renewable energy. It is my understanding that NOAA is working closely with the Department of Energy on this research.

a. Please describe your wind research activities?

A1. (a) NOAA is currently engaged in several wind research activities in relation to renewable energy. Several projects and initiatives are described below:

1. **Boundary Layer Characterization Research in the NOAA FY 12 Budget**—NOAA is requesting $2 million in FY 12 to improve the Nation's understanding of the atmospheric phenomena driving and determining boundary layer winds. Developing more accurate nationwide wind forecasts will enable industry to make more accurate predictions of wind power production, which will help facilitate the expansion of U.S. clean energy generation. Additionally, the improved weather forecasts that result from this work will benefit many other NOAA efforts and national priorities, such as aviation, surface transportation, air quality, and plume dispersion studies. The $2 million will focus on two activities:

a. *(1) Deploying wind test beds*—To improve short-term operational predictions, NOAA will deploy wind test beds in different regions of the Nation because there are different factors that influence weather, including wind speeds and wind direction in different regions. These test beds will help determine the optimal mix of instrumentation needed for wind resource characterization and forecast improvement. Regions include the Pacific Northwest, offshore along the Atlantic Coast, the Appalachian region, the inter-mountain west, and California.

b. *(2) Improve the HRRR weather model*—The observations collected at the test beds will be used to initialize the High-Resolution Rapid Refresh (HRRR) weather model to understand how to best utilize new observations in different locations to produce a more accurate forecast of wind speed and direction. In addition, operational observations will be obtained and assimilated into the HRRR weather model. NOAA will leverage high performance computing investments that the agency has already made to facilitate improved Numerical Weather Prediction forecasts.

2. **Wind-Forecast Improvement Project (WFIP)**—The WFIP is a 12-month field demonstration project funded by the Department of Energy (DOE) that will occur in two regions of the country: the upper Midwest and Texas. DOE is funding NOAA in this project because DOE recognizes NOAA as a key partner in the atmospheric science and services required for the development of renewable energy. NOAA's weather forecasts are currently used by the renewable energy sector but are not advanced enough to provide the level of accuracy needed. The WFIP is a one-time field project, and it aims to demonstrate that forecasts of turbine-level (80–100 m) wind speeds and wind ramp events can be improved by collection and assimilation of additional meteorological observations. In addition, the results of the WFIP will add to the published estimates of the economic value of wind forecasts to the energy industry. Published studies currently indicate that day-ahead wind forecasts save the industry $1-$5 billion per year.

   To do this, NOAA will deploy meteorological instruments, run a research-grade weather model (High-Resolution Rapid Refresh model), and analyze data from the WFIP. DOE is also funding two private-sector companies that will use NOAA's improved wind forecasts to create more accurate wind power predictions in the WFIP.

3. **Collaboration with Duke Energy Generation**—NOAA's Air Resources Laboratory (ARL) is currently working under a Cooperative Research and Development Agreement (CRADA) with Duke Energy Generation (headquartered in Charlotte, NC). This CRADA was initiated as a public-private partnership to explore potential improvements in techniques used to support hub-height wind forecasts. Through the CRADA, ARL has deployed various weather measurement capabilities at the Duke Energy's Ocotillo wind farm located near Big Spring, Texas. The goal is to conduct research on the structure of low-level winds affecting wind turbines. ARL's research and observations are also being made available to the various NOAA weather forecast groups supporting renewable energy.

4. **Planning for the Future via the NOAA Energy Team**—On January 24, 2011, a memorandum of understanding (MOU) formalized cooperation between the DOE/Energy Efficiency and Renewable Energy and DOC/NOAA to work on initiatives of mutual benefit and interest to the two parties on weather-dependent and oceanic renewable energy. The MOU also requires that by May 20, 2011, the two parties sign an action plan that identifies key challenges, goals and proposed initiatives to develop improved science and services to support growth of renewable energy, such as wind (terrestrial and offshore), solar, biomass/biopower, conventional hydropower and marine hydrokinetic (waves, tides, and currents). A draft action plan is currently being prepared.

Q1. (b) What is the arrangement between DOE and NOAA and what is DOE's contribution to NOAA's work? Is DOE procuring equipment for NOAA or providing technical assistance related to wind energy generation?

A1. (b) While DOE is not procuring equipment or providing direct support for this wind research initiative, staffers of the two agencies meet regularly to share information and advice on how to best support the information needs for wind, solar and other renewable energy generation such as hydrokinetic and biomass sources. The primary focus of this request is wind energy as DOE and NOAA are in agreement

that the information needs for wind energy are currently most pressing and most attainable. NOAA's expertise lies in meteorology and climate science that are needed for optimal operations and planning for both renewable energy generation and facility siting. Separate from the FY 12 request for Boundary Layer Characterization Research (as described above), DOE is funding NOAA to participate in a one-time, 12-month field research project. This project is called the Wind Forecast Improvement Project (WFIP). NOAA hopes to have all instruments turned on and collecting data from July 2011–July 2012.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Dr. Paul Anastas, Assistant Administrator, Office of Research and Development(ORD), U.S. Environmental Protection Agency

Questions submitted by Chairman Ralph Hall

IRIS ASSESSMENT

Q1. On June 15th, the EPA placed the IRIS assessments for several chemicals "on hold" citing the need to determine whether questions raised by the National Toxicology Program's review of the Ramazzini Institute's methanol study will require the Agency to revise the assessments or take additional action to verify the data used in these assessments.

a. It is my understanding that the Agency is in discussions with the National Institute of Environmental Health Sciences (NIEHS) to send an additional team of pathologists to Italy to visit the Ramazzini laboratory to conduct a full review of the chemical studies in question. Is that accurate?

A1. (a) EPA and NIEHS are jointly sponsoring an independent Pathology Working Group (PWG) review of selected studies on methanol, MTBE, ETBE, acrylonitrile, and vinyl chloride conducted by the Ramazzini Institute. The PWG review is currently underway and involves a team of pathologists traveling to the Ramazzini laboratory in Italy to conduct the review.

b. If so, how do you intend to conduct this review?

A1. (b) EPA coordinated with NIEHS to outline the issues related to the specific chemicals of concern and is co-sponsoring the effort. NIEHS is overseeing the PWG review, which was designed in accordance with standard procedures established for NIEHS's National Toxicology Program (NTP) pathology reviews.

c. What will you do to ensure that this effort is conducted in a fully transparent manner that allows for the public to comment?

A1. (c) EPA announced in an April 11, 2011 press release that a PWG review was being conducted, co-sponsored by NIEHS and EPA and in cooperation with the Ramazzini Institute. The PWG review is ongoing and is being conducted independently by NIEHS using standard pathology review procedurespathology review procedurespathology review procedures [1]

d. If you are not in discussion with NIEHS, please tell me in detail what you are doing regarding the IRIS assessments that are currently on hold?

A1. (d) EPA continues to work closely and collaboratively with NIEHS on methanol cancer review. The non cancer assessment for methanol is not impacted by Ramazzini data and is moving forward to an independent external peer review. Based on other available data, EPA has determined that reliance on Ramazzini Institute study results is not necessary to continue with assessment development for MTBE, ETBE and acrylonitrile (EPA released for a 60 day public comment and peer review on June 30, 2011), including an assessment of cancer risks. Therefore, work on the assessments for the three chemicals will continue during the PWG review.

RAMAZZINI INSTITUTE

Q2. In June 2010, EPA announced that it had "under[taken] a thorough review of all ongoing and previous chemical assessments to determine which, if any, relied substantially on cancer testing from the Ramazzini Institute," had "found four ongoing chemical assessments—on methanol, MTBE, ETBE and acrylonitrile—that rely significantly on cancer data from the Ramazzini Institute," and had "placed those assessments on hold and will determine whether the questions raised by NTP will require EPA to revise the assessments or take additional, action to verify the data used in these assessments." The TCE assessment relies substantially on Ramazzini data, both to support its conclusion that TCE is a kidney carcinogen, the endpoint that drives the cancer risk assessment, and to

[1] Standard procedures outlined in p605–608 Principles in toxicology http://books.google.com/books?id=vgHXTId8rnYC&pg=PA606&lpg=PA606&dq=pathology+working+group+procedures&source=bl&ots=IW8kjubP–d&sig=iSYelcWvpgzlxs5002MMIKUudME&hl=en&ei=naTJTdnMEafu0gGvhemZCg&sa=X&oi=book_result&ct=result&resnum=5&ved=0CDAQ6AEwBA#v=onepage&q=pathology %20working%20group%20procedures&f=false

derive the cancer potency factor. Has EPA verified the TCE Ramazzini data? If not, why has EPA not placed the TCE assessment on hold along with the others?

A2. In EPA's 2009 draft Toxicological Review of Trichloroethylene (TCE), cancer potency estimates are based on epidemiologic data indicating that TCE increases the risk of cancer in humans. Human studies (see references below) are also the primary basis for the proposed conclusion in the draft assessment that TCE is a kidney carcinogen. EPA does not use the animal studies [e.g., Ramazzini Institute studies (Maltoni et al. 1986 and 1988)] as the primary basis for concluding that TCE is a human kidney carcinogen, or to derive the cancer potency factor in the draft assessment.

Multiple positive rodent bioassays, one of which is the "Ramazzini data," lend additional support for the human-based cancer classification and cancer potency values. The results from each of the independently run rodent bioassays are similar. In other words, multiple independent studies produced similar results. Therefore, removing one of these independent supporting studies (e.g., Ramazzini) would have no effect on EPA's conclusions regarding the qualitative or quantitative assessment of cancer. EPA is not considering removing any study from the TCE assessment at this time.

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HALOGENATED PLATINUM COMPOUNDS

Q3. The IRIS program continues to be on the GAO High Risk list. Much, but by no means all, of the GAO's stated concerns focus on the slow pace of completion of IRIS assessments. The Committee believes the Agency should improve the way it allocates its limited resources and more effectively prioritize the candidates for assessment. Please explain the process the Agency uses to prioritize candidate substances for review. Why did EPA choose to initiate an IRIS assessment of halogenated platinum compounds when there is no scientific information to conclude that there is the risk of ambient exposure?

A3. In its solicitation for nomination of new chemicals, EPA asks the public, interagency partners, and Agency programs and regions for information to help prioritize the need for IRIS assessments. This information includes:

- potential public health impact,
- EPA statutory, regulatory, or program-specific needs,
- availability of new scientific information or methodology that might significantly change the current IRIS information,
- interest to other governmental agencies, the public or other stakeholders outside of EPA (e.g., states, tribes, local governments, environmental organizations, industries, or other IRIS users),
- availability of other scientific assessment documents that could serve as the basis for an IRIS assessment, and
- other factors such as widespread exposure or potential susceptible groups that would make the substance a high priority for assessment.

EPA then uses this information to inform the decisions on which assessments to undertake. Two of the more important pieces of information that are used to gauge whether an assessment will be placed on the IRIS agenda are EPA program and regulatory needs and the availability of Agency resources to complete an assessment.

EPA's Office of Research and Development (ORD) proceeded with an IRIS assessment of halogenated platinum compounds because EPA needed the assessment to inform its evaluation of platinum *fuel additives* for diesel engines in EPA's diesel retrofit program. EPA has posted a general statement regarding emissions from the use of platinum-based fuel additives that can be found at: http://www.epa.gov/cleandiesel/verification/verif-list.htm (PDF file is found at: http://www.epa.gov/cleandiesel/documents/420b08014.pdf). The need for the assessment of halogenated platinum salts and platinum compounds was not related to any concerns regarding emissions from catalysts commonly used on automobiles.

RELATIONSHIP OF FUTURE CSS WORK TO EXISTING IRIS WORK

Q4. How will the new draft plan "Framework for an EPA Chemical Safety for Sustainability (CSS) Research Program" inform existing or pending IRIS assessments if the intent of the CSS research program is to look at chemicals in a more holistic, sustainable framework?

A4. Once finalized, the draft CSS Framework will guide EPA's chemicals-related research activities over an approximately five-year period beginning October 2011, thus its impact on current IRIS assessments may not be large in the short term for assessments being finalized and ones which have already undergone peer review. Results from the CSS program will be used as soon as they become available and are peer reviewed. These early inputs of CSS research will inform IRIS assessments under development by elucidating mode(s)-of-action and toxicity pathway information that informs hazard and dose-response assessments. This evidence is anticipated to strengthen weight of evidence determinations in IRIS assessments under development. The CSS program will derive information coming from alternative animal species testing, high-throughput and high content data source and will be integrated with other biological measurements to inform health assessments like those contained in IRIS. We expect the CSS research program to play an important role in informing IRIS assessments in the future. As defined by an approximate 3–5 year time horizon, one of the key objectives of the CSS program is getting stakeholder involvement and buy-in for the application of these new data in assessments. The full impact of CSS on IRIS must factor in this process and the routine inclusion into assessments will realistically take a few years.

INORGANIC ARSENIC

Q5. The Science Advisory Board recently concluded its review of the IRIS assessment of inorganic arsenic. The SAB noted that it was not asked to conduct a full peer review of the assessment, including EPA's calculation of the cancer risk estimate, a critical element of EPA's conclusions regarding arsenic. Why did ORD intentionally limit the scope of the SAB peer review? Why has EPA never obtained independent peer review of the cancer slope factor it asserts for arsenic?

A5. The SAB completed, in 2007, an independent peer review of the 2005 External Review Draft Toxicological Review of Ingested Inorganic Arsenic. After revising the draft assessment and in response to comments received from external stakeholders, EPA went well beyond the normal peer review process and opted to conduct a second external peer review focused on EPA's implementation of the recommendations received from the 2007 SAB panel. In other words, the 2010 SAB panel review was a second peer review of the revisions that were made as a result of the 2007 SAB panel review. The scope of the review was discussed at the SAB face-to-face meeting on April 6–7, 2010, as well as during the chartered SAB meetings on June 16, 2010, and November 22, 2010. The following text was contained in the ChargeJune 16, 2010, and November 22, 2010. The following text was contained in the ChargeJune 16, 2010, and November 22, 2010. The following text was contained in the Charge [2]

> *"The goal of this focused external peer review is to evaluate EPA's implementation of the key SAB (2007) external peer review recommendations. This focused review should concentrate on EPA's Response to the SAB comments in Appendix A and the corresponding revisions in the 2010 draft IRIS assessment. Please provide specific response to the Charge below. If there are recommendations for further changes or additions to the assessment, please provide specific information on how those changes could be implemented with the currently available scientific information."*

EPA completed an independent peer review of the EPA cancer modeling approach including the derivation of the oral CSF for inorganic arsenic through the Science Advisory Board (Advisory on EPA's Assessments of Carcinogenic Effects of Organic and Inorganic Arsenic [3]) in 2007. The charge (see Section A–1 of the Advisory report) presented to this 2007 SAB included five questions specific to the cancer modeling approach, including the derivation of the oral CSF. The 2007 SAB responded with several recommendations for revision and corrections to the derivation of the oral CSF contained within the EPA's 2005 External Review Draft Toxicological Review of Ingested Inorganic Arsenic. [4] EPA considered all of the conclusions and recommendations from the 2007 SAB report in preparing the current 2010 External Review Draft "Toxicological Review of Inorganic Arsenic (cancer)." We note that the oral CSF falls within the range of risk estimates developed by the National Research Council in 2001, as indicated on page 137 of the 2010 External Review Draft "Toxicological Review of Inorganic Arsenic (cancer)."

ENDOCRINE DISRUPTION SCREENING PROGRAM

Q6. The EPA has proposed a second list of 134 chemicals for testing under the Endocrine Disruptor Screening Program (EDSP), which is intended to screen chemicals for their potential to interact with the human endocrine system. In publishing this list of chemicals, the EPA failed to abide by a requirement from the Office of Management and Budget that the Agency report on the actual costs and time companies have invested in the first round of testing of 67 pesticides.

a. With testing costs estimated to be as high as $1 million per chemical, what is the EPA doing to ensure that experience gained from the first round of testing is captured before requiring testing for the second EDSP list?

A6. EPA is committed to producing a full review of the EDSP Tier 1 Screening Battery to "ensure that experience gained from the first round of testing is captured." EPA is currently reviewing the public comments we received on the amendment to the original EDSP Information Collection Request. A full review of the EDSP Tier 1 Battery cannot occur until data from the first list of chemicals have been submitted and reviewed. The first sets of data from EDSP List 1 are not due until Octo-

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[2] http://yosemite.epa.gov/sab/sabproduct.nsf/C74350B789B646D4852576D900693B14/$File/ORD–NCEA+Charge+Memo+for+ARSENIC–WG+Feb+26+2010.pdf

[3] http://yosemite.epa.gov/sab/sabproduct.nsf/EADABBF40DED2A0885257308006741EF/$File/sab-07–008.pdf

[4] http://oaspub.epa.gov/eims/eimscomm.getfile?p__download—id=494513

ber of this year. The last due date for the submission of data from EDSP List 1 is May 2013. After submission of the data, the individual studies will be reviewed and integrated into decisions about the potential of the chemical to interact with the endocrine system. Only after completion of these chemical-by-chemical evaluations can EPA scientists most effectively evaluate the battery and coordinate a scientific peer review. The earliest timeframe for the completion of the scientific peer review would be 2014.

ENDOCRINE DISRUPTION SCREENING PROGRAM UNDER THE SAFE WATER DRINKING ACT

Q7. In developing the list of chemicals for the second round of EDSP screening test orders under the Safe Drinking Water Act, the Agency must demonstrate that the chemicals "may be a contaminant in drinking water" and/or that "a substantial population must be exposed" to the chemicals. However, when it published the proposed second list of chemicals the Agency simply used the unregulated contaminant list from the third Containment Candidate List (CCL3) without conducting any effort to see if each of the chemicals on the CCL3 met the critical factors that the Agency is required to consider under the SDWA.

a. What is the EPA doing to ensure that EDSP testing orders are only given to the manufacturers and distributors of specific chemicals that meet the criteria for EDSP testing established under the Safe Drinking Water Act?

A7. Section 1457 of SDWA provides that "in addition to the substances" referred to in FFDCA section 408(p)(3)(B), "the Administrator may provide for testing under the screening program authorized by section 408(p) of such Act, in accordance with the provisions of section 408(p) of such Act, of any other substance that may be found in sources of drinking water if the Administrator determines that a substantial population may be exposed to such substance." (42 U.S.C. 300j-17). The Agency used the third Contaminant Candidate List (CCL 3) and the list of regulated drinking water contaminants as the starting point to develop the second EDSP list because these compounds represent the priority chemicals for the Office of Water and the chemicals that are most likely to meet the criteria specified by SDWA 1457.

In developing the CCL 3, the Agency considered not only public water system occurrence data but also the occurrence data for ambient concentrations in surface and ground water, and release to the environment. The Agency believes these data are sufficient to anticipate contaminants that "may" occur in public water systems and furthermore, also represent those substances that may be found in sources of drinking water to which a substantial population may be exposed.

When the Agency published the second EDSP list in November of 2010, we encouraged the public to submit comments and information related to the inclusion and exclusion of chemicals from the second list. The Agency is in the process of reviewing the public comments and information it received on the list and will consider this information before finalizing the second list and the schedule for issuing test orders. If our evaluation of the public comments and information submitted by commenters indicate that we should reconsider the inclusion of contaminants that may not meet the SDWA 1457 criteria, we plan to make any necessary changes before finalizing the second EDSP list.

STAR PROGRAM vs OTHER FEDERAL GRANT PROGRAMS

Q8. Your testimony stated that "EPA will enhance its outreach to the broader scientific community through its STAR program, which funds competitive research grants across a broad range of scientific and engineering disciplines." Does this program overlap with other scientific programs that offer research grants? If so, can you distinguish the STAR program from other federal programs?

A8. EPA coordinates its research with other federal agencies and EPA programs through all stages of the STAR grant process to ensure we are funding unique research that meets the needs of the Agency. A number of steps are built into EPA's grant solicitation and award process that provide a high level of confidence that we are not funding research that overlaps with the missions of other federal agencies in a duplicative way:

- First, EPA chooses research topics based on projected future policy needs, current investments across the government, and available resources. When EPA pursues research in areas where other agencies have large investments, EPA consults these agencies during the solicitation development process.

- Second, EPA's collaboration with other federal agencies supporting related research ensures that roles are clearly defined and that EPA supports environmental research uniquely targeted to its science needs. For example, EPA's membership on the OSTP Intergovernmental Panel on Climate Change (IPCC) ensures that EPA's research is coordinated with the larger federal efforts in global change research.
- Third, EPA frequently involves experts from other agencies to serve on its external peer panels for reviewing grant proposals. These rigorous peer-reviews are performed by panelists from the National Science Foundation (NSF), the National Institutes of Health (NIH), and the Department of Homeland Security, (DHS) among others, and are a key part of the foundation on which excellence is achieved in all research programs.
- Finally, EPA coordinates scientific research with other agencies through informal interactions at scientific meetings and workshops and also works closely with other agencies to communicate research progress and results. For example, EPA's Nanotechnology Research Program has held research planning workshops with researchers from government, industry and academia to identify gaps in society's understanding of nanotechnology in relation to human and environmental health, and to guide EPA's research planning. In addition, EPA's Computational Toxicology Research Program has a Memorandum of Understanding with the U.S. Department of Health and Human Services (HHS), the National Institute of Health (NIH), the National Institutes of Environmental Health Sciences (NIEHS), the National Toxicology Program (NTP) and the U.S. Food and Drug Administration (FDA) to study high throughput screening, toxicity pathway profiling, and biological interpretation of the research findings.

EPA's Science to Achieve Results (STAR) program was evaluated by the National Academy of Sciences (NAS) who released its findings in a report titled "The Measure of STAR." According to the report, EPA's STAR program fills a unique niche by supporting "important research that is not conducted or funded by other agencies" and is "directly relevant" to the EPA's mission to protect human health and the environment[5]. The report goes on to say that "the agency has taken effective steps to ensure that the process does not suffer from conflicts of interest" by providing a "firewall that shields the peer-review process from the influence of the project officers and staff who oversee the individual-investigator, fellowship, and center awards."

The Board of Scientific Counselors (BOSC) also reviewed EPA's STAR program and claimed that STAR fellows have made "excellent contributions in environmental science and engineering. The BOSC's review highlighted the STAR program's unique ability to perform targeted and unduplicated research: "Although other federal agencies fund a number of fellowship programs, none are dedicated exclusively to the environmental sciences and engineering." Based on this finding, the Chair of the BOSC claimed that EPA's STAR program is "clearly are of value to the Agency and the nation in helping to educate the next generation of environmental scientists and engineers."[6]

Questions submitted by Representative Judy Biggert

NATIONAL CONTINGENCY PLAN SCHEDULE

Q1. I understand EPA plans to revise the National Contingency Plan (NCP) Schedule for dispersants in 2012. Can you indicate what the timeline and plans are around this revision?

A1. EPA plans to propose revisions to the National Contingency Plan (NCP) Subpart J Product Schedule regulations by the end of this calendar year. EPA projects a publication date (in the Federal Register) of December 2011. Incorporating lessons learned from the BP Deepwater Horizon Oil Spill, EPA is developing revisions to the Subpart J regulations under the NCP that govern the Product Schedule. These regulations identify the tests and information required of product manufacturers to list dispersants and other chemical agents on the Product Schedule for use on oil spills in U.S. waters. Additional toxicity testing, toxicity thresholds, and more rigorous efficacy testing parameters are some of the priority issues being examined.

[5] The Measure of STAR: Review of the U.S. Environmental Protection Agency's Science to Achieve Results (STAR) Research Grants Program

[6] James H. Johnson, BOSC Review—http://www.epa.gov/osp/bosc/pdf/star0610ltr.pdf

HYDRAULIC FRACTURING

Q2. As you know, natural gas development in the Marcellus shale, and related debate around the process of hydraulic fracturing, have received a lot of attention. There is a lot of support for this natural gas development and making sure it is done in a manner that protects the environment—specifically—water resources. How does EPA intend to support innovative technologies that can responsibly develop this resource?

A2. EPA fully supports the development of innovative, responsible technologies for extracting natural gas deposits. We are working with the Department of Energy (DOE), particularly the National Energy Technology Laboratory (NETL), on this issue. NETL has both experience and the lead at the Federal level to assess the efficacy and impacts of technologies related to hydraulic fracturing. This joint research includes wastewater treatment of produced and flowback waters. EPA and DOE wish to identify and assess the performance of options for wastewater treatment of produced and flowback waters.

Q3. As an example, your testimony mentions "green chemistry" research. Are there potential green chemistry technologies that EPA is considering for water treatment in fracturing?

A3. EPA's research efforts are currently focused on its hydraulic fracture study. In addition to our research efforts, through the voluntary Design for the Environment Program, EPA may work with industry to evaluate alternative fracturing fluid systems. The goal is to see if there are greener chemical combinations that are at least as effective as current fracturing fluids.

EPA GUIDANCE ON SELECTIVE CATALYTIC REDUCTION

Q4. On September 29, 2010, I joined several of my colleagues in a letter to acknowledge the EPA's finding that SCR systems are vulnerable to tampering and to encourage the Agency to review the rules governing the operation of such systems.

On November 19, 2010, the Assistant Administrator for Air and Radiation responded to our letter with a letter of her own. In that correspondence, Ms. Gina McCarthy indicated that the EPA planned "to issue new [SCR] guidance by the end of the year."

To date, EPA has not acted on any new guidance. Can EPA provide any idea what their timeline might be for new SCR guidance?

A4. Since July 2010, EPA has been reviewing comments and information submitted in response to the public workshop and drafting updated guidance. We plan to publish the guidance in the Federal Register for public comment within the next few months. Question for the Record by Representative Neugebauer

ENSURING SCIENTIFIC INTEGRITY

Q5. In my view the Environmental Protection Agency has recently imposed multiple costly regulations that have been based on unsettled science. Most notably, hundreds of scientists have opposed the science upon which the EPA based its greenhouse gas regulations. Moving forward, how will your agency ensure that research contains a variety of scientific input, including views that may diverge from the Administration's agenda?

A5. It is essential that the EPA's scientific and technical activities are of the highest quality and credibility for the American people to have trust and confidence in EPA decisions and actions. We welcome differing views and opinions on scientific and technical matters as an important, legitimate and necessary part of the process to provide the best possible information to regulatory and policy decisions.

Regarding your specific reference to climate change science:

EPA Administrator made Lisa Jackson made the Greenhouse Gas Endangerment Finding on the basis of the science in the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report, the work of the United States Global Change Research Program (USGCRP), and the work of the National Academy of Sciences (NAS) National Research Council (NRC). The products from all three of these groups were peer-reviewed. These reports and peer reviews involved thousands of scientists.

Most recently, in 2010 the NAS/NRC published a report- *Advancing the Science of Climate Change*—which stated that "Climate change is occurring, is caused largely by human activities, and poses significant risks for-and in many cases is already affecting-a broad range of human and natural systems." This is only the latest report by preeminent scientists that come to the same conclusion.

The report further states: "Most of the warming over the last several decades can be attributed to human activities that release carbon dioxide (CO_2) and other heat-trapping greenhouse gases (GHGs) into the atmosphere. The burning of fossil fuels-coal, oil, and natural gas-for energy is the single largest human driver of climate change, but agriculture, forest clearing, and certain industrial activities also make significant contributions."

Further, two recent publications, looking at both surveys of scientists and the scientific literature, found that 97–98% of the climate researchers most actively publishing in the field agreed on anthropogenic climate change.[7] [8] EPA is charged with making its decisions on science and in using that science for the good of the public and the environment. As such, EPA relied on the vast scientific literature, from a huge number and diversity of scientists, to develop its assessment reports and ultimately inform its endangerment finding.

In addition, EPA's Technical Support Document (TSD) for the Endangerment Finding was peer reviewed and the Endangerment Finding was subject to public comment. The peer review was conducted by a panel of federal experts, including one expert from EPA, to assure consistency with the underlying assessment reports. There were two opportunities for public comment on the Endangerment Finding, once during the Advanced Notice of Proposed Rulemaking (ANPR) process and once after publication of the Proposed Finding. The public comment period for the Proposed Finding, including formal public hearings, was held after the proposal was issued but prior to the final action being developed. Public engagement was significant: over 380,000 public comments were received. EPA responded in depth to all the arguments raised within the approximately 11,000 unique and substantive comments in a comprehensive 11-volume Response to Comments document. EPA reviewed individual submitted studies that were not included in the major assessments, with an overall conclusion that the studies did not change the judgments EPA would draw based on the assessment reports. A limited number of appropriate revisions were made to the TSD in response to the public process, usually where public comments revealed that the TSD summary of the underlying assessments could be improved. These activities demonstrate that the development of EPA's Greenhouse Gas Endangerment Finding included a broad variety of scientific input, including views that were divergent from the ultimate conclusion of the Finding.

Questions submitted by Ranking Member Eddie Bernice Johnson

E15

Q1. Several U.S. ethanol associations submitted a waiver to the EPA to increase the ethanol blend up to E15 from E10. (That is a blend of 15 percent ethanol and 85 percent gasoline.) EPA has partially granted a waiver to allow manufacturers to introduce gasoline that contains greater than ten percent ethanol and up to 15 percent ethanol (E15) for use in motor vehicles newer than model year 2001, subject to several conditions. It is the Committee's understanding that EPA is not finished with its work on this issue. What kind of research went into making the decision and what role did the Department of Energy play in conducting this research?

A1. We based our decisions primarily on key data provided by the Department of Energy's (DOE) Catalyst Study which was designed to evaluate the long-term effects of gasoline-ethanol blends, including E15, on the durability of emissions control systems, including catalysts, used in passenger cars and light trucks to control emissions. The test fleets were designed to be reasonably representative of the national passenger vehicle fleet. They included several high sales volume vehicle models and models selected for their expected sensitivity to ethanol so that any potential problems would be more likely to become apparent. The results of the DOE study coupled with the results of other relevant test programs, including studies conducted by the Coordinating Research Council (sustaining members include the American

[7] Anderegg, W.R.L., J.W. Prall, J. Harold, and S.H. Schneider, 2010: Expert credibility in climate change, Proc. Natl. Acad. Sci., 107 (27), 12107–12109.

[8] Doran, P.T., and M.K. Zimmerman, 2009: Examining the scientific consensus on climate change, EOS Trans. AGU, 90 (3), 22–23.

Petroleum Institute and a group of automobile manufacturers), confirmed the Agency's engineering assessment that the changes in regulatory requirements for MY2001 and newer light-duty motor vehicles led manufacturers to design and build vehicles able to use E15 without a significant impact on the performance of light duty vehicle emissions control systems. EPA believes that the available data and information were sufficient to grant the waiver request for MY2001 and newer light-duty motor vehicles.

Q2. Can you provide us with a timeline of the expected additional studies underway or planned for ethanol blends?

A2. As discussed in the partial waiver decisions, it is our understanding that the results of additional testing conducted by the Coordinating Research Council on E10 and E20 are expected by the end of 2011. We did not believe it was necessary to await these program results to decide the waiver request for MY2001 and newer light-duty motor vehicles given the lack of documented problems in our motor vehicle compliance program, the results of the DOE Catalyst Study and other studies, and EPA's engineering assessment of vehicle emissions systems compatibility with E15. Based on this combined body of knowledge, we expect that MY2001 and newer light-duty motor vehicles will be able to operate on E15 without experiencing long-term deterioration.

Q3. What is the long-term impact on our economic competitiveness?

A3. The increased use of renewable fuels required by the RFS2 standards is expected to reduce dependence on foreign sources of crude oil and increase domestic sources of energy. We expect that the increased use of renewable fuels needed to reach the 36 billion gallons mandated by 2022 will displace a significant amount of petroleum-based gasoline and diesel fuel relative to market projections of gasoline and diesel use in the absence of the mandate. Furthermore, we expect the rule to decrease oil imports and sustain the market for U.S. agricultural products, including corn.

HYDRAULIC FRACTURING

Q4. At the hearing in response to a question on the Hydraulic Fracturing Study Plan, you mentioned EPA would ensure that strong and thorough consideration would be given to all stakeholders concerns in an objective and transparent manner? You further committed to providing opportunities for input by stakeholders, including states, industry and academia about concerns after the study has been initiated. a. Please describe how you intend to do this while maintaining scientific integrity and meeting tight time deadlines for the report.

A4. EPA has committed to conducting the study of the potential impacts of hydraulic fracturing on drinking water resources in an objective and transparent manner. The Agency's study will be conducted under EPA's most rigorous quality assurance guidelines, which will ensure that all of the study results will be reported objectively. EPA has encouraged stakeholders to play an active role in the development of the study plan and will continue to communicate with all interested stakeholders regarding our progress.

EPA has already undertaken efforts to ensure stakeholder engagement, as well as transparency in our deliberations and implementation actions. These efforts include:

- Public meetings held in Texas, Colorado, Pennsylvania, and New York in 2010.
- Webinars and meetings with federal, state, interstate, and tribal partners during 2010.
- An e-mail inbox dedicated to receiving comments from all interested stakeholders.
- Webinars regarding the release of the draft study plan in February and March 2011
- A period for stakeholders to comment on the draft study plan to the Science Advisory Board in March 2011. We will continue to engage interested stakeholders throughout the course of the study by:

  Providing opportunities for public comment during the SAB review process. The SAB Review Panel held public teleconferences on May 19 and 25th to discuss their draft report of the review of EPA's draft Hydraulic Fracturing Study Plan. Stakeholders were provided an opportunity to submit oral or written comments for consideration by the Panel.

Holding additional webinars-or other forms of communication-to report on the progress of the study. Providing the public with an opportunity to comment to the SAB during their review of the 2012 and 2014 reports.

Summaries of all of these interactions can be found on EPA's website at http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/wells__hydroout.cfm, or on the SAB website at http://yosemite.epa.gov/sab/sabproduct.nsf/MeetingCal/153AC7DF8D2626F98525781000648075?OpenDocument.

Appendix II:

Additional Material for the Record

SUBMITTED MATERIALS BY REPRESENTATIVE DANA ROHRABACHER

Mr. Rohrabacher of California introducing 10 Quotes from the ClimateGate emails (emphasis added) regarding the manipulation of information, suppressing dissent, and other unscientific activities:

From Phil Jones (manipulating what gets considered by the IPCC as relevant):

I can't see either of these papers being in the next IPCC report. **Kevin and I will keep them out somehow — even if we have to redefine what the peer-review literature is!**

From Nick McKay (modifying data):

The Korttajarvi record was oriented in the reconstruction in the way that McIntyre said. I took a look at the original reference – the temperature proxy we looked at is x-ray density, which the author interprets to be inversely related to temperature. We had higher values as warmer in the reconstruction, so **it looks to me like we got it wrong, unless we decided to reinterpret the record** which I don't remember. Darrell, does this sound right to you?

From Kevin Trenberth (failure of computer models):

The fact is that we can't account for the lack of warming at the moment and it is a travesty that we can't. The CERES data published in the August BAMS 09 supplement on 2008 shows there should be even more warming: but the data are surely wrong. **Our observing system is inadequate.**

From Phil Jones (modification of data to hide unwanted results):

I've just completed Mike's Nature trick of adding in the real temps to each series for the last 20 years (ie from 1981 onwards) amd from 1961 for Keith's **to hide the decline.**

From Michael Mann (truth doesn't matter):

Perhaps **we'll** do a simple update to the Yamal post, **e.g.** linking Keith/s new page--Gavin t? As to the issues of robustness, particularly w.r.t. inclusion of the Yamal series, we actually emphasized that (including the Osborn and Briffa '06 sensitivity test) in our original post! As we all know, **this isn't about truth at all, its about plausibly deniable accusations.**

From Phil Jones (withholding of data):

The skeptics seem to be building up a head of steam here! ... The IPCC comes in for a lot of stick. Leave it to you to delete as appropriate! Cheers Phil

PS I'm getting hassled by a couple of people to release the CRU station temperature data. **Don't any of you three tell anybody that the UK has a Freedom of Information Act!**

From Phil Jones (destroying of emails / evidence):

Mike, **Can you delete any emails you may have had with Keith re AR4?** Keith will do likewise. He's not in at the moment – minor family crisis. Can you also email Gene and get him to do the same? I don't have his new email address. We will be getting Caspar to do likewise.

From Tom Wigley (ousting of a skeptic from a professional organization):

Proving bad behavior here is very difficult. If **you think that Saiers is in the greenhouse skeptics camp,** then, if we can find documentary evidence of this, **we could go through official AGU channels to get him ousted**.

From Phil Jones (forging of dates):

Gene/Caspar, Good to see these two out. Wahl/Ammann **doesn't appear to be** in CC's **online first,** but comes up if you search. You likely know that **McIntyre will check this one to make sure it hasn't changed since the IPCC close-off date July 2006!** Hard copies of the WG1 report from CUP have arrived here today. Ammann/Wahl **- try and change the Received date!** Don't give those skeptics something to amuse themselves with.

From Mick Kelly (modifying data to hide cooling):

Yeah, it wasn't so much 1998 and all that that I was concerned about, used to dealing with that, but the possibility that we **might be going through a longer – 10 year – period of relatively stable temperatures beyond what you might expect from La Nina etc.** Speculation, but if I see this as a possibility then others might also. Anyway, **I'll maybe cut the last few points off the filtered curve before I give the talk again as that's trending down as a result of the end effects and the recent cold-ish years.**

Submitted Materials by Representative Brad Miller

House of Commons

Science and Technology Committee

The disclosure of climate data from the Climatic Research Unit at the University of East Anglia

Eighth Report of Session 2009–10

Report, together with formal minutes

Ordered by the House of Commons to be printed 24 March 2010

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The Science and Technology Committee

The Science and Technology Committee is appointed by the House of Commons to examine the expenditure, administration and policy of the Government Office for Science. Under arrangements agreed by the House on 25 June 2009 the Science and Technology Committee was established on 1 October 2009 with the same membership and Chairman as the former Innovation, Universities, Science and Skills Committee and its proceedings were deemed to have been in respect of the Science and Technology Committee.

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The Committee is one of the departmental Select Committees, the powers of which are set out in House of Commons Standing Orders, principally in SO No.152. These are available on the Internet via www.parliament.uk.

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The Reports and evidence of the Committee are published by The Stationery Office by Order of the House. All publications of the Committee (including press notices) are on the Internet at http://www.parliament.uk/science. A list of reports from the Committee in this Parliament is included at the back of this volume.

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The current staff of the Committee are: Glenn McKee (Clerk); Richard Ward (Second Clerk); Dr Christopher Tyler (Committee Specialist); Xameerah Malik (Committee Specialist); Andy Boyd (Senior Committee Assistant); Camilla Brace (Committee Assistant); Dilys Tonge (Committee Assistant); Melanie Lee (Committee Assistant); Jim Hudson (Committee Support Assistant); and Becky Jones (Media Officer).

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Contents

Report

		Page
	Summary	**3**
1	**Introduction**	**5**
	The Climatic Research Unit at UEA	5
	The disclosure of climate data	5
	The aftermath	6
	The independent inquiries set up by UEA	7
	Our inquiry	8
	Our Report	9
2	**Datasets**	**10**
	Climate science	10
	Context	11
	Complaints and accusations	11
	Transparency	12
	Dishonesty	19
	Perverting the peer review process	21
3	**Freedom of information issues**	**24**
	Freedom of Information legislation	24
	Alleged breaches of the Freedom of Information Act 2000	26
	The e-mails	26
	Correspondence with the Deputy Information Commissioner	28
	Volume of requests	33
4	**Independent inquiries**	**36**
	The Independent Climate Change Email Review	36
	Terms of reference	36
	The Review team	38
	Transparency	40
	Scientific Appraisal Panel	41
	Public view of the climate science	42
	Need for a single review	44
5	**Conclusions**	**46**
	Conclusions and recommendations	**47**
Formal Minutes		**52**
Witnesses		**55**
List of written evidence		**55**

List of unprinted evidence 57

List of Reports from the Committee during the current Parliament 58

Summary

The disclosure of climate data from the Climatic Research Unit (CRU) at the University of East Anglia (UEA) in November 2009 had the potential to damage the reputation of the climate science and the scientists involved.

We believe that the focus on CRU and Professor Phil Jones, Director of CRU, in particular, has largely been misplaced. Whilst we are concerned that the disclosed e-mails suggest a blunt refusal to share scientific data and methodologies with others, we can sympathise with Professor Jones, who must have found it frustrating to handle requests for data that he knew—or perceived—were motivated by a desire simply to undermine his work.

In the context of the sharing of data and methodologies, we consider that Professor Jones's actions were in line with common practice in the climate science community. It is not standard practice in climate science to publish the raw data and the computer code in academic papers. However, climate science is a matter of great importance and the quality of the science should be irreproachable. We therefore consider that climate scientists should take steps to make available all the data that support their work (including raw data) and full methodological workings (including the computer codes). Had both been available, many of the problems at UEA could have been avoided.

We are content that the phrases such as "trick" or "hiding the decline" were colloquial terms used in private e-mails and the balance of evidence is that they were not part of a systematic attempt to mislead. Likewise the evidence that we have seen does not suggest that Professor Jones was trying to subvert the peer review process. Academics should not be criticised for making informal comments on academic papers.

In the context of Freedom of Information (FOIA), much of the responsibility should lie with UEA. The disclosed e-mails appear to show a culture of non-disclosure at CRU and instances where information may have been deleted, to avoid disclosure. We found *prima facie* evidence to suggest that the UEA found ways to support the culture at CRU of resisting disclosure of information to climate change sceptics. The failure of UEA to grasp fully the potential damage to CRU and UEA by the non-disclosure of FOIA requests was regrettable. UEA needs to review its policy towards FOIA and re-assess how it can support academics whose expertise in this area is limited.

The Deputy Information Commissioner has given a clear indication that a breach of the Freedom of Information Act 2000 may have occurred but that a prosecution was time-barred; however no investigation has been carried out. In our view it is unsatisfactory to leave the matter unresolved. We conclude that the matter needs to be resolved conclusively—either by the Independent Climate Change Email Review or by the Information Commissioner.

We accept the independence of the Climate Change E-mail Review and recommend that the Review be open and transparent, taking oral evidence and conducting interviews in public wherever possible.

On 22 March UEA announced the Scientific Appraisal Panel to be chaired by Lord

Oxburgh. This Panel should determine whether the work of CRU has been soundly built and it would be premature for us to pre-judge its work.

1 Introduction

1. On Friday 20 November 2009 it was reported across the world that hackers had targeted a "leading climate research unit"[1] and that e-mails from the University of East Anglia's (UEA) Climatic Research Unit (CRU), one of the world's foremost centres of climate science, had been published in the internet.[2] The story of the substantial file of private e-mails, documents and data that had been leaked helped ignite the global warming debate in the run up to the Copenhagen climate change conference in December 2009. As reported by the press, exchanges on the internet alleged that data had been manipulated or deleted, in order to support evidence on global warming.

The Climatic Research Unit at UEA

2. UEA was founded in 1963 and in 1972 UEA established CRU.[3] CRU's website describes the Unit as being "widely recognised as one of the world's leading institutions concerned with the study of natural and anthropogenic [human caused] climate change".[4] CRU has a staff of around thirty research scientists and students.[5] But as we heard in oral evidence, it is in fact "a very small Unit [with only] three full-time members of academic staff".[6]

3. CRU has developed a number of the datasets widely used in climate research, including the global temperature record used to monitor the state of the climate system, as well as statistical software packages and climate models. In its written submission to the inquiry UEA outlined CRU's "pioneering role" in the science of understanding the world's changing climate. CRU's contributions included the compilation of a global land temperature record and the development of increasingly sophisticated methods by which to represent the average temperature of the globe and changes in that average over time.[7] Professor Edward Acton, the Vice-Chancellor of UEA, indicated that he was "immensely proud of what they have done; [as] without them humanity would be vastly less able to understand climate change."[8]

The disclosure of climate data

4. In mid November 2009 it appeared that a server used by CRU had been accessed with 160 MB of data containing more than 1,000 e-mails and 3,000 other documents being

1 "Hackers target leading climate research unit", *BBC News website*, 20 November 2009 news.bbc.co.uk/1/hi/sci/tech/8370282.stm

2 For example: "Hacked E-Mail Is New Fodder for Climate Dispute", *New York Times website*, 21 November 2009 www.nytimes.com/2009/11/21/science/earth/21climate.html?_r=4 and "Hackers leak emails, stoking climate debate", *Sydney Morning Herald website*, 23 November 2009, www.smh.com.au/technology/technology-news/hackers-leak-emails-stoking-climate-debate-20091123-iu6u.html

3 Ev 17, paras 1.2 and 1.5

4 "About the Climatic Research Unit", CRU website, www.cru.uea.ac.uk/cru/about/

5 *As above*

6 Q 92

7 Ev 17, paras 1.5-1.6

8 Q 152

copied.[9] A UEA spokeswoman confirmed that the information was not available on a server that could be easily accessed and could not have been inadvertently released.[10] It is not known exactly when the breach occurred; the RealClimate website, "a commentary site on climate science by working climate scientists for the interested public and journalists",[11] indicated that UEA had been notified of the possible security breach on 17 November.[12] The following was posted anonymously on the climate-sceptic blog, *The Air Vent*:

> November 17, 2009 at 9:57 pm
>
> We feel that climate science is, in the current situation, too important to be kept under wraps.
>
> We hereby release a random selection of correspondence, code, and documents. Hopefully it will give some insight into the science and the people behind it.[13]

From here the debate was "blown wide open".[14] *The Guardian* ran the story on 20 November with the headline: "Climate sceptics claim leaked e-mails are evidence of collusion among scientists".[15]

5. UEA issued a statement on 20 November: "This information has been obtained and published without our permission and we took immediate action to remove the server in question from operation. We are undertaking a thorough internal investigation and we have involved the police in this inquiry."[16] The e-mails contained technical and routine aspects of climate research, including data analysis and details of scientific conferences. The controversy has focused on a small number of e-mails, particularly those sent to, or written by, climatologist Professor Phil Jones, the Director of CRU.

The aftermath

6. Condemnation of alleged malpractices found within the leaked CRU e-mails was quickly disseminated on the internet. Contributors to climate change debate websites and written submissions to us claimed that these e-mails showed a deliberate and systematic attempt by leading climate scientists to manipulate climate data, arbitrarily adjusting and "cherry-picking" data that supported their global warming claims and deleting adverse data that questioned their theories.[17] It was alleged that UEA may not have complied with the requirements of the Freedom of Information Act 2000, that inappropriate statistical methods and defective computer programmes may have been used to analyse data and that

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9 RealClimate website archive, November 2009, www.realclimate.org/index.php/archives/2009/11/the-cru-hack

10 "Scotland Yard call in to probe climate data leak from UEA in Norwich", *Norwich Evening News*, 1 December 2009

11 RealClimate website 'about' page, www.realclimate.org

12 RealClimate website archive, November 2009, www.realclimate.org/index.php/archives/2009/11/the-cru-hack; the data may have been downloaded on to the RealClimate—see paragraph 12.

13 The Air Vent website, November 2009 archive, noconsensus.wordpress.com/2009/11/page/3/

14 *As above*

15 "Climate sceptics claim leaked emails are evidence of collusion among scientists", *The Guardian*, 20 November 2009

16 "Sceptics publish climate e-mails 'stolen from East Anglia University'", *The Times*, 21 November 2009

17 For examples see Ev 85 [Roger Helmer MEP], Ev 92 [Godfrey Bloom MEP], and Ev 144 [Stephen McIntyre]

CRU may have attempted to abuse the process of peer review to prevent the publication of research papers with conflicting opinions about climate change.[18]

7. In a statement released on 24 November, Professor Trevor Davies, UEA pro-Vice-Chancellor with responsibility for research, rejected calls for Professor Jones's resignation: "We see no reason for Professor Jones to resign and, indeed, we would not accept his resignation. He is a valued and important scientist."[19] He also contested several of the claims of malpractice: "It is well known within the scientific community and particularly those who are sceptical of climate change that over 95% of the raw station data has been accessible through the Global Historical Climatology Network for several years. We are quite clearly not hiding information which seems to be the speculation on some blogs and by some media commentators". He added:

> There is nothing in the stolen material which indicates that peer-reviewed publications by CRU, and others, on the nature of global warming and related climate change are not of the highest-quality of scientific investigation and interpretation. CRU's peer-reviewed publications are consistent with, and have contributed to, the overwhelming scientific consensus that the climate is being strongly influenced by human activity.[20]

8. On 1 December, Professor Jones announced that he would step aside from the Director's role during the course of the independent review.[21]

The independent inquiries set up by UEA

9. On 3 December UEA announced that an independent review—the Independent Climate Change Email Review—into the allegations made against CRU would be carried out by Sir Muir Russell.[22] Professor Acton explained in a letter to us why Sir Muir was chosen to head the review:

> Sir Muir is extremely experienced in public life, has an understanding of the conduct of universities and research, and is entirely independent of any association with this University and with the climate change debate.[23]

10. Alongside the Independent Climate Change E-Mails Review, UEA decided on a separate scientific assessment of CRU's key scientific publications; an external reappraisal of the science itself. The Royal Society agreed to assist UEA in identifying assessors with the requisite experience, standing and independence.[24] UEA announced on 22 March that Lord Oxburgh FRS would "chair an independent Scientific Assessment Panel to examine

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18 For examples see Ev 90 [Phillip Bratby]; Ev 115 [David Holland], para 2; Ev 144 [Stephen McIntyre]; Ev 194 [Peabody Energy Company], para 24.

19 "Climate scientist at centre of leaked email row dismisses conspiracy claims", *The Guardian*, 24 November 2009

20 UEA, "CRU update 2", 24 November 2009, www.uea.ac.uk/mac/comm/media/press/2009/nov/CRUupdate

21 UEA, "CRU update 3", 1 December 2009, www.uea.ac.uk/mac/comm/media/press/2009/nov/CRUupdate

22 "Sir Muir Russell to head the Independent Review into the allegations against the Climatic Research Unit (CRU)", UEA Press Release, 3 December 2009, www.uea.ac.uk/mac/comm/media/press/2009/dec/CRUreview

23 Ev 16

24 Ev 18, para 2.3

important elements of the published science of the Climatic Research Unit (CRU) at the University of East Anglia".[25]

Our inquiry

11. We were concerned by the press reports and on 1 December 2009 the Chair of the Committee wrote to the Vice-Chancellor of UEA. The letter explained that we took a close interest in academic integrity and the systems in place to ensure the quality of evidence from research and evidence-based policy making. The letter requested a note on the recent events setting out:

a) what had taken place;

b) the steps that had been taken to investigate the allegations and to test the integrity of the data held and used by CRU;

c) how CRU justified its commitment to academic transparency; and

d) how the Vice-Chancellor proposed to restore confidence in CRU and its handling of data.

We also asked for an assurance that none of the data referred to in the e-mails that had been publicised had been destroyed.[26]

12. UEA replied on 10 December 2009. It explained that "a significant amount of material including emails and documents appears to have been accessed illegally from a back-up server in CRU and downloaded in whole, or possibly in part, on to the RealClimate website."[27] This incident was the subject of a police enquiry and the Norfolk Constabulary investigation was expected to take some time. UEA was keen to stress that this "episode is being treated very seriously" and announced that it had set up the independent inquiry, headed by Sir Muir Russell, to investigate the allegations against CRU. UEA said that "none of the adjusted station data referred to in the emails that have been published has been destroyed."[28]

13. In the light of the gravity of the allegations against CRU, the growing weight of damaging press coverage, on-going concerns about the deletion of data and the serious implications for UK science we decided to hold an inquiry into the disclosure of the data at CRU. On 22 January 2010 we therefore announced the inquiry inviting submissions on three key issues:

- What were the implications of the disclosures for the integrity of scientific research?
- Were the terms of reference and scope of the Independent Review announced on 3 December 2009 by UEA adequate?

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25 "CRU Scientific Assessment Panel announced", UEA Press Release, 22 March 2010, www.uea.ac.uk/mac/comm/media/press/CRUstatements/SAPannounce

26 House of Commons Science and Technology Committee Press Notice 04, 7 December 2009, Session 2009–10

27 Ev 16

28 Ev 17

- How independent were the other two international data sets (see paragraph 23)?

14. If there had been more time available before the end of this Parliament we would have preferred to carry out a wider inquiry into the science of global warming itself. In response to enquiries we issued a statement on 1 February making it clear that the inquiry would focus on the terms of reference announced on 22 January and that this was not an inquiry into global warming.[29]

15. We set a deadline of 10 February for the submission of memoranda and we have received 58 submissions, not including supplementary memoranda. We held one oral evidence session on 1 March, when we took evidence from five panels:

a) Rt Hon Lord Lawson of Blaby, Chairman, and Dr Benny Peiser, Director, Global Warming Policy Foundation;

b) Richard Thomas CBE, former Information Commissioner;

c) Professor Edward Acton, Vice-Chancellor, UEA and Professor Phil Jones, Director of CRU;

d) Sir Muir Russell, Head of the Independent Climate Change E-Mails Review; and

e) Professor John Beddington, Government Chief Scientific Adviser, Professor Julia Slingo OBE, Chief Scientist, Met Office, and Professor Bob Watson, Chief Scientist, Department for Environment, Food and Rural Affairs.

16. We would like to thank everyone who contributed to the inquiry through written submissions or oral evidence. We also received unsolicited copies of a number of books challenging anthropogenic global warming and reviewing events at CRU and the disclosed e-mails.[30]

Our Report

17. In the time left before the end of this Parliament we will not be able to cover all the issues raised by the events at UEA, nor cover all the ground that would be covered by the Independent Climate Change Email Review and the Scientific Appraisal Panel. We have therefore concentrated on what we believe to be key issues. Of central concern is the accuracy and availability of CRU's data, datasets and computer programming, which we address in Chapter 2 of this Report; and related to the data and methodology is the question of access, or the withholding of access, under the Freedom of Information Act 2000 which we cover in Chapter 3. Finally, in Chapter 4 we comment on the independent reviews that UEA has announced.

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29 House of Commons Science and Technology Committee Press Notice 11, 1 February 2010, Session 2009–10

30 The Committee received the following books:
Christopher Booker, *The Real Global Warming Disaster*, Continuum, 2009
A.W. Montford, *The Hockey Stick Illusion*, Stacey International, 2010
Steven Mosher and Tom Fuller, *Climategate*, St Matthew Publishing, 2010
Ian Plimer, *Heaven and Earth*, Quartet Books Limited, 2009

2 Datasets

Climate science

18. *Climate* is distinct from *weather*: it is the average of weather conditions over a number of years. Climatologists study climates in different parts of the world and for the Earth as a whole. CRU, according to its website: "has developed a number of the data sets widely used in climate research, including the global temperature record used to monitor the state of the climate system, as well as statistical software packages and climate models".[31]

19. The process of calculating the Earth's average global temperatures (past, present and future) is complicated and lengthy. Data from thousands of weather stations all around the world, on land and at sea, must be collected, checked for quality, adjusted for inconsistencies and error margins, and then mapped onto a series of grids on the Earth's surface. The methods, results and conclusions are then presented to the academic world, first by passing the peer review process prior to publication, and second, after presentation, the scrutiny of the wider academic community.

20. Climate science, like any other science, uses the scientific method to make its assessments of past and present climate and predictions about the future climate. The key characteristics of the scientific method can be described as: characterisations, hypotheses, predictions, and experiments.

- Characterisations: consideration of a problem, and examination of whether or not an explanation exists for it.
- Hypotheses: if no such explanation exists, a new explanation is stated.
- Predictions: what consequences follow from a new explanation?
- Experiments: is the outcome consistent with the predicted consequences?

Each of these is subject to peer review prior to the formal sharing of knowledge through publication. Through peer review scientists allow their views and methods to be critically appraised expertly and externally.

- Replication and verification

To have the results and conclusions survive criticism or scepticism and be part of the accepted canon of scientific knowledge, most experiments will have to be demonstrably replicable (by the same group) to pass peer review and will often need to be verified by other independent researchers taking similar approaches.

21. Therefore climatologists are, like other scientists, required to test their theories—such as global warming and the causes of warming—against observational data. They must also replicate and verify their experiments, by holding independent datasets and conducting independent analyses of these datasets, and by publishing their full methods and results for

31 www.cru.uea.ac.uk/cru/about

scrutiny. Ultimately, these ideas are put up to the threat of falsification by other scientists working in the field.

22. In this Chapter we discuss some aspects of this process.

Context

23. There are three main international climate datasets, which have been built up from direct temperature measurements on land and sea at weather stations all around the world:

a) the National Climatic Data Center (NCDC) of the National Oceanographic and Atmospheric Administration (NOAA) in Asheville, North Carolina, USA;

b) the Goddard Institute of Space Studies (GISS), part of the National Aeronautic and Space Administration (NASA) in New York, USA; and

c) CRUTEM3, at CRU, UEA.[32]

24. In addition, there are two others, one in Russia and one in Japan, that use similar methods.[33] There are also two that use satellite observations, by the University of Alabama at Huntsville and by Remote Sensing Systems, California.[34]

25. Professor Jones, commenting on the different climate research groups around the world in the UK, US, Russia and Japan,[35] told us that:

> we are all working independently so we may be using a lot of common data but the way of going from the raw data to a derived product of gridded temperatures and then the average for the hemisphere and the globe is totally independent between the different groups.[36]

26. What sets the CRU dataset apart is its comprehensiveness:

> The CRU dataset, which forms the land surface component of the HadCRUT global temperature record, was compiled with the aim of comprehensiveness. The majority of the data in it are derived from the same freely-available raw data sets used by NOAA and NASA. However, it also includes data derived from station data that were obtained directly from countries, institutions and scientists on the understanding that they would not be passed on.[37]

Complaints and accusations

27. The complaints and accusations made against CRU in relation to the scientific process come under two broad headings. The first is transparency: that CRU failed to abide by best

32 Ev 21, para 4.2

33 Q 78

34 Ev 104 [D.R. Keiller], para 2

35 Q 79

36 Q 80

37 Ev 64 [John Beddington and Julia Slingo]

scientific practice by refusing to share its raw data and detailed methods. The second is honesty: that CRU has deliberately misrepresented the data, in order to produce results that fit its preconceived views about the anthropogenic warming of the climate. We take each of these complaints and accusations in turn.

Transparency

Raw data

28. Warwick Hughes, a "freelance earth scientist from Australia",[38] had asked Professor Jones for CRU's raw data. He received the following reply:

> I should warn you that some data we have we are not supposed [to] pass on to others. We can pass on the gridded data—which we do. Even if WMO [World Meteorological Organization] agrees, I will still not pass on the data. We have 25 or so years invested in the work. Why should I make the data available to you, when your aim is to try and find something wrong with it.[39]

29. On the face of it, this looks like an unreasonable response to a reasonable request. As Lord Lawson put it: "Ask any decent scientist and they will say the keystone for integrity in scientific research is full and transparent disclosure of data and methods".[40] However, Professor Jones, while confessing that he has sent some "awful" e-mails,[41] defended his position.

30. First, in answer to the question of whether the raw data are accessible and verifiable, Professor Jones told us that:

> The simple answer is yes, most of the same basic data are available in the United States in something called the Global Historical Climatology Network. They have been downloadable there for a number of years so people have been able to take the data, do whatever method of assessment of the quality of the data and derive their own gridded product and compare that with other workers.[42]

31. In addition, of course, there are the sources of the data, the weather stations, to which any individual is free to go and collect the data in the same way that CRU did. This is feasible because the list of stations that CRU used was published in 2008.[43]

32. Even if CRU had wanted to, it would have been unable to publish all of these data because, as Professor Acton explained, some of the data are bound by commercial agreements with different national meteorological organisations:

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38 www.warwickhughes.com

39 Ev 158, Appendix 1

40 Q 9

41 Q 103

42 Q 78

43 Q 98

> Unfortunately, several of these countries impose conditions and say you are not allowed to pass [on the data]. Seven countries have said "No, you cannot", half the countries have not yet answered, Canada and Poland are amongst those who have said, "No you cannot publish it" and also Sweden. Russia is very hesitant. We are under a commercial promise, as it were, not to; we are longing to publish it because what science needs is the most openness.[44]

(The issue with Sweden has since been resolved. The Swedish Meteorological and Hydrological Institute gave permission for CRU to publish its Swedish data on the UEA website on 8 March 2010.[45])

33. Second, as UEA explained in its submission, it is:

> sometimes necessary to adjust temperature data because changes in station location, instrument or observation time, or in the methods used to calculate monthly average temperatures can introduce false trends. These have to be removed or adjusted, or else the overall series of values will be incorrect. In the early 1980s, CRU painstakingly examined the long-term homogeneity of each station temperature series which it acquired. As a result, data were adjusted for about 11% of the sites, that is approximately 314 sites out of a then-total of some 3,276. This was in complete accordance with standard practice, and all adjustments were documented.[46]

34. Professor Jones added, when he gave oral evidence:

> It is all documented [...] what [adjustments we made to the data] in the 1980s and since then we have obviously added more station data as more has become available, as countries have digitised more data; we have added that in and we have reported on that in our peer review publications in 2003 and 2006.[47]

35. These kinds of adjustments to raw data take a lot of time. That is why, in the words of Professor Jones, "Most scientists do not want to deal with the raw station data, they would rather deal with a derived product".[48]

36. A third point was made by Professor Acton that CRU should not be under any obligation to provide raw data:

> May I also point out that it is not a national archive, it is not a library, it is a research unit. It has no special duty to conserve and its data is the copy of data provided by over 150 countries, whose national meteorological stations turn the data into the average for a month.[49]

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44 Q 94

45 Ev 39, para B

46 Ev 18, para 3.4

47 Q 81

48 Q 107

49 Q 92

37. CRU's refusal to release the raw data gave some the impression that it was deliberately keeping its work private so that its studies could not "be replicated and critiqued".[50] The Peabody Energy Company said of CRU that "they appeared to be particularly concerned that putting their information in the public domain would expose their work to criticism".[51] Even an effort to conduct a simple quality check was said to be thwarted by CRU's unwillingness to share the data it had used.[52] In contrast, NASA has been able to make all its raw data available as well as its programmes.[53]

38. **We recognise that some of the e-mails suggest a blunt refusal to share data, even unrestricted data, with others. We acknowledge that Professor Jones must have found it frustrating to handle requests for data that he knew—or perceived—were motivated by a desire simply to seek to undermine his work. But Professor Jones's failure to handle helpfully requests for data in a field as important and controversial as climate science was bound to be viewed with suspicion. He was obviously frustrated by other workers in the field trying to "undermine" his work, but his actions were inevitably counterproductive. Professor Jones told us that the published e-mails represented only "one tenth of 1%" of his output, which amounts to one million e-mails, and that we were only seeing the end of a protracted series of e-mail exchanges. We consider that further suspicion could have been allayed by releasing all the e-mails. In addition, we consider that had the available raw data been available online from an early stage, these kinds of unfortunate e-mail exchanges would not have occurred. In our view, CRU should have been more open with its raw data and followed the more open approach of NASA to making data available.**

39. **We are not in a position to set out any further the extent, if any, to which CRU should have made the data available in the interests of transparency, and we hope that the Independent Climate Change Email Review will reach specific conclusions on this point. However, transparency and accountability are of are increasing importance to the public, so we recommend that the Government reviews the rules for the accessibility of data sets collected and analysed with UK public money.**

Methods

40. The Royal Society of Chemistry in its submission made it clear that:

> It is essential that the public and all non-specialists remain truly confident in the scientific method to provide a sound scientific evidence-base on which strong decisions can be made.[54]

There have been criticisms that Professor Jones and colleagues have not shared their methodologies. Andrew Montford, author of *The Hockey Stick Illusion*,[55] pointed out in his memorandum that:

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50 Ev 194 [Peabody Energy Company], para 20

51 *As above*

52 Ev 152 [Steven Mosher], para 8

53 Q 150 [Professor Jones]

54 Ev 170, summary

> The scientific method demands that findings be subject to testing and verification by others. The refusal of CRU scientists to release information to those who they felt might question or threaten their findings have led many to conclude that the CRU's work is not trustworthy.[56]

41. Professor Jones contested these claims. According to him, "The methods are published in the scientific papers; they are relatively simple and there is nothing that is rocket science in them".[57] He also noted: "We have made all the adjustments we have made to the data available in these reports[58]; they are 25 years old now".[59] He added that the programme that produced the global temperature average had been available from the Met Office since December 2009.[60]

42. On this basis, he argued, it was unnecessary to provide the exact codes that he used to produce the CRUTEM3 chart. The Met Office had released its code and it produced exactly the same result.[61]

43. In answer to the charge that the computer codes that were stolen from CRU's computer network were defective,[62] Professor Jones pointed out that:

> Those codes are from a much earlier time, they are from the period about 2000 to 2004. [They] do not relate to the production of the global and hemispheric temperature series. They are nothing to do with that, they are to do with a different project [...] that was funded by the British Atmospheric Data Centre, which is run by NERC, and that was to produce more gridded temperature data and precipitation data and other variables. A lot of that has been released on a Dutch website and also the BADC website.[63]

44. CRU's alleged refusal to disclose its assumptions and methodologies gave credence to the view that exposure to "independent scrutiny would have undermined the AGW [anthropogenic global warming] hypothesis".[64] However, the failure to publish the computer code for CRUTEM3 left CRU vulnerable when concerns emerged that other codes it used had faults. John Graham-Cumming, a professional computer programmer, told us that:

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55 Andrew Montford, *The Hockey Stick Illusion: Climategate and the corruption of science*, Stacey International, 2010

56 Ev 159, para 4

57 Q 92

58 Raymond Bradley, Mick Kelly, Phil Jones and others, *A Climatic Data Bank for Northern Hemisphere Land Areas, 1851-1980*, US DoE, Technical Report TRO17, 1985, p 335; Phil Jones, Sarah Raper, Ben Santer, and others, *A Grid Point Surface Air Temperature Data Set for the Northern Hemisphere*, DoE Technical Report No. TR022, US Department of Energy, 1985, p 251; Phil Jones, Sarah Raper, Claire Goodess, and others, *A Grid Point Surface Air Temperature Data Set for the Southern Hemisphere, 1851-1984*, DoE Technical Report No. TR027, US Department of Energy, 1986, 73

59 Q 97

60 *As above*

61 Qq 139-42

62 Ev 32, Q 137; Ev 196 [John Graham-Cumming]

63 Qq 137-38

64 Ev 94 [Clive Menzies], para 1.5

> the organization writing the [other] code did not adhere to standards one might find in professional software engineering. The code had easily identified bugs, no visible test mechanism, was not apparently under version control and was poorly documented. It would not be surprising to find that other code written at the same organization was of similar quality. And given that I subsequently found a bug in the actual CRUTEM3 code only reinforces my opinion.[65]

45. The conspiracy claims were fuelled by CRU's refusal to share the most detailed aspects of its methodologies, for example, the computer codes for producing global temperature averages. **We note that the research passed the peer review process of some highly reputable journals. However, we note that CRU could have been more open at that time in providing the detailed methodological working on its website. We recommend that all publicly funded research groups consider whether they are being as open as they can be, and ought to be, with the details of their methodologies.**

Repeatability and verification

46. These complaints and concerns surrounding transparency cut to the heart of the scientific process. It has been argued that without access to the raw data and detailed methodology it is not possible to check the results of CRU's work. The Institute of Physics pointed out that:

> Published reconstructions may represent only a part of the raw data available and may be sensitive to the choices made and the statistical techniques used. Different choices, omissions or statistical processes may lead to different conclusions. This possibility was evidently the reason behind some of the (rejected) requests for further information.[66]

47. This has substance if one considers CRU's work in isolation. But science is more than individual researchers or research groups. One should put research in context and ask the question: what would one hope to find by double checking the processing of the raw data? If this were the only dataset in existence, and Professor Jones's team had been the only team in the world to analyse it, then it might make sense to double check independently the processing of the raw data and the methods. But there are other datasets and other analyses that have been carried out as Professor Jones explained:

> There are two groups in America that we [CRU] compare with and there are also two additional groups, one in Russia and one in Japan, that also produce similar records to ourselves and they all show pretty much the same sort of course of instrumental temperature change since the nineteenth century compared to today.[67]
>
> [...] we are all working independently so we may be using a lot of common data but the way of going from the raw data to a derived product of gridded temperatures and

65 Ev 196

66 Ev 167, para 4

67 Q 78

> then the average for the hemisphere and the globe is totally independent between the different groups.[68]

48. In its memorandum UEA explained the differences between the methodologies used by three basic datasets for land areas of the world, NOAA, NASA and CRU/UEA:

> All these datasets rely on primary observations recorded by NMSs [National Meteorological Services] across the globe.[69]

> GISS[70] and NCDC[71] each use at least 7,200 stations. CRUTEM3 uses fewer. In CRUTEM3, each monthly temperature value is expressed as a departure from the average for the base period 1961–90. This "anomaly method" of expressing temperature records demands an adequate amount of data for the base period; this limitation reduces the number of stations used by CRUTEM3 to 4,348 (from the dataset total of 5,121). The latest NCDC analysis [...] has now moved to the "anomaly method" though with different refinements from those of CRU.[72]

> NCDC and GISS use different approaches to the problem of "absolute temperature" from those of CRUTEM3. The homogeneity procedures undertaken by GISS and NCDC are completely different from those adopted for CRUTEM3. NCDC has an automated adjustment procedure [...], whilst GISS additionally makes allowances for urbanization effects at some stations.[73]

49. In our call for evidence we asked for submissions on the question of how independent the other international data sets are. We have established to the extent that a limited inquiry of this nature can, that the NCDC/NOAA and GISS/NASA data sets measuring temperature changes on land and at sea have arrived at similar conclusions using similar data to that used by CRU, but using independently devised methodologies. We have further identified that there are two other data sets (University of Alabama and Remote Sensing Systems), using satellite observations that use entirely different data than that used by CRU. These also confirm the findings of the CRU work. **We therefore conclude that there is independent verification, through the use of other methodologies and other sources of data, of the results and conclusions of the Climate Research Unit at the University of East Anglia.**

50. The fact that all the datasets show broadly the same sort of course of instrumental temperature change since the nineteenth century compared to today was why Professor John Beddington, the Government Chief Scientific Adviser, had the confidence to say that

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68 Q 80

69 Ev 21, para 4.3

70 Dataset held by the Goddard Institute for Space Studies (GISS, USA) part of the National Aeronautic and Space Administration (NASA)

71 Global Historical Climatology Network (GHCN) dataset held by National Climatic Data Center (NCDC), the National Oceanographic and Atmospheric Administration (NOAA, USA)

72 Ev 21, para 4.4

73 Ev 21, para 4.5

human induced global warming was, in terms of the evidence to support that hypothesis, "unchallengeable":[74]

> I think in terms of datasets, of the way in which data is analysed, there will always be some degree of uncertainty but when you get a series of fundamentally different analyses on the basic data and they come up with similar conclusions, you get a [...] great deal of certainty coming out of it.[75]

51. **Even if the data that CRU used were not publicly available—which they mostly are—or the methods not published—which they have been—its published results would still be credible: the results from CRU agree with those drawn from other international data sets; in other words, the analyses have been repeated and the conclusions have been verified.**

52. That is probably part of why it has not been practice in the climate science community to publish all the data and computer codes with the academic papers. We got to the crux of the issue during an interesting exchange with Professor Jones:

> **Graham Stringer:** You are saying that every paper that you have produced, the computer programmes, the weather stations, all the information, the codes, have been available to scientists so that they could test out how good your work was. Is that the case on all the papers you have produced?
>
> ***Professor Jones:*** That is not the case.
>
> **Graham Stringer:** Why is it not?
>
> ***Professor Jones:*** Because it has not been standard practice to do that.
>
> **Graham Stringer:** That takes me back to the original point, that if it is not standard practice how can the science progress?
>
> ***Professor Jones:*** Maybe it should be standard practice but it is not standard practice across the subject.[76]

53. Another reason why data and the codes were not published may be that norms for publication evolved in a period when the journals were only published in hard copy. In such circumstances it is understandable why an editor would not want to publish raw climate data (extremely long lists of numbers) and code for the computer programmes that analyse the data (which run to hundreds of thousands of lines of code). However, in the age of the internet, these kinds of products can be made available more easily, and we are minded to agree with Professor Jones observation on this point that: "Maybe it should be standard practice".[77]

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74 Q 191

75 Qq 191–92

76 Qq 100–02

77 Q 102

54. **It is not standard practice in climate science and many other fields to publish the raw data and the computer code in academic papers. We think that this is problematic because climate science is a matter of global importance and of public interest, and therefore the quality and transparency of the science should be irreproachable. We therefore consider that climate scientists should take steps to make available all the data used to generate their published work, including raw data; and it should also be made clear and referenced where data has been used but, because of commercial or national security reasons is not available. Scientists are also, under Freedom of Information laws and under the rules of normal scientific conduct, entitled to withhold data which is due to be published under the peer-review process.[78] In addition, scientists should take steps to make available in full their methodological workings, including the computer codes. Data and methodological workings should be provided via the internet. There should be enough information published to allow verification.**

Dishonesty

55. Of all the e-mails released, one dated 16 November 1999 has caused particular concern:

> I've just completed Mike's Nature trick of adding in the real temps to each series for the last 20 years (ie from 1981 onwards) amd [*sic*] from 1961 for Keith's to hide the decline.[79]

56. The word "trick" and the phrase "hide the decline" have been taken by some to demonstrate intent on the part of Professor Jones to "falsify data" and to "exaggerate warming".[80]

"Trick"

57. In his submission, Peter Taylor, author of *Chill*,[81] states that:

> The tree ring data did not match the model expectation (ie the 'hockey stick' pattern of a sudden rise at the end of the period). Rather than admit this, the team-workers discuss using Michael Mann's 'trick' of replacing the offending tree-ring data and using instrumental data in its place in a spliced graph.[82]

58. UEA interpreted the use of the word "trick" differently:

> as for the (now notorious) word 'trick', so deeply appealing to the media, this has been richly misinterpreted and quoted out of context. It was used in an informal email, discussing the difficulties of statistical presentation. It does not mean a 'ruse' or method of deception. In context it is obvious that it is used in the informal sense

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78 See paragraph 78 and following; section 22 of the FOIA provides an exemption from disclosure where the requested information is intended for future (but imminent) publication.

79 E-mail from Phil Jones to Ray Bradley, 16 November 1999

80 Ev 93 [Godfrey Bloom MEP], para 4

81 Peter Taylor, *Chill, A Reassessment of Global Warming Theory: Does Climate Change Mean the World is Cooling, and If So What Should We Do About It?*, Clairview Books, 2009

82 Ev 188, para 22

> of 'the best way of doing something'. In this case it was 'the trick or knack' of constructing a statistical illustration which would combine the most reliable proxy and instrumental evidence of temperature trends.[83]

59. These interpretations of the colloquial meaning of "trick" have been accepted by even the staunchest of critics:

> ***Lord Lawson of Blaby:*** The sinister thing is not the word 'trick'. In their [UEA's] own evidence they say that what they mean by 'trick' is the best way of doing something.
>
> **Chairman:** You accept that?
>
> ***Lord Lawson of Blaby:*** I accept that.[84]

60. **Critics of CRU have suggested that Professor Jones's use of the word "trick" is evidence that he was part of a conspiracy to hide evidence that did not fit his view that recent global warming is predominately caused by human activity. The balance of evidence patently fails to support this view. It appears to be a colloquialism for a "neat" method of handling data.**

"Hide the decline"

61. Lord Lawson did, however, describe CRU's treatment of the data as "reprehensible",[85] because, in his view, Professor Jones deliberately hid data that demonstrated a decline in temperatures.[86]

62. The data that he believed to be "hidden" are a set of tree ring data that disagree with other data sources regarding temperature trends. Lord Lawson said: "when the proxy series [...] departed from the measured temperature series, a normal person will say maybe that means the proxy series is not all that reliable".[87] In that context he made two specific claims:

- that the tree ring data were flawed because "for a long period before 1421 they relied on one single pine tree";[88] and
- that the divergence problem was not just for data after the 1960s, "it is not a good fit in the latter half of the nineteenth century either".[89]

63. It is outside the remit of the terms of reference of this inquiry to make a detailed assessment of the science, but it is worth noting that Professor Jones had a very different perspective. On the first point, he commented:

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83 Ev 19, para 3.5.6

84 Qq 25–26

85 Q 26

86 Qq 26–28

87 Q 26

88 *As above*

89 Q 28

> That particular reconstruction went back to 1400, or just after 1400, and that is because there are insufficient trees to go back before that, there are more than just one. We have criteria to determine how far you can go back in terms of the number of trees you have at a certain number of sites.[90]

64. On the second point, he told us:

> One of the curves was based on tree ring data which showed a very good relationship between the tree rings and the temperature from the latter part of the nineteenth century through to 1960, and after that there was a divergence where the trees did not go up as much as the real temperatures had.[91]

65. Professor Jones has published on this issue on several occasions, including a 1998 *Nature* paper[92] and subsequent papers.[93] He contested the view that he was trying to hide the decline in the sense that he was trying to pretend that these data did not exist and thereby exaggerate global warming: "We do not accept it was hidden because it was discussed in a paper[94] the year before and we have discussed it in every paper we have written on tree rings and climate".[95] Rather, what was meant by "hide the decline" was remove the effects of data known to be problematic in the sense that the data were known to be misleading. UEA made it clear in its written submission that:

> CRU never sought to disguise this specific type of tree-ring "decline or divergence". On the contrary, CRU has published a number of pioneering articles that illustrate, suggest reasons for, and discuss the implications of this interesting phenomenon.[96]

66. **Critics of CRU have suggested that Professor Jones's use of the words "hide the decline" is evidence that he was part of a conspiracy to hide evidence that did not fit his view that recent global warming is predominantly caused by human activity. That he has published papers—including a paper in *Nature*—dealing with this aspect of the science clearly refutes this allegation. In our view, it was shorthand for the practice of discarding data known to be erroneous. We expect that this is a matter the Scientific Appraisal Panel will address.**

Perverting the peer review process

67. The main allegations on the suppression or distortion of others' findings concern the role of CRU in the operation of the peer review process. It has been alleged that scientists at CRU abused the peer review process to prevent those with dissenting views on climate change the opportunity in getting papers published. There are three key accusations. First,

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90 Q 125

91 Q 122

92 Q 122; Keith Briffa and others, "Reduced sensitivity of recent tree-growth to temperature at high northern latitudes", *Nature*, vol 391 (1998), pp 678-82

93 For example: Edward Cook, Paul Krusic and Phil Jones, "Dendroclimatic signals in long tree-ring chronologies from the Himalayas of Nepal", *International Journal of Climatology*, Vol 23 (2003), pp 707-32

94 Keith Briffa and others, "Trees tell of past climates: but are they speaking less clearly today?", *Philosophical Transactions of the Royal Society of London Series B-Biological Sciences*, vol 353 (1998), pp 65-73

95 Q 124

96 Ev 19, para 3.5.5

David Holland, an author of several FOIA requests that were mentioned in the leaked e-mails, claimed that climate scientists at CRU corrupted the IPCC process:

> The emails show that a group of influential climate scientists colluded to subvert the peer-review process of the IPCC and science journals, and thereby delay or prevent the publication and assessment of research by scientists who disagreed with the group's conclusions about global warming. They manufactured pre-determined conclusions through the corruption of the IPCC process and deleted procedural and other information hoping to avoid its disclosure under freedom-of-information requests.[97]

68. In one e-mail, Professor Jones appeared to suggest that he and another scientist would deliberately try to "keep out" two papers from the IPCC's Fourth Assessment Report.[98]

> From: Phil Jones <p.jones@xxxxxxxxx.xxx>
> To: "Michael E. Mann" <mann@xxxxxxxxx.xxx>
> Subject: HIGHLY CONFIDENTIAL
> Date: Thu Jul 8 16:30:16 2004
>
> Mike,
>
> Only have it in the pdf form. FYI ONLY - don't pass on. Relevant paras are the last
>
> 2 in section 4 on p13. As I said it is worded carefully due to Adrian knowing Eugenia for years. He knows the're wrong, but he succumbed to her almost pleading with him to tone it down as it might affect her proposals in the future !
>
> I didn't say any of this, so be careful how you use it - if at all. Keep quiet also that you have the pdf. The attachment is a very good paper - I've been pushing Adrian over the last weeks to get it submitted to JGR or J. Climate. The main results are great for CRU and also for ERA-40. The basic message is clear - you have to put enough surface and sonde obs into a model to produce Reanalyses. The jumps when the data input change stand out so clearly. NCEP does many odd things also around sea ice and over snow and ice. The other paper by MM is just garbage - as you knew. De Freitas again. Pielke is also losing all credibility as well by replying to the mad Finn as well - frequently as I see it. I can't see either of these papers being in the next IPCC report. Kevin and I will keep Them out somehow - even if we have to redefine what the peer-review literature is !

69. The second is that climate scientists tried to suppress a paper on research fraud. As Dr Benny Peiser, Director of the Global Warming Policy Foundation, put it:

> The CRU e-mails under investigation suggest that climate scientists (not only at CRU but also elsewhere) have actively sought to prevent a paper on alleged research fraud from being published in violation of principles of academic integrity.[99]

70. The third allegation is made by Dr Sonja Boehmer-Christiansen, a former peer reviewer for the IPCC, editor of the journal, *Energy & Environment*, and Reader Emeritus

97 Ev 115, para 2

98 www.eastangliaemails.com

99 Ev 164, para 2

at Hull University, who stated in her memorandum that her journal became the focus of attacks from CRU scientists:

> As editor of a journal which remained open to scientists who challenged the orthodoxy, I became the target of a number of CRU manoeuvres. The hacked emails revealed attempts to manipulate peer review to E&E's disadvantage, and showed that libel threats were considered against its editorial team. Dr Jones even tried to put pressure on my university department. The emailers expressed anger over my publication of several papers that questioned the 'hockey stick' graph and the reliability of CRU temperature data. The desire to control the peer review process in their favour is expressed several times. [...] CRU clearly disliked my journal and believed that "good" climate scientists do not read it.[100]

71. When we asked Professor Jones about these accusations, he contested each of them.

- On the claim that he tried to keep two papers out of the IPCC report, he explained that the papers were already published and that "I was just commenting that I did not think those papers were very good".[101]
- On the claim by he tried to suppress papers that alleged research fraud, he told us:

  > Dr Benny Peiser [...] was editing a series of papers in *Energy & Environment*. He asked me to comment on a particular paper and I sent him some views back that I did not think the paper was very good. It was not a formal review, he was just asking me for my views.[102]

- On the claims made by Dr Boehmer-Christiansen, he noted: "I was sending an email to the head of department about a complaint that she had made about me to the UK Climate Impacts Programme, so I was just responding there".[103]

72. In summary, Professor Jones argued:

> I do not think there is anything in those emails that really supports any view that I or CRU have been trying to pervert the peer review process in any way. I have just been giving my views on specific papers.[104]

73. **The evidence that we have seen does not suggest that Professor Jones was trying to subvert the peer review process. Academics should not be criticised for making informal comments on academic papers. The Independent Climate Change Email Review should look in detail at all of these claims.**

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100 Ev 125, paras 4.1–4.3

101 Q 154

102 Q 157

103 *As above*

104 Q 159

3 Freedom of information issues

74. We are not a tribunal reviewing whether breaches of the Freedom of Information Act 2000 (FOIA) have taken place but see as our role in this inquiry as considering whether:

(a) the arrangements for examining whether CRU breached FOIA are adequate;

(b) whether the six-month time limit on the initiation of a prosecution where a public authority acts so as to prevent intentionally the disclosure of requested information needs to be revised; and

(c) whether UEA ensured that CRU was able to meet the requirements of the legislation when it received FOIA requests.

Freedom of Information legislation

75. The FOIA creating new rights of access to information came into operation on 1 January 2005. CRU, as part of UEA, is classed as a "public authority" for the purposes of the FOIA. In his submission Richard Thomas, who was Information Commissioner from 2002 until June 2009, explained the application of the FOIA to scientific data held by UK universities:

> the public must be satisfied that publicly-funded universities, as with any other public authority in receipt of public funding, are properly accountable, adopt systems of good governance and can inspire public trust and confidence in their work and operations [...] The fact that the FOIA requests relate to complex scientific data does not detract from this proposition or excuse non-compliance.[105]

76. When he gave oral evidence, we asked Mr Thomas if the legislation drew a distinction between, on the one hand, scientific data and modelling and, on the other hand, administrative records. He replied:

> the broad answer [...] is no [...] First of all, the legislation applies to information held by the public authority, and information is not elaborated in that sense. [...] It is not ownership. The legislation uses the word "held", and in the Environmental Information Regulations [EIR] that phrase "held" is slightly elaborated. If I can quote the regulation for you there, "It is held by a public authority if the information: (a) is in the authority's possession and has been produced or received by the authority, or (b) is held by another person on behalf of the authority." So that is an elaboration of the concept of "held". It is not ownership.[106]

77. Mr Thomas considered that the issues in this case which were most relevant to the information law appeared to be:

(a) the relevance and impact of the information laws on scientific and academic research conducted within universities;

105 Ev 8, para 3.2

106 Qq 59–60

(b) the adequacy of section 77 of FOIA to deal with suggestions that CRU researchers deleted information, not in the course of normal work, but to frustrate FOIA/EIR[107] requests;

(c) the handling of a large number of FOIA/EIR requests by UEA relating especially to climate change research which (within CRU) it "held"; and

(d) whether this case illustrates that there is scope to extend the "proactive" disclosure provisions of FOIA as they relate to universities.[108]

78. Parliament has created a presumption in favour of disclosure but there are exclusions.[109] Mr Thomas explained:

> There are over 20 exemptions to the fundamental duty to disclose requested information in FOIA.[...] Eight of the main exemptions are absolute and 16 are qualified. Qualified means that there is a "public interest override," which means that, even where the exemption applies, the public interest considerations must be considered. In formal terms, there must still be disclosure—even though the qualified exemption applies—unless the public interest in the exemption outweighs the public interest in disclosure.

Mr Thomas added that:

> The exemptions are similar to those found in other Freedom of Information laws in force in the world. I am not aware which exemptions were considered by the University as potentially applicable to some or all of the requests to CRU. I can speculate that some or all of the following [...] might have been considered:
>
> (a) Section 22—where the requested information is intended for future (but imminent) publication;
>
> (b) Section 40—where disclosure of personal data would breach any of the data protection principles;
>
> (c) Section 41—where the information had been obtained from elsewhere in such circumstances that its disclosure would constitute an actionable breach of confidence under common law;
>
> (d) Section 43 (qualified)—where disclosure would, or would be likely to, prejudice the commercial interests of any person, including the public authority;
>
> (e) Section 44—where disclosure is prohibited by another enactment or inconsistent with an EU obligation (which may include some intellectual property restrictions); and

107 EIR: Environmental Information Regulations 2004. Deriving from European Directive 2003/4/EC these give rights of public access to environmental information held by public authorities.

108 Ev 8, para 2.2

109 Ev 9, para 3.6

(f) Section 14 (not an exemption, strictly speaking)—where the request is vexatious.[110]

79. We were grateful to Mr Thomas for explaining the operation of the FOIA and EIR. He did, however, point out that he did not have detailed knowledge of events at UEA since leaving the Information Commissioner's Office:

> I have no idea at all what has happened inside my former office. I cannot say because this is a serious matter. It depends a great deal on the circumstances of the particular case, the evidence. I have had no direct contact with the office as to how this case is being handled.[111]

Alleged breaches of the Freedom of Information Act 2000

The e-mails

80. Some of the hacked e-mails appear to reveal scientists encouraging their colleagues to resist disclosure and to delete e-mails, apparently to prevent them from being revealed to people making FOIA requests. Below are examples, in chronological order, of e-mails sent by Professor Jones which address FOIA and requests for information.

E-mail: 1107454306 [Extract]
At 09:41 AM 2/2/2005, Phil Jones wrote:
Mike,[...]Just sent loads of station data to Scott. Make sure he documents everything better this time! And don't leave stuff lying around on ftp sites - you never know who is trawling them. The two MMs have been after the CRU station data for years. If they ever hear there is a Freedom of Information Act now in the UK, I think I'll delete the file rather than send to anyone. Does your similar act in the US force you to respond to enquiries within 20 days? - our does ! The UK works on precedents, so the first request will test it. We also have a data protection act, which I will hide behind. Tom Wigley has sent me a worried email when he heard about it - thought people could ask him for his model code. He has retired officially from UEA so he can hide behind that. IPR should be relevant here, but I can see me getting into an argument with someone at UEA who'll say we must adhere to it !. [...]

E-mail: 1219239172 [Extract]
From: Phil Jones <p.jones@xxxxxxxxx.xxx>
To: Gavin Schmidt <gschmidt@xxxxxxxxx.xxx>
Subject: Re: Revised version the Wengen paper
Date: Wed Aug 20 09:32:52 2008

[...] Keith/Tim still getting FOI requests as well as MOHC and Reading. All our FOI officers have been in discussions and are now using the same exceptions not to respond - advice they got from the Information Commissioner. As an aside and just between us, it seems that Brian Hoskins has withdrawn himself from the WG1 Lead nominations. It seems he doesn't want to have to deal with

110 Ev 9, para 3.7

111 Q 58

this hassle.

The FOI line we're all using is this. IPCC is exempt from any countries FOI – the Sceptics have been told this. Even though we (MOHC, CRU/UEA) possibly hold relevant info the IPCC is not part our remit (mission statement, aims etc) therefore we don't have an obligation to pass it on.
Cheers
Phil

E-mail: 1228330629
From: Phil Jones <p.jones@xxxxxxxxx.xxx>
To: santer1@xxxxxxxxx.xxx, Tom Wigley <wigley@xxxxxxxxx.xxx>
Subject: Re: Schles suggestion
Date: Wed Dec 3 13:57:09 2008
Cc: mann <mann@xxxxxxxxx.xxx>, Gavin Schmidt <gschmidt@xxxxxxxxx.xxx>, Karl Taylor <taylor13@xxxxxxxxx.xxx>, peter gleckler gleckler1@xxxxxxxxx.xxx

Ben,
When the FOI requests began here, the FOI person said we had to abide by the requests. It took a couple of half hour sessions - one at a screen, to convince them otherwise showing them what CA was all about. Once they became aware of the types of people we were dealing with, everyone at UEA (in the registry and in the Environmental Sciences school - the head of school and a few others) became very supportive. I've got to know the FOI person quite well and the Chief Librarian - who deals with appeals. The VC is also aware of what is going on - at least for one of the requests, but probably doesn't know the number we're dealing with. We are in double figures.

One issue is that these requests aren't that widely known within the School. So I don't know who else at UEA may be getting them. CRU is moving up the ladder of requests at UEA though - we're way behind computing though. We're away of requests going to others in the UK - MOHC, Reading, DEFRA and Imperial College. So spelling out all the detail to the LLNL management should be the first thing you do. I hope that Dave is being supportive at PCMDI. The inadvertent email I sent last month has led to a Data Protection Act request sent by a certain Canadian, saying that the email maligned his scientific credibility with his peers!

If he pays 10 pounds (which he hasn't yet) I am supposed to go through my emails and he can get anything I've written about him. About 2 months ago I deleted loads of emails, so have very little - if anything at all. This legislation is different from the FOI - it is supposed to be used to find put why you might have a poor credit rating ! In response to FOI and EIR requests, we've put up some data - mainly paleo data. Each request generally leads to more - to explain what we've put up. Every time, so far, that hasn't led to anything being added - instead just statements saying read what is in the papers and what is on the web site! Tim Osborn sent one such response (via the FOI person) earlier this week. We've never sent programs, any codes and manuals.

In the UK, the Research Assessment Exercise results will be out in 2 weeks time.
These are expensive to produce and take too much time, so from next year we'll be moving onto a metric based system. The metrics will be # and amounts of grants, papers and citations etc. I did flippantly suggest that the # of FOI requests you get should be another.

When you look at CA, they only look papers from a handful of people. They will start on another coming out in The Holocene early next year. Gavin and Mike are on this with loads of others. I've told both exactly what will appear on CA once they get access to it!
Cheers

Phil
E-mail: 1237496573 [Extract] From: Phil Jones <p.jones@xxxxxxxxx.xxx> To: santer1@xxxxxxxxx.xxx Subject: Re: See the link below Date: Thu Mar 19 17:02:53 2009 [...] CRU has had numerous FOI requests since the beginning of 2007. The Met Office, Reading, NCDC and GISS have had as well – many related to IPCC involvement. I know the world changes and the way we do things changes, but these requests and the sorts of simple mistakes, should not have an influence on the way things have been adequately dealt with for over a century. Cheers Phil

81. In his submission Andrew Montford stated that:

> Research materials should be made available to outsiders as a requirement of the scientific method. That scientists have failed to do so is reprehensible, but the fact that they have apparently also resorted to breaches of the Freedom of Information Act in order to do so requires urgent attention from policymakers.[112]

82. As we explained in the previous chapter, David Holland was the author of several FOIA requests that were mentioned in the leaked e-mails. In his submission he pointed out that on 9 May [2008] in e-mail 1210367056, Professor Jones sent "my formal information request to 'team' members Mann, Hughes and Ammann" writing:

> You can delete this attachment if you want. Keep this quiet also, but this is the person who is putting in FOI requests for all emails Keith and Tim have written and received re Ch 6 of AR4.[113] We think we've found a way around this.[114]

83. Mr Holland also drew attention to e-mail 1212063122 dated 29 May 2008 in which Professor Jones asked Professor Mann:

> Can you delete any emails you may have had with Keith re AR4? Keith will do likewise. Can you also email [Eu]Gene [Wahl] and get him to do the same? I don't have his new email address. We will be getting Caspar [Ammann] to do likewise.[115]

Correspondence with the Deputy Information Commissioner

84. On 22 January 2010, when the Deputy Information Commissioner, Graham Smith, issued a statement which suggested that at l east some of the requested information should

112 Ev 159, para 6

113 Intergovernmental Panel on Climate Change: Fourth Assessment Report

114 Ev 117, para 23

115 Ev 118, para 32

have been disclosed in the absence of applicable exemptions, it gave support to the criticisms of CRU's handling of FOIA requests. Mr Smith said:

> The FOI Act makes it an offence for public authorities to act so as to prevent intentionally the disclosure of requested information. Mr Holland's FOI requests were submitted in 2007/8, but it has only recently come to light that they were not dealt with in accordance with the Act. The legislation requires action within six months of the offence taking place, so by the time the action came to light the opportunity to consider a prosecution was long gone.[116]

85. Mr Thomas commented that this was "clearly a reference to section 77 of the Act and/or the near-identical Regulation 19 of EIR".[117] Section 77 of the FOIA provides:

> 1. Where:
>
> (a) a request for information has been made to a public authority,
>
> (b) under section 1 of this Act or section 7 of the Data Protection Act 1998, the applicant would have been entitled (subject to payment of any fee) to communication of any information in accordance with that section,
>
> any person to whom this subsection applies is guilty of an offence if he alters, defaces, blocks, erases, destroys or conceals any record held by the public authority, with the intention of preventing the disclosure by that authority of all, or any part, of the information to the communication of which the applicant would have been entitled.
>
> 2. Subsection (1) applies to the public authority and to any person who is employed by, is an officer of, or is subject to the direction of, the public authority.
>
> 3. A person guilty of an offence under this section is liable on summary conviction to a fine not exceeding level 5 on the standard scale.[118]

86. Mr Thomas added that the Deputy Commissioner also appeared "to have in mind" section 127(1) of the Magistrates Court Act 1980, which provides that

> a magistrates' court shall not try an information or hear a complaint unless the information was laid, or the complaint made, within 6 months from the time when the offence was committed, or the matter of complaint arose.[119]

Mr Thomas confirmed in oral evidence that

> because of the interaction with the Magistrates Court Act, any prosecution must be brought within six months of the offence being committed.[120]

87. In its memorandum to our inquiry, UEA defended its actions:

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116 Ev 9, para 4.1

117 Ev 10

118 Ev 10, para 4.1

119 Ev 10, para 4.2

120 Q 56

> CRU has been accused of refusing to release data requested under the FOIA. There are many obstacles outside CRU's control surrounding the release of data provided by NMSs [National Meteorological Services]. Many FOIA requests made to CRU related to primary data provided by the NMSs. Some of these data are subject to formal non-publication agreements between the NMS and CRU. Other primary data had been provided to CRU on an individual-to-individual basis, with accompanying verbal agreements that they may be used within the gridded dataset, but should not be passed on to others. CRU responded to the FOIA requests for primary data by pointing out that approximately 90% of the stations in the CRU dataset are available from other sources, particularly GHCN.[121]

88. On 29 January there was an exchange between UEA and Mr Smith, the Deputy Commissioner. Brian Summers, the Registrar and Secretary of UEA responded forcibly to Mr Smith's 22 January press statement, which asserted that UEA had not dealt with FOIA requests "as they should have been under the legislation".[122] He did not consider it was "acceptable that such a statement which has led to an extremely damaging commentary on the University [was] first communicated to the University by a journalist".[123] His letter goes on to defend UEA's actions in detail and to ask that, if the Information Commissioner's Office (ICO) cannot retract the 22 January statement, it issue a clarification regarding the alleged breaches of the FOIA. A response from the ICO was issued the same day. It did not retract the original statement but offered clarification:

> 1. [No] decision notice has yet been issued and no alleged breaches have yet been put to the University for comment. That matter has yet to be addressed, but it will be over coming months.
>
> 2. The fact that the elements of a section 77 offence may have been found here, but cannot be acted on because of the elapsed time, is a very serious matter. The ICO is not resiling from its position on this.
>
> 3. The ICO's position is as stated in point 2 above. The statement may be read to indicate that.[124] Under section 77, an offence may be committed by an individual, not necessarily the public authority itself.
>
> 4. Errors like this are frequently made in press reports and the ICO cannot be expected to correct them, particularly when the ICO has not itself referred to penalties or sanctions in its own statement.[125]

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121 Ev 20, para 3.7.2

122 "Scientists in stolen e-mail scandal hid climate data", *The Times*, 28 January 2010

123 Registrar and Secretary to Deputy Information Commissioner - 29 January 2010, UEA website, Correspondence between University of East Anglia and the Information Commissioner's Office, www.uea.ac.uk/mac/comm/media/press/CRUstatements/ICOcorrespondence

124 UEA had asked the Deputy Commissioner to confirm that "your statement cannot be taken to mean that there has been a demonstrable breach of Section 77, which is a breach of the FOI which can result in prosecution"; Registrar and Secretary to Deputy Information Commissioner, 29 January 2010, UEA website, Correspondence between University of East Anglia and the Information Commissioner's Office, www.uea.ac.uk/mac/comm/media/press/CRUstatements/ICOcorrespondence

125 Deputy Information Commissioner to Registrar and Secretary - 29 January 2010, UEA website, Correspondence between University of East Anglia and the Information Commissioner's Office, www.uea.ac.uk/mac/comm/media/press/CRUstatements/ICOcorrespondence

89. UEA responded on 1 February thanking the ICO for the clarification but setting out its concerns relating to the press coverage of the ICO's original statement:

> Your clarification that the press cannot infer from your statement to the Sunday Times that it has been established that the University (or indeed any individual associated with the University) has breached the terms of the Freedom of Information Act is welcome. [UEA's] reputation which has been subjected to these damaging and incorrect assertions claiming to be based on your statement and we must take some steps to put this right. We will be writing to the media which carried reports based on your statement, pointing out the inaccuracies and asking them to rectify the position.[126]

90. In his oral evidence Professor Acton questioned the ICO statement of 22 January:

> our principle is that *prima facie* evidence is evidence which on the face of it and without investigation suggests that there is a case to answer. To my mind if there is *prima facie* evidence; why did I set up the Muir Russell independent review? Prima facie evidence is not the same as, you have been found to breach. [...] If it is sub judice, if, as we had in the letter ten days ago from the ICO, the investigation has not even begun, I am puzzled how we could have been found to breach if there has been no investigation.[127]

91. The ICO's most recent letter, dated 3 March, in UEA's view, "makes plain that there is no assumption by the ICO, prior to investigation, that UEA has breached the Act; and that no investigation has yet been completed."[128] The ICO's letter confirmed that the "ICO is not pursuing any investigation under section 77 of the Act. That matter is closed as far as the ICO is concerned, given the statutory time limits for action". It added that:

> The ICO acknowledges your concern about the statement made and the subsequent media and blog reports. Given that the Deputy Commissioner has already been publicly associated with the matter, any Decision Notice will be reviewed and signed off by another authorised signatory.[129]

We regret that the ICO made a statement to the press that went beyond that which it could substantiate and that it took over a month for the ICO properly to put the record straight. We recommend that the ICO develop procedures to ensure that its public comments are checked and that mechanisms exist to swiftly correct any mis-statements or misinterpretations of such statements.

92. The disclosed e-mails appear to show a culture of non-disclosure at CRU and instances where information (disclosable or otherwise) may have been deleted, to avoid disclosure. The Deputy Information Commissioner's letter of 29 January gives a clear indication that a

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126 Registrar and Secretary to Deputy Information Commissioner - 1 February 2010, UEA website, Correspondence between University of East Anglia and the Information Commissioner's Office, www.uea.ac.uk/mac/comm/media/press/CRUstatements/ICOcorrespondence

127 Q130

128 Ev 39, para A

129 Ev 39, annex

breach of the FOIA may have occurred but that a prosecution was time-barred.[130] As, however, UEA pointed out, no investigation has been carried out.

93. It seems to us that both sides have a point. **There is *prima facie* evidence that CRU has breached the Freedom of Information Act 2000. It would, however, be premature, without a thorough investigation affording each party the opportunity to make representations, to conclude that UEA was in breach of the Act. In our view, it is unsatisfactory to leave the matter unresolved simply because of the operation of the six-month time limit on the initiation of prosecutions. Much of the reputation of CRU hangs on the issue. We conclude that the matter needs to be resolved conclusively—either by the Independent Climate Change Email Review or by the Information Commissioner.**

94. On the question of the six-month time limit on the initiation of prosecutions, Mr Thomas pressed for a revision of the law. He pointed out that apart from in the most blatant cases "it will usually be impossible for the ICO to detect an offence within 6 months of its occurrence" and thus to be able to initiate a prosecution.[131] He drew attention to a recent debate in the House of Lords on a proposal to amend the time limit. In reply, in the debate the Parliamentary Under-Secretary of State at the Ministry of Justice said that:

> The Freedom of Information Act 2000 came into force only in 2005, and [...] we have no evidence at present that the current six-month time limit presents a systemic problem for the Information Commissioner or any other prosecutor in taking action under Section 77. [...] We will listen to the views of the Information Commissioner and other interested parties on this point, and if there is evidence that the current legislation is causing systemic difficulties, we will look for ways to address the matter, if necessary by means of an alternative legislative vehicle in the future. However, I cannot go further than that today on behalf of the Government.[132]

No change was made to the legislation.

95. We consider that events at CRU throw light on the operation of the Freedom of Information Act 2000 and, in particular, whether there is a need to amend the time limit on prosecutions from six months from the time the alleged offence was committed. **If the Minister was correct to assert in July 2009 that the Government had no evidence that the current six-month time limit presents a systemic problem, then it is now clear that such evidence exists. Irrespective of whether or not CRU breached the Freedom of Information Act 2000, we recommend that the Government review the operation of section 77 of the 2000 Act and the six month limit on the initiation of prosecutions provided by section 127(1) of the Magistrates Court Act 1980.**

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130 UEA website, Correspondence between University of East Anglia and the Information Commissioner's Office, www.uea.ac.uk/mac/comm/media/press/CRUstatements/ICOcorrespondence

131 Ev 10, para 4.3

132 HL Deb, 21 July 2009, col 1571

Volume of requests

96. In the face of allegations of poor handling of FOIA requests, one of the explanations offered by UEA was that in:

> July 2009 UEA received an unprecedented, and frankly administratively overwhelming, deluge of FOIA requests related to CRU. These amounted to 61 requests out of a 2009 total of 107 related to CRU, compared to annual totals of 2 in 2008 and 4 in 2007 (University totals for those years were 204, 72 and 44 respectively).[133]

97. At the oral evidence session Lord Lawson commented on the increase in the volume of FOIA requests:

> what had happened was there had been a very, very small number of FOI Act requests to begin with and it was in response to those that there was all the evasion, the lack of disclosure and all the other things which we have seen in the emails: discussions about possibly destroying evidence and so on. All that came well before the 2009 flood of stuff. The 2009 flood, if you look at the sequence of events, was a response to the refusal to give disclosure of various things before. That was what came first.[134]

98. There are two issues here: the adequacy of CRU's handling of the FOIA requests and whether the increase in the number of requests in July 2009 was a deluge. On the latter, Mr Thomas said that, whilst agreeing that UEA had faced a significant rise in FOIA requests in July 2009, he did not consider that a total of 61 was a "huge number".[135]

99. On handling, CRU claimed that it could not cope with the significant rise in FOIA requests because it only had three full-time academic staff.[136] We therefore wrote to UEA on 2 March 2010 to ask what extra resources were provided to assist CRU cope with these requests. UEA responded that:

> additional support was provided to the University's Information Policy Compliance Manager (IPCM) who handles FOI requests. This included rescheduling workloads to allow him to concentrate on the CRU FOI requests and diverting secretarial support to provide additional resource. Given the high volume of requests received, the Director of Information Services (DoIS) also took an active role in the first stage of a number of requests, thus providing additional support to the IPCM. (Should any cases where the DoIS was directly involved in the first stage be appealed then we have arranged for the PVC Academic to adjudicate to ensure impartiality). ISD also fast-tracked the merging of the Security Policy and Compliance team to ensure that a fully trained back-up to the IPCM was available.[137]

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133 Ev 20, para 3.7.4

134 Q 9

135 Q 68

136 Q 92 [Professor Acton], Ev 20, para 3.7.4; Ev 37, Q 1

137 Ev 37, para 1

100. The Science Faculty also provided additional administrative support, including that of the Director of Faculty Administration, the most senior member of the Faculty's administrative staff. UEA pointed out that many of the requests were of a very technical nature and:

> required scientific knowledge and understanding of the subject area in order to provide the details. Despite the additional administrative resources provided, the requirement to respond to the 61 requests received in July 2009 impacted considerably upon the work of CRU.[138]

101. We also asked UEA to outline what legal advice and guidance on handling had been offered to CRU in handling these FOIA requests. UEA confirmed that the:

> IPCM provided advice to CRU on the requirements of the Act both generally, and in relation to any applicable sections, exemptions or exceptions pertaining to the specific request. In this latter role, the IPCM set out the requirements of any possible exemption or exception, inclusive of the public interest test, and elicited from CRU staff whether the public interest test had been met. Additional advanced training was provided to the 'FOI Contact' for the Faculty of Science, the Director of Faculty Administration. In this role, the FOI contact acted as a support to CRU in the location and retrieval of information and provided assistance to the IPCM in exploring the application of the Act to the specific requests.[139]

102. On the evidence we took we have concerns about the handling of FOIA requests by CRU. First, the disclosed e-mails betray an attitude to freedom of information that was antipathetic to the spirit of disclosure in the legislation. Mr Thomas pointed out that:

> the simplest approach, particularly where requests tend to generate either a defensive attitude or place a great burden on the public authority, is proactive disclosure in the first place.[...] Public authorities ought to decide what really has to be kept away from the public. If it is particularly sensitive or there is a good reason for withholding it, fair enough, but where there is no good reason for withholding information, then why not proactively disclose it and avoid the hassle of large numbers of requests?[140]

103. Whether or not CRU liked it, those making FOIA requests were entitled to have their requests dealt with in accordance with the legislation and, if the information sought did not fall within one of the exclusions provided by the FOIA, it should have been disclosed. **We have already recommended in paragraph 54 above that in future information, including data and methodology, should be published proactively on the internet wherever possible. However, a culture of withholding information—from those perceived by CRU to be hostile to global warming—appears to have pervaded CRU's approach to FOIA requests from the outset. We consider this to be unacceptable.**

104. In the face of such an unhelpful approach we are not surprised that FOIA requests multiplied. When the surge in FOIA requests hit CRU in July 2009 UEA provided extra

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138 Ev 37, para 1

139 Ev 37, para 2

140 Q 70

resources but because of their technical nature the same small group of staff at CRU had a pivotal role in handling the requests. We are not clear that the culture changed. **We cannot reach a firm conclusion on the basis of the evidence we took but we must put on record our concern about the manner in which UEA allowed CRU to handle FOIA requests. Further, we found *prima facie* evidence to suggest that the UEA found ways to support the culture at CRU of resisting disclosure of information to climate change sceptics. The failure of UEA to grasp fully the potential damage to CRU and UEA by the non-disclosure of FOIA requests was regrettable. UEA needs to review its policy towards FOIA and re-assess how it can support academics whose expertise in this area is limited.**

4 Independent inquiries

105. There are two reviews underway: the Independent Climate Change Email Review led by Sir Muir Russell; and a scientific assessment panel reviewing CRU's key scientific publications. The Vice-Chancellor explained to us in oral evidence on 1 March 2010 that the reviews would focus on different matters:

> Muir Russell's independent review is not looking at the science, it is looking at allegations about malpractice. As for the science itself, I have not actually seen any evidence of any flaw in the science but I am hoping, later this week, to announce the chair of a panel to reassess the science and make sure there is nothing wrong.[141]

In the event the announcement was not made until 22 March.

The Independent Climate Change Email Review

106. The Independent Climate Change Email Review is being conducted by a team, led by Sir Muir Russell. According to the Review's website the team has more than 100 years' collective expertise of scientific research methodology and a wide range of scientific backgrounds. None have any links to the Climatic Research Unit, or the United Nations' Intergovernmental Panel on Climate Change (IPCC).[142]

Terms of reference

107. The Review's terms of reference are as follows:

> The Independent Review will investigate the key allegations that arose from a series of hacked e-mails from the University of East Anglia's Climatic Research Unit (CRU). The review will:
>
> 1.1. Examine the hacked e-mail exchanges, other relevant e-mail exchanges and any other information held at CRU to determine whether there is any evidence of the manipulation or suppression of data which is at odds with acceptable scientific practice and may therefore call into question any of the research outcomes.
>
> 1.2. Review CRU's policies and practices for acquiring, assembling, subjecting to peer review and disseminating data and research findings, and their compliance or otherwise with best scientific practice.
>
> 1.3. Review CRU's compliance or otherwise with the University's policies and practices regarding requests under the Freedom of Information Act ('the FOIA') and the Environmental Information Regulations ('the EIR') for the release of data.

141 Q 129

142 www.cce-review.org/About.php

> 1.4. Review and make recommendations as to the appropriate management, governance and security structures for CRU and the security, integrity and release of the data it holds.[143]

108. Sir Muir has discretion to amend or add to the terms of reference if he feels necessary, devise his own methods of working, and call on appropriate expertise, in order to investigate the allegations fully. UEA has asked for the Review to be completed by Spring 2010 and this will be made public along with UEA's response.[144]

109. Lord Lawson, in both his written submission and his oral evidence, considered that the terms of reference "may be a bit too CRU-centric"[145] and "needed to be extended to include more fully the issue of the dissenting scientists".[146] These points were echoed in written submissions to us. Andrew Montford suggested that:

> The independence of the review is not assured. Sir Muir Russell was appointed to head the review by the vice-chancellor of the University of East Anglia, [...] Edward Acton. However, the emails disclosed implicate [his] predecessor in an apparent breach of the Freedom of Information Act and there is therefore a prime-facie case that the review is not sufficiently independent. [...] The review must take evidence from sceptics. At time of writing it appears that no prominent sceptic has been contacted by Sir Muir with a view to providing evidence. Without complainants being able to make their case to the review, it is unlikely that the findings will be sound or accepted by the sceptic community.[147]

Mike Haseler, creator of the Number 10 Petition regarding the CRU, was also critical of the Review saying that it "seems to serve no real purpose except the PR of the University to appear to be doing something."[148]

110. Others offered amendments to the terms of reference. Professor Ross McKitrick, a professor of environmental economics, recommended that the terms of reference "should consider whether CRU scientists whose responsibilities include providing climate data to the IPCC should not serve as IPCC Lead Authors (or Coordinating Lead Authors) on any Report or Chapter that assesses evidence for or against its quality for climatic research purposes."[149]

111. The Royal Society of Chemistry considered the terms of reference "adequate"[150] and Professor John Beddington suggested that they "give sufficient scope for the issue to be investigated in full".[151] Professor Peter Cox, a former lead author on the last IPCC Working

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143 Ev 39

144 "Sir Muir Russell to head the Independent Review into the allegations against the Climatic Research Unit (CRU)" UEA Press Release, 3 December 2009, www.uea.ac.uk/mac/comm/media/press/2009/dec/CRUreview

145 Q 5, Ev 1, annex containing letter dated 26 January 2010 from the Foundation to Sir Muir Russell (*not printed*)

146 Q 3

147 Ev 161, paras 22 and 24

148 Ev 139, para 27

149 Ev 140, para 3.2

150 Ev 172, para 12

151 Ev 45, para 7

Group, suggested that the "Inquiry should hear evidence on the reviewing of scientific papers and the exclusion of papers from the IPCC report. It will be critical to determine whether these decisions were carried out on the basis of scientific merit alone".[152]

112. In response to criticisms Sir Muir pointed out that the review "is not actually about the big science of global warming and making forecasts for the next hundred years".[153] He said that "it will not be window dressing", and UEA had "not interfered at all".[154]

113. **We accept the assurances that Sir Muir Russell has given about the independence of the Independent Climate Change Email Review and we expect him to be scrupulous in preserving its impartiality. We see no reason why the Review's conclusions and UEA's response have to be published together. Indeed, it could give the impression that UEA was being given an advantage when it comes to responding. We consider that the Review's conclusions and recommendations should not be conveyed to UEA in advance of publication.**

114. **With regards to the terms of reference of the Review, we consider that as well as measuring CRU against current acceptable scientific practice, the Review should also make recommendations on best practice to be followed by CRU in the future. We invite Sir Muir Russell to respond formally to our Report to the extent that he sets out whether, on the basis of its contents, he finds the Terms of Reference of his inquiry need to be changed.**

The Review team

115. The Review Team membership, as announced, consisted of:

Sir Muir Russell
Professor Geoffrey Boulton
Dr Philip Campbell [*subsequently resigned*]
Professor Peter Clarke
Mr David Eyton
Professor Jim Norton.[155]

116. Sir Muir and the Review team held a press briefing at the Science Media Centre in London on 11 February 2010 to announce its membership, publish its workplan and issue a call for submissions from interested parties. Almost immediately it was beset by claims of partiality. On the same day as the launch Sir Muir Russell accepted the resignation of Dr Philip Campbell, Editor of Chief of *Nature*, after a recording of an interview given by Dr Campbell to China Radio International in December 2009 was alleged to raise doubts over his impartiality. Dr Campbell said:

> I made the remarks in good faith on the basis of media reports of the leaks. As I have made clear subsequently, I support the need for a full review of the facts behind the

152 Ev 132, para 2

153 Q 163

154 Q 166

155 Ev 40

> leaked e-mails. There must be nothing that calls into question the ability of the independent Review to complete this task, and therefore I have decided to withdraw from the team.[156]

117. Sir Muir said "I have spoken to Philip Campbell, and I understand why he has withdrawn. I regret the loss of his expertise, but I respect his decision."[157] Further allegations arose on 12 February that Professor Geoffrey Boulton's background and views affected his ability to be a member of the Review.[158] These have been rejected by Sir Muir Russell and by Professor Boulton. Professor Boulton said:

> At the Review press conference (on February 11), I pointed out that I had worked full-time in the School of Environmental Sciences at UEA from its inception in 1968 to 1980, and that I had a part-time appointment between 1980 and 1986, whilst working primarily in the University of Amsterdam. Since then, I have had no professional contact with the University of East Anglia or the Climatic Research Unit. I was equally clear that although my research is not in the field of modern or recent climate change, I am familiar with its scientific basis and uncertainties surrounding it. I declared my current view of the balance of evidence: that the earth is warming and that human activity is implicated. These remain the views of the vast majority of scientists who research on climate change in its different aspects. They are based on extensive work worldwide, not that of a single institution. As a sceptical scientist, I am prepared to change those views if the evidence merits it. They certainly do not prevent me from being heavily biased against poor scientific practice, wherever it arises.[159]

Sir Muir Russell said:

> This Review must determine if there is evidence of poor scientific practice, as well as investigate allegations around the manipulation and suppression of data. As others have pointed out, it would be impossible to find somebody with the qualifications and experience we need who has not formed an opinion on climate change. I am completely confident that each member of the Review team has the integrity, the expertise, and the experience to complete our work impartially.[160]

118. In his oral evidence Sir Muir outlined his approach in choosing the team:

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156 "Dr Philip Campbell withdraws from the Review", *Independent Climate Change Email Review News release*, 12 February 2010, www.cce-review.org/News.php

157 *As above*

158 There has been pressure on Professor Boulton to step down. *The Scotsman* reported: "Dr Benny Peizer, [*sic*] director of the Global Warming Policy Foundation, a think tank which claims the debate on climate change has become distorted, called for Prof Boulton to step down, too. He said: 'Prof Boulton obviously is a very distinguished geologist. The problem is, he is a very outspoken campaigner on this issue and he's given talks calling for galvanising public opinion. He also worked at the very institution that he is now going to be investigating. That, we think, is a conflict of interest.'" ("Senior Scots scientist in climate probe row", *The Scotsman*, 13 February 2010) Sir Muir has rejected the call. ("Allegations of bias against Review member rejected", *Independent Climate Change Email Review News release*, 15 February 2010)

159 "Allegations of bias against Review member rejected", *Independent Climate Change Email Review News release*, 15 February 2010,www.cce-review.org/News.php

160 *As above*

> You can see as you look at the composition of the team that I needed to be looking at climate science in general but not somebody who was associated with this particular stream of work but would understand what was going on. There were going to be huge data handling issues, there was a lot of work on computing and data security and so on and that the work was going to have a resonance out there in the real world and around the world. Really on that basis I came up with this set of names that you can see. In relation to Dr Campbell, the others that I had got together thought that it would be extremely important to have somebody who knew about peer review and that was really the qualification that brought him in.[161]

119. **It is unfortunate that the Independent Review got off to a bad start with the necessary resignation of Dr Campbell. The question of the operation of peer review is going to be a critical issue in the inquiry and the Review Team needs to take steps to ensure the insight and experience he would have brought are replaced.**

Transparency

120. Contributors to our inquiry have suggested the importance that the Independent Review is open and transparent. Lord Lawson, in his oral evidence, said that he was:

> concerned about the openness and transparency, [...] there should be public hearings, like you are having here—I think that is very, very important—and I regret the fact that it appears that they do not intend to do this.[162]

Andrew Montford commented:

> The review must be held in public. Sir Muir Russell has stated that he wants to retain the confidence of global warming sceptics. However, in his letter to Mr Willis of 10 December 2009, [...] the vice-chancellor of UEA, states that Sir Muir will present his findings to [him], who will in turn present a report to the council of the university. We are asked to believe that Sir Muir will properly investigate [the Vice-Chancellor's] role in the alleged FoI breaches, and that [he] will pass on the findings that Sir Muir makes on this subject to the university council.[163]

121. When answering our question on transparency Sir Muir indicated that the Review team "plans to put on its website the evidence that we receive".[164] When pressed on the question of holding public evidence sessions Sir Muir responded that:

> all my predispositions and those of the fellow team members are to do it that way [via written evidence] rather than to do it in a hearing of perhaps this kind or in a series of one-to-one interviews or whatever. Where we have interviews with people in CRU or elsewhere, those will be written up and they will be part of the record but at the moment I am not really sure that getting to the stage of putting people in a

161 Q 160

162 Q 3

163 Ev 161, para 23

164 Q 172

> hearing context is going to be a particularly effective way of adding value to the objective evidence that we want to get our hands on.[165]

122. We agree that the Review must be open and transparent. **We conclude that, when the Independent Review holds oral hearings or interviews, they should be carried out in public wherever possible and that it should publish all the written evidence it receives on its website as soon as possible.**

Scientific Appraisal Panel

123. In its evidence to us the Independent Climate Change Email Review stated that its remit does not invite it to re-appraise the scientific work of CRU. That re-appraisal is being separately commissioned by UEA, with the assistance of the Royal Society.[166] In a statement released on 11 February UEA said that:

> The Royal Society will assist the University in identifying assessors with the requisite expertise, standing and independence. "Published papers from CRU have gone through the rigorous and intensive peer review process which is the keystone for maintaining the integrity of scientific research," said Professor Trevor Davies, the University's Pro-Vice-Chancellor for Research, Enterprise and Engagement. "That process and the findings of our researchers have been the subject of significant debate in recent months. Colleagues in CRU have strenuously defended their conduct and the published work and we believe it is in the interests of all concerned that there should be an additional assessment considering the science itself."
>
> The independent reassessment will complement Sir Muir Russell's Review of the key allegations about the handling of data arising from the publication of a series of e-mails hacked from CRU. Sir Muir's Review is expected to announce its finding in Spring 2010.
>
> The reassessment of CRU's key publications will be completed at the earliest date the assessors can manage. The findings will be made public.[167]

124. Details of the panel were announced on 22 March. It will be headed by Lord Oxburgh. His appointment was made on the recommendation of the Royal Society, which was also consulted on the choice of the six scientists on the panel: Professor Huw Davies, Professor of Physics at the Institute for Atmospheric and Climate Science at ETH Zürich; Professor Kerry Emanuel, Professor of Meteorology at Massachusetts Institute of Technology; Professor Lisa Graumlich, Director of the School of Natural Resources and the Environment at The University of Arizona; Professor David Hand, Professor of Statistics in the Department of Mathematics at Imperial College; Professor Herbert Huppert, Professor of Theoretical Geophysics at the University of Cambridge; and Professor Michael Kelly, Prince Philip Professor of Technology at the University of Cambridge. The panel will have

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165 Q 176

166 Ev 40, para 4

167 UEA, 11 February 2010, www.uea.ac.uk/mac/comm/media/press/CRUstatements/New+scientific+assessment+of+climatic+research+publications+announced

access to any publications or materials it requests, and all information considered will be listed in the Report. UEA, in consultation with the Royal Society, has suggested that the panel looks in particular at key publications, from the body of CRU's research referred to in the UEA submission to our inquiry. According to the announcement on 22 March, the panel will meet in Norwich in April and will have the opportunity to see original data and speak to those who did the work and it comprises of scientists who use techniques similar to those used in CRU but who largely apply them to other areas of research, as well as those with experience in climate or related research.[168]

125. Announcing the Panel, Professor Trevor Davies, UEA's Pro-Vice-Chancellor for Research, said that:

> Our concern has been to bring together a distinguished group of independent scientists who understand the difference between assertion and evidence, and are familiar with using the latter to judge the validity of conclusions arising from science research. The panel members have the right mix of skills to understand the complex nature of climate research and the discipline-based expertise to scrutinise CRU's research. How they do this will be entirely down to the panel.
>
> The choice of scientists is sure to be the subject of discussion, and experience would suggest that it is impossible to find a group of eminent scientists to look at this issue who are acceptable to every interest group which has expressed a view in the last few months. Similarly it is unlikely that a group of people who have the necessary experience to assess the science, but have formed no view of their own on global warming, could be found.[169]

Public view of the climate science

126. There is no doubt that the e-mail disclosure from CRU in November 2009, and especially the extensive media coverage that has followed it ever since, has affected the general public view of climate science, both in the UK and further afield. Professor Bob Watson, Defra's Chief Scientific Adviser, told us that "the media has certainly portrayed the UEA issue as a crisis, so I think to the public it has been portrayed as a crisis".[170] Professor Peter Cox, a climate scientist and a lead-author on the last IPCC[171] Working Group, in his written submission to us, said as much: "I am concerned that public confidence in the science of climate change has been undermined by the email leak".[172] In its submission the Royal Society of Chemistry said that the:

> true nature of science dictates that research is transparent and robust enough to survive scrutiny. A lack of willingness to disseminate scientific information may infer that the scientific results or methods used are not robust enough to face scrutiny, even if this conjecture is not well-founded. This has far-reaching consequences for

168 "CRU Scientific Assessment Panel announced", UEA Press Release, 22 March 2010, www.uea.ac.uk/mac/comm/media/press/CRUstatements/SAPannounce

169 *As above*

170 Q 198

171 Intergovernmental Panel on Climate Change

172 Ev 132, para 1

> the reputation of science as a whole, with the ability to undermine the public's confidence in science.[173]

127. The majority of submissions submitted to our inquiry has been from those who stated that the disclosed e-mails confirmed their worries that the climate change orthodoxy has serious flaws and the actions of CRU seriously impugned the integrity of climate change research.[174] A representative example was the memorandum from Dr Phillip Bratby, "a semi-retired energy consultant", who said that having examined the disclosures:

> It is concluded that over at least a period of 20 years, climate science has been seriously compromised by the actions of a small group of scientists who have attempted to control the debate about climate change. The effects of this are potentially profound. For example a generation of work may have been corrupted and may be unreliable. A generation of students may have been corrupted and their work may be unreliable.[175]

128. Others offered a different perspective. Dr Timothy Osborn, a full-time member of staff at CRU, defended CRU:

> It is impossible to draw firm conclusions from the hacked documents and emails. They do not represent the complete record, and they are not a random selection from the complete record. They are clearly selected with a purpose in mind and it is easy for people to fall into the traps set by those who did the selection.[176]

129. Beyond CRU, Professor Hans von Storch and Dr Myles Allen, professional statistical climatologists, agreed that the publication of the hacked e-mails had initiated an intense debate about the credibility of climate science and that "unfortunately, this debate sometimes goes so far as to question a key result of climate science",[177] and the

> language used in some of these e-mails has created concern, among both scientists and the public, about the openness and integrity of the scientific process. But at the same time it is critical to point out that no grounds have arisen to doubt the validity of the thermometer-based temperature record since 1850, nor any results based upon it.[178]

130. We put the concerns about the threat to the reputation of science to the fifth panel who gave oral evidence: Professor John Beddington, Government Chief Scientific Adviser, Professor Julia Slingo, Chief Scientist, Met Office, and Professor Bob Watson, Chief Scientist, Department for Environment, Food and Rural Affairs. Professor Beddington did

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173 Ev 171, para 4

174 For examples, see Ev 68 [Richard S Courtney]; Ev 77 [Walter Radtke]; Ev 78 [Geoffrey Sherrington]; and Ev 93 [Clive Menzies]

175 Ev 92, para 21

176 Ev 130, para 3

177 Ev 172, para 1

178 *As above*

not consider that "UK science has been damaged".[179] The Met Office, in its written submission stated that

> the UK enjoys a reputation for strong and robust science on the international stage. In the field of climate research the Met Office is widely acknowledged as world leading.[180]

Professor Slingo confirmed in oral evidence that she has "absolute confidence in the science that we produce at the Met Office",[181] and Professor Watson, looking at the wider situation, attested that "there is absolutely no adverse effect on any of the conclusions of the IPCC."[182]

131. **In our view, reputation has to be built on the solid foundation of excellent, peer-reviewed science. The review of the science to be carried out by the Scientific Appraisal Panel, which UEA announced on 22 March, should determine whether the work of CRU has been soundly built and it would be premature for us to pre-judge that review.**

132. **Reputation does not, however, rest solely on the quality of work as it should. It also depends on perception. It is self-evident that the disclosure of CRU e-mails has damaged the reputation of UK climate science and, as views on global warming have become polarised, any deviation from the highest scientific standards will be pounced on. As we explained in chapter 2, the practices and methods of climate science are a key issue. If the practices of CRU are found to be in line with the rest of climate science, the question would arise whether climate science methods of operation need to change. In this event we would recommend that the scientific community should consider changing those practices to ensure greater transparency.**

Need for a single review

133. The final issue is whether the best interests of science are served by having two reviews or inquiries. We found this difficult to evaluate as details of the Scientific Appraisal Panel were released in a late stage in our inquiry. When we asked Sir Muir whether it would be better to have a single inquiry, he responded:

> It would have been possible, obviously, to have constructed an inquiry that looked at both aspects of that, and that was not what I was asked to do. Whether I would have been the right person to be asked to do it I do not know but certainly it obviously became clear to the Vice Chancellor that there was this different issue about the confidence that one should have not in all the methodological and handling issues but in the higher level set of conclusions about what was actually happening.[183]

134. The process of two reviews or inquiries is underway. In our view there is the potential for overlap between the two inquiries—for example, the question of the operation of peer

179 Q 194

180 Ev 46, para 1

181 Q 197

182 Q 198

183 Q 181

review needs to examine both methodology and quality of the science subject to review. **The two reviews or inquiries need to map their activities to ensure that there are no unmanaged overlaps or gaps. If there are, the whole process could be undermined.**

5 Conclusions

135. Consideration of the complaints and accusations made against CRU has led us to three broad conclusions.

136. Conclusion 1 **The focus on Professor Jones and CRU has been largely misplaced. On the accusations relating to Professor Jones's refusal to share raw data and computer codes, we consider that his actions were in line with common practice in the climate science community. We have suggested that the community consider becoming more transparent by publishing raw data and detailed methodologies. On accusations relating to Freedom of Information, we consider that much of the responsibility should lie with UEA, not CRU.**

137. Conclusion 2 **In addition, insofar as we have been able to consider accusations of dishonesty—for example, Professor Jones's alleged attempt to "hide the decline"—we consider that there is no case to answer. Within our limited inquiry and the evidence we took, the scientific reputation of Professor Jones and CRU remains intact. We have found no reason in this unfortunate episode to challenge the scientific consensus as expressed by Professor Beddington, that "global warming is happening [and] that it is induced by human activity".[184] It was not our purpose to examine, nor did we seek evidence on, the science produced by CRU. It will be for the Scientific Appraisal Panel to look in detail into all the evidence to determine whether or not the consensus view remains valid.**

138. Conclusion 3 **A great responsibility rests on the shoulders of climate science: to provide the planet's decision makers with the knowledge they need to secure our future. The challenge that this poses is extensive and some of these decisions risk our standard of living. When the prices to pay are so large, the knowledge on which these kinds of decisions are taken had better be right. The science must be irreproachable.**

184 Q 191

Conclusions and recommendations

Datasets

1. We recognise that some of the e-mails suggest a blunt refusal to share data, even unrestricted data, with others. We acknowledge that Professor Jones must have found it frustrating to handle requests for data that he knew—or perceived—were motivated by a desire simply to seek to undermine his work. But Professor Jones's failure to handle helpfully requests for data in a field as important and controversial as climate science was bound to be viewed with suspicion. He was obviously frustrated by other workers in the field trying to "undermine" his work, but his actions were inevitably counterproductive. Professor Jones told us that the published e-mails represented only "one tenth of 1%" of his output, which amounts to one million e-mails, and that we were only seeing the end of a protracted series of e-mail exchanges. We consider that further suspicion could have been allayed by releasing all the e-mails. In addition, we consider that had the available raw data been available online from an early stage, these kinds of unfortunate e-mail exchanges would not have occurred. In our view, CRU should have been more open with its raw data and followed the more open approach of NASA to making data available. (Paragraph 38)

2. We are not in a position to set out any further the extent, if any, to which CRU should have made the data available in the interests of transparency, and we hope that the Independent Climate Change Email Review will reach specific conclusions on this point. However, transparency and accountability are of are increasing importance to the public, so we recommend that the Government reviews the rules for the accessibility of data sets collected and analysed with UK public money. (Paragraph 39)

3. We note that the research passed the peer review process of some highly reputable journals. However, we note that CRU could have been more open at that time in providing the detailed methodological working on its website. We recommend that all publicly funded research groups consider whether they are being as open as they can be, and ought to be, with the details of their methodologies. (Paragraph 45)

4. We therefore conclude that there is independent verification, through the use of other methodologies and other sources of data, of the results and conclusions of the Climate Research Unit at the University of East Anglia. (Paragraph 49)

5. Even if the data that CRU used were not publicly available—which they mostly are—or the methods not published—which they have been—its published results would still be credible: the results from CRU agree with those drawn from other international data sets; in other words, the analyses have been repeated and the conclusions have been verified. (Paragraph 51)

6. It is not standard practice in climate science and many other fields to publish the raw data and the computer code in academic papers. We think that this is problematic because climate science is a matter of global importance and of public interest, and therefore the quality and transparency of the science should be irreproachable. We

therefore consider that climate scientists should take steps to make available all the data used to generate their published work, including raw data; and it should also be made clear and referenced where data has been used but, because of commercial or national security reasons is not available. Scientists are also, under Freedom of Information laws and under the rules of normal scientific conduct, entitled to withhold data which is due to be published under the peer-review process. In addition, scientists should take steps to make available in full their methodological workings, including the computer codes. Data and methodological workings should be provided via the internet. There should be enough information published to allow verification. (Paragraph 54)

7. Critics of CRU have suggested that Professor Jones's use of the word "trick" is evidence that he was part of a conspiracy to hide evidence that did not fit his view that recent global warming is predominately caused by human activity. The balance of evidence patently fails to support this view. It appears to be a colloquialism for a "neat" method of handling data. (Paragraph 60)

8. Critics of CRU have suggested that Professor Jones's use of the words "hide the decline" is evidence that he was part of a conspiracy to hide evidence that did not fit his view that recent global warming is predominantly caused by human activity. That he has published papers—including a paper in *Nature*—dealing with this aspect of the science clearly refutes this allegation. In our view, it was shorthand for the practice of discarding data known to be erroneous. We expect that this is a matter the Scientific Appraisal Panel will address. (Paragraph 66)

9. The evidence that we have seen does not suggest that Professor Jones was trying to subvert the peer review process. Academics should not be criticised for making informal comments on academic papers. The Independent Climate Change Email Review should look in detail at all of these claims. (Paragraph 73)

Freedom of Information issues

10. We regret that the ICO made a statement to the press that went beyond that which it could substantiate and that it took over a month for the ICO properly to put the record straight. We recommend that the ICO develop procedures to ensure that its public comments are checked and that mechanisms exist to swiftly correct any mis-statements or misinterpretations of such statements. (Paragraph 91)

11. There is *prima facie* evidence that CRU has breached the Freedom of Information Act 2000. It would, however, be premature, without a thorough investigation affording each party the opportunity to make representations, to conclude that UEA was in breach of the Act. In our view, it is unsatisfactory to leave the matter unresolved simply because of the operation of the six-month time limit on the initiation of prosecutions. Much of the reputation of CRU hangs on the issue. We conclude that the matter needs to be resolved conclusively—either by the Independent Climate Change Email Review or by the Information Commissioner. (Paragraph 93)

12. If the Minister was correct to assert in July 2009 that the Government had no evidence that the current six-month time limit presents a systemic problem, then it is now clear that such evidence exists. Irrespective of whether or not CRU breached the Freedom of Information Act 2000, we recommend that the Government review the operation of section 77 of the 2000 Act and the six month limit on the initiation of prosecutions provided by section 127(1) of the Magistrates Court Act 1980. (Paragraph 95)

13. We have already recommended in paragraph 54 above that in future information, including data and methodology, should be published proactively on the internet wherever possible. However, a culture of withholding information—from those perceived by CRU to be hostile to global warming—appears to have pervaded CRU's approach to FOIA requests from the outset. We consider this to be unacceptable. (Paragraph 103)

14. We cannot reach a firm conclusion on the basis of the evidence we took but we must put on record our concern about the manner in which UEA allowed CRU to handle FOIA requests. Further, we found *prima facie* evidence to suggest that the UEA found ways to support the culture at CRU of resisting disclosure of information to climate change sceptics. The failure of UEA to grasp fully the potential damage to CRU and UEA by the non-disclosure of FOIA requests was regrettable. UEA needs to review its policy towards FOIA and re-assess how it can support academics whose expertise in this area is limited. (Paragraph 104)

The Independent Climate Change Email Review

15. We accept the assurances that Sir Muir Russell has given about the independence of the Independent Climate Change Email Review and we expect him to be scrupulous in preserving its impartiality. We see no reason why the Review's conclusions and UEA's response have to be published together. Indeed, it could give the impression that UEA was being given an advantage when it comes to responding. We consider that the Review's conclusions and recommendations should not be conveyed to UEA in advance of publication. (Paragraph 113)

16. With regards to the terms of reference of the Review, we consider that as well as measuring CRU against current acceptable scientific practice, the Review should also make recommendations on best practice to be followed by CRU in the future. We invite Sir Muir Russell to respond formally to our Report to the extent that he sets out whether, on the basis of its contents, he finds the Terms of Reference of his inquiry need to be changed. (Paragraph 114)

17. It is unfortunate that the Independent Review got off to a bad start with the necessary resignation of Dr Campbell. The question of the operation of peer review is going to be a critical issue in the inquiry and the Review Team needs to take steps to ensure the insight and experience he would have brought are replaced. (Paragraph 119)

18. We conclude that, when the Independent Review holds oral hearings or interviews, they should be carried out in public wherever possible and that it should publish all the written evidence it receives on its website as soon as possible. (Paragraph 122)

The Scientific Appraisal Panel

19. In our view, reputation has to be built on the solid foundation of excellent, peer-reviewed science. The review of the science to be carried out by the Scientific Appraisal Panel, which UEA announced on 22 March, should determine whether the work of CRU has been soundly built and it would be premature for us to pre-judge that review. (Paragraph 131)

20. Reputation does not, however, rest solely on the quality of work as it should. It also depends on perception. It is self-evident that the disclosure of the CRU e-mails has damaged the reputation of UK climate science and, as views on global warming have become polarised, any deviation from the highest scientific standards will be pounced on. As we explained in chapter 2, the practices and methods of climate science are a key issue. If the practices of CRU are found to be in line with the rest of climate science, the question would arise whether climate science methods of operation need to change. In this event we would recommend that the scientific community should consider changing those practices to ensure greater transparency. (Paragraph 132)

The two inquiries

21. The two reviews or inquiries need to map their activities to ensure that there are no unmanaged overlaps or gaps. If there are, the whole process could be undermined. (Paragraph 134)

Conclusions

22. The focus on Professor Jones and CRU has been largely misplaced. On the accusations relating to Professor Jones's refusal to share raw data and computer codes, we consider that his actions were in line with common practice in the climate science community. We have suggested that the community consider becoming more transparent by publishing raw data and detailed methodologies. On accusations relating to Freedom of Information, we consider that much of the responsibility should lie with UEA, not CRU. (Paragraph 136)

23. In addition, insofar as we have been able to consider accusations of dishonesty—for example, Professor Jones's alleged attempt to "hide the decline"—we consider that there is no case to answer. Within our limited inquiry and the evidence we took, the scientific reputation of Professor Jones and CRU remains intact. We have found no reason in this unfortunate episode to challenge the scientific consensus as expressed by Professor Beddington, that "global warming is happening [and] that it is induced by human activity". It was not our purpose to examine, nor did we seek evidence on, the science produced by CRU. It will be for the Scientific Appraisal Panel to look in detail into all the evidence to determine whether or not the consensus view remains valid. (Paragraph 137)

24. A great responsibility rests on the shoulders of climate science: to provide the planet's decision makers with the knowledge they need to secure our future. The challenge that this poses is extensive and some of these decisions risk our standard of

living. When the prices to pay are so large, the knowledge on which these kinds of decisions are taken had better be right. The science must be irreproachable. (Paragraph 138)

Formal Minutes

Wednesday 24 March 2010

Members present:

Mr Phil Willis, in the Chair

Mr Tim Boswell	Dr Brian Iddon
Dr Evan Harris	Graham Stringer

The Committee considered this matter.

Draft Report (The disclosure of climate data from the Climatic Research Unit at the University of East Anglia), proposed by the Chair, brought up and read.

Ordered, That the draft Report be read a second time, paragraph by paragraph.

Paragraphs 1 to 46 read and agreed to.

Paragraph 47 read.

Question put, That the paragraph stand part of the Report.

The Committee divided.

Ayes, 3	Noes, 1
Mr Tim Boswell	Graham Stringer
Dr Evan Harris	
Dr Brian Iddon	

Paragraphs 48 to 50 read and agreed to.

Paragraph 51 read.

Question put, That the paragraph stand part of the Report.

The Committee divided.

Ayes, 3	Noes, 1
Mr Tim Boswell	Graham Stringer
Dr Evan Harris	
Dr Brian Iddon	

Paragraphs 52 to 65 read and agreed to.

Paragraph 66 read.

Amendment proposed, to leave out from the beginning to "We" in line 6 and insert "We have not taken enough evidence on this matter to come to a final conclusion".—(*Graham Stringer.*)

Question put, That the Amendment be made.

The Committee divided.

Ayes, 1	Noes, 3
Graham Stringer	Mr Tim Boswell
	Dr Evan Harris
	Dr Brian Iddon

Paragraph 66 agreed to.

Paragraphs 67 to 131 read and agreed to.

Paragraph 132 read.

Amendment proposed, to leave out from "science" in line 6 to the end and add "it would be necessary for the whole of climate science to increase its transparency and improve its scientific methodology".—(*Graham Stringer.*)

Question put, That the Amendment be made.

The Committee divided.

Ayes, 1	Noes, 3
Graham Stringer	Mr Tim Boswell
	Dr Evan Harris
	Dr Brian Iddon

Paragraph 132 agreed to.

Paragraph 133 read and agreed to.

Paragraph 134 read.

Amendment proposed, at the end of line 5 to insert "Given the increasingly hostile attitudes of both sides on this issue, it is vital that these two inquiries have at least one member each who is a reputable scientist, and is sceptical of anthropogenic climate change".—(*Graham Stringer.*)

Question put, That the Amendment be made.

The Committee divided.

Ayes, 1	Noes, 3
Graham Stringer	Mr Tim Boswell
	Dr Evan Harris
	Dr Brian Iddon

Paragraphs 135 and 136 read and agreed to.

Paragraph 137 read.

Amendment proposed, after "answer" in line 3 add "**Within our limited inquiry and the evidence we took, the scientific reputation of Professor Jones and CRU remains intact.**"—(*Dr Evan Harris.*)

Question put, That the Amendment be made.

The Committee divided.

Ayes, 3	Noes, 1
Mr Tim Boswell	Graham Stringer
Dr Evan Harris	
Dr Brian Iddon	

Question put, That the paragraph, as amended, stand part of the Report.

The Committee divided.

Ayes, 3	Noes, 1
Mr Tim Boswell	Graham Stringer
Dr Evan Harris	
Dr Brian Iddon	

Paragraph 138 read and agreed to.

Summary brought up and read.

Question put, That the summary be added to the Report.

The Committee divided.

Ayes, 3	Noes, 1
Mr Tim Boswell	Graham Stringer
Dr Evan Harris	
Dr Brian Iddon	

Motion made, and Question put, That the Report be the Eighth Report of the Committee to the House.

The Committee divided.

Ayes, 3	Noes, 1
Mr Tim Boswell	Graham Stringer
Dr Evan Harris	
Dr Brian Iddon	

Resolved, That the Report be the Eighth Report of the Committee to the House.

Ordered, That the Chair make the Report to the House.

Ordered, That embargoed copies of the Report be made available, in accordance with the provisions of Standing Order No. 134.

Written evidence was ordered to be reported to the House for printing with the Report, together with written evidence reported and ordered to be published on 24 February and 1 March 2010.

Written evidence was ordered to be reported to the House for placing in the Library and Parliamentary Archives.

[The Committee adjourned

Witnesses

Wednesday 1 March 2010

The Rt Hon Lord Lawson of Blaby, Chairman, and **Dr Benny Peiser,** Director, Global Warming Policy Foundation — Ev 2

Richard Thomas CBE, former Information Commissioner — Ev 11

Professor Edward Acton, Vice-Chancellor, University of East Anglia and **Professor Phil Jones,** Director of the Climatic Research Unit — Ev 27

Sir Muir Russell, Head of the Independent Climate Change E-Mails Review — Ev 41

Professor John Beddington, Government Chief Scientific Adviser, **Professor Julia Slingo OBE,** Chief Scientist, Met Office, and **Professor Bob Watson,** Chief Scientist, Defra — Ev 58

List of written evidence

1	Andrew Montford	Ev 159
2	Anne Stallybrass	Ev 169
3	Aporia	Ev 98
4	Climate Change E-Mails Review Team	Ev 39
5	Clive Menzies	Ev 93
6	David Andrew Cockroft	Ev 168
7	David Holland	Ev 115
8	David Shaw	Ev 99
9	Douglas J. Keenan	Ev 181
10	Dr. Benny Peiser	Ev 164
11	Dr. D. R. Keiller	Ev 103
12	Dr. Michael Simons	Ev 97
13	Dr. Sonja Boehmer-Christiansen	Ev 124, Ev 127
14	Dr. Timothy J. Osborn	Ev 129
15	Edward Dilley	Ev 76
16	Eric Rasmusen	Ev 89
17	G R Ryan	Ev 78
18	Geoffrey Sherrington	Ev 78
19	Global Warming Policy Foundation	Ev 1
20	Godfrey Bloom MEP	Ev 92
21	Ian Goddard	Ev 82
22	Institute of Physics	Ev 167
23	J Ronan	Ev 197

24	John F Kelly	Ev 191
25	John Graham-Cumming	Ev 195
26	John Wadsworth	Ev 81
27	Lalu Hanuman	Ev 81
28	Martin Brumby	Ev 82
29	Met Office	Ev 46, Ev 64
30	Mike Haseler	Ev 133
31	Nicholas Barnes and David Jones	Ev 197
32	Peabody Energy Company	Ev 191
33	Peter Sinclair	Ev 82
34	Peter Taylor	Ev 186
35	Phillip Bratby	Ev 90
36	Professor Darrel Ince	Ev 152
37	Professor Hans von Storch and Dr. Myles R. Allen	Ev 172
38	Professor John Beddington, Government Chief Scientific Adviser	Ev 45, Ev 64
39	Professor Peter Cox	Ev 132
40	Professor Ross McKitrick	Ev 140
41	Public Interest Research Centre	Ev 176
42	Research Councils UK	Ev 175
43	Richard S Courtney	Ev 68
44	Richard Thomas CBE	Ev 7
45	Richard Tyrwhitt-Drake	Ev 162
46	Roger Helmer MEP	Ev 85
47	Ronald K Bolton	Ev 119, Ev 123
48	Royal Society of Chemistry	Ev 170
49	Royal Statistical Society	Ev 185
50	Stephen McIntyre	Ev 82, Ev 144
51	Stephen Prower	Ev 86
52	Steven Mosher	Ev 151
53	Stuart Huggett	Ev 77
54	Susan Ewens	Ev 83
55	University of East Anglia	Ev 16, Ev 17, Ev 25, Ev 34, Ev 37, Ev 38
56	Walter Radtke	Ev 77
57	Warwick Hughes	Ev 153

List of unprinted evidence

The following written evidence has been reported to the House, but has not been printed and copies have been placed in the House of Commons Library, where they may be inspected by Members. Other copies are in the Parliamentary Archives (www.parliament.uk/archives), and are available to the public for inspection. Requests for inspection should be addressed to The Parliamentary Archives, Houses of Parliament, London SW1A 0PW (tel. 020 7219 3074; e-mail archives@parliament.uk). Opening hours are from 9.30 am to 5.00 pm on Mondays to Fridays.

CRU 27 The Global Warming Policy Foundation annexes

CRU 58/58a Dr Nigel Dudley memoranda

List of Reports from the Committee during the current Parliament

The reference number of the Government's response to each Report is printed in brackets after the HC printing number.

Session 2009–10

First Report	The work of the Committee in 2008–09	HC 103
Second Report	Evidence Check 1: Early Literacy Interventions	HC 44 (HC 385)
Third Report	The Government's review of the principles applying to the treatment of independent scientific advice provided to government	HC 158-I (HC 384)
Fourth Report	Evidence Check 2: Homeopathy	HC 45
Fifth Report	The Regulation of Geoengineering	HC 221
Sixth Report	The impact of spending cuts on science and scientific research	HC 335-I
Seventh Report	Bioengineering	HC 220
Eighth Report	The disclosure of climate data from the Climatic Research Unit at the University of East Anglia	HC 387-I

Session 2008–09

First Report	Re-skilling for recovery: After Leitch, implementing skills and training policies	HC 48–I (HC 365)
Second Report	The Work of the Committee 2007–08	HC 49
Third Report	DIUS's Departmental Report 2008	HC 51–I (HC 383)
Fourth Report	Engineering: turning ideas into reality	HC 50–I (HC 759)
Fifth Report	Pre-appointment hearing with the Chair-elect of the Economic and Social Research Council, Dr Alan Gillespie CBE	HC 505
Sixth Report	Pre-appointment hearing with the Chair-elect of the Biotechnology and Biological Sciences Research Council, Professor Sir Tom Blundell	HC 506
Seventh Report	Spend, spend, spend? – The mismanagement of the Learning and Skills Council's capital programme in further education colleges	HC 530 (HC 989)
Eighth Report	Putting Science and Engineering at the Heart of Government Policy	HC 168–I (HC 1036)
Ninth Report	Pre-appointment hearing with the Chair-elect of the Science and Technology Facilities Council, Professor Michael Sterling	HC 887
Tenth Report	Sites of Special Scientific Interest	HC 717 (HC 990)
Eleventh Report	Students and Universities	HC 170–I (HC 991)

Session 2007–08

First Report	UK Centre for Medical Research and Innovation	HC 185 (HC 459)
Second Report	The work and operation of the Copyright Tribunal	HC 245 (HC 637)
Third Report	Withdrawal of funding for equivalent or lower level qualifications (ELQs)	HC 187–I (HC 638)
Fourth Report	Science Budget Allocations	HC 215 (HC 639)
Fifth Report	Renewable electricity-generation technologies	HC 216–I (HC 1063)
Sixth Report	Biosecurity in UK research laboratories	HC 360–I (HC 1111)

Seventh Report	Pre-legislative Scrutiny of the Draft Apprenticeships Bill	HC 1062–I (HC (2008–09)262)
First Special Report	The Funding of Science and Discovery Centres: Government Response to the Eleventh Report from the Science and Technology Committee, Session 2006–07	HC 214

Session 2007–08 (Continued)

Second Special Report	The Last Report: Government Response to the Thirteenth Report from the Science and Technology Committee, Session 2006–07	HC 244
Fourth Special Report	Investigating the Oceans: Government Response to the Science and Technology Committee's Tenth Report of Session 2006–07	HC 506 [incorporating HC 469–i]

SUBMITTED MATERIALS BY REPRESENTATIVE BRAD MILLER

RA-10 Final Investigation Report Involving Dr. Michael E. Mann
The Pennsylvania State University
June 4, 2010

Composition of the Investigatory Committee:

Sarah M. Assmann, Waller Professor
Department of Biology

Welford Castleman, Evan Pugh Professor and Eberly Distinguished Chair in Science
Department of Chemistry and Department of Physics

Mary Jane Irwin, Evan Pugh Professor
Department of Computer Science and Electrical Engineering

Nina G. Jablonski, Department Head and Professor
Department of Anthropology

Fred W. Vondracek, Professor
Department of Human Development and Family Studies

Research Integrity Officer:

Candice Yekel, Director of the Office for Research Protections

Background of the alleged misconduct as described in the RA10 Inquiry Report:

On and about November 22, 2009, The Pennsylvania State University began to receive numerous communications (emails, phone calls and letters) accusing Dr. Michael E. Mann of having engaged in acts, beginning in approximately 1998, that included manipulating data, destroying records and colluding to hamper the progress of scientific discourse around the issue of anthropogenic global warming. These accusations were based on perceptions of the content of the emails stolen from a server at the Climatic Research Unit of the University of East Anglia in Great Britain as widely reported.

Given the sheer volume of the communications to Penn State, the similarity of their content and the variety of sources, which included University alumni, federal and state politicians, and others, many of whom had had no relationship with Penn State, Dr. Eva J. Pell, then Senior Vice President for Research and Dean of the Graduate School, was asked to examine the matter. The reason for having Dr. Pell examine the matter was that the accusations, when placed in an academic context, could be construed as allegations of *research misconduct*, which would constitute a violation of Penn State policy.

Under The Pennsylvania State University's policy, Research Administration Policy No. 10, (hereafter referred to as RA-10), *Research Misconduct* is defined as:

(1) fabrication, falsification, plagiarism or other practices that seriously deviate from accepted practices within the academic community for proposing, conducting, or reporting research or other scholarly activities;
(2) callous disregard for requirements that ensure the protection of researchers, human participants, or the public; or for ensuring the welfare of laboratory animals;
(3) failure to disclose significant financial and business interest as defined by Penn State Policy RA20, *Individual Conflict of Interest*;
(4) failure to comply with other applicable legal requirements governing research or other scholarly activities.

RA-10 further provides that "research misconduct does not include disputes regarding honest error or honest differences in interpretations or judgments of data, and is not intended to resolve bona fide scientific disagreement or debate."

On November 24, 2009, two days after receipt of the allegations, Dr. Pell initiated the process articulated in RA-10 by scheduling a meeting with the Dean of the College of Earth and Mineral Sciences (Dr. William Easterling), the Associate Dean for Graduate Education and Research of the College of Earth and Mineral Sciences (Dr. Alan Scaroni), the Director of the Office for Research Protections (Ms. Candice Yekel), and the Head of the Department of Meteorology (Dr. William Brune).

At this meeting, all were informed of the situation and of the decision to initiate an inquiry under RA-10. Dr. Pell then discussed the responsibilities that each individual would have according to the policy. Dean Easterling recused himself from the inquiry due to a conflict of interest. As the next administrator in the line of management for the college, Dr. Scaroni was asked to take on Dean Easterling's function in the ensuing inquiry.

The Inquiry Committee assigned to conduct the inquiry into the matter consisted of Dr. Eva J. Pell, Senior Vice President for Research, Ms. Candice Yekel, Director of the Office for Research Protections, and Dr. Alan Scaroni, Associate Dean for Graduate Education and Research of the College of Earth and Mineral Sciences. Dr. William Brune, Head of the Department of Meteorology, was to serve in a consulting capacity for the Inquiry Committee. Dr. Henry C. Foley, then Dean of the College of Information Sciences and Technology, was added to the Inquiry Committee in an ex-officio role for the duration of 2009, since he had been named to succeed Dr. Pell as the next Vice President for Research, beginning January 1, 2010.

At the time of initiation of the inquiry, no formal allegations accusing Dr. Mann of research misconduct had been submitted to any University official. Therefore, the emails and other communications were reviewed by Dr. Pell, and from these she synthesized the following four formal allegations. To be clear, these were not allegations that Dr. Pell put forth but rather her best effort to reduce to reviewable allegations the many different accusations that were received from parties outside of the University. The four synthesized allegations were as follows:

1. Did you engage in, or participate in, directly or indirectly, any actions with the intent to suppress or falsify data?

2. Did you engage in, or participate in, directly or indirectly, any actions with the intent to delete, conceal or otherwise destroy emails, information and/or data, related to AR4, as suggested by Phil Jones?

3. Did you engage in, or participate in, directly or indirectly, any misuse of privileged or confidential information available to you in your capacity as an academic scholar?

4. Did you engage in, or participate in, directly or indirectly, any actions that seriously deviated from accepted practices within the academic community for proposing, conducting, or reporting research, or other scholarly activities?

On November 29, 2009, Dr. Pell and Dr. Foley met with Dr. Mann to inform him personally that he had been accused of research misconduct and that an inquiry under RA-10 would take place. On November 30, 2009, a letter was delivered by Dr. Pell to Dr. Mann to notify him of these allegations and Dr. Pell's decision to conduct an inquiry under RA-10. The inquiry phase of RA-10 was thereby formally initiated on November 30, 2009.

From November 30 to December 14, 2009, staff in the Office for Research Protections culled through the 1073 files that contained emails or email strings that were purloined from a server at the University of East Anglia. A subset of the files containing emails or email strings was reviewed. This subset of files included emails that were sent by Dr. Mann, were sent to Dr. Mann, were copied to Dr. Mann, or discussed Dr. Mann (but were neither addressed nor copied to him). In summary, the following were found:

- 206 files that contained emails or email strings that contained message/text from Dr. Mann somewhere in the chain;
- 91 files that contained emails or emails strings that were received by Dr. Mann, but in which he did not participate; and
- 79 files that contained emails or email strings that dealt with Dr. Mann, his work or publications but that he neither authored nor was listed as copied.

From among these 376 files, the Inquiry Committee focused on 47 files that contained emails or email strings that were deemed relevant. On December 17, 2009, the Inquiry Committee (Pell, Scaroni, Yekel), Dr. Brune and Dr. Foley met to review the emails, the RA-10 inquiry process, and their respective activities. It was agreed that these individuals would meet again in early January and that they would use the time until that meeting to review the relevant information, including the above mentioned e-mails, journal articles, OP-ED columns, newspaper and magazine articles, the National Academy of Sciences report entitled "Surface Temperature Reconstructions for the Last 2,000 Years," ISBN: 0-309-66144-7 and various blogs on the internet.

On January 4, 2010, Dr. Foley, in his capacity as the new Vice President for Research and Dean of the Graduate School, became the convener of the Inquiry Committee as Dr. Pell had left the University to become the Under-Secretary of Science for the Smithsonian Institution. On January 8, 2010, Dr. Foley convened the Inquiry Committee to discuss their thoughts on the evidence presented in the emails and other publically available materials. At this meeting, it was decided that each Inquiry Committee member would send to Dr. Foley specific questions to be used by the Inquiry Committee during the interview of Dr. Mann. During the interview, Dr. Foley would moderate the interview and ask each of the initial questions with follow-up questions coming from the other Inquiry Committee members.

On January 12, 2010, the Inquiry Committee (Foley, Yekel, Scaroni) and Dr. Brune met with Dr. Mann. Dr. Mann was asked to address the four allegations leveled against him and to provide answers to the fifteen additional questions that the Inquiry Committee had compiled. In an interview lasting nearly two hours, Dr. Mann addressed each of the questions and follow-up questions. A recording was made of the interview and was later transcribed. The Inquiry Committee members asked occasional follow-up questions. Dr. Mann answered each question carefully:

- He explained the content and meaning of the emails about which the Inquiry Committee inquired;
- He stated that he had never falsified any data, nor had he had ever manipulated data to serve a given predetermined outcome;
- He stated that he never used inappropriate influence in reviewing papers by other scientists who disagreed with the conclusions of his science;
- He stated that he never deleted emails at the behest of any other scientist, specifically including Dr. Phil Jones, and that he never withheld data with the intention of obstructing science; and
- He stated that he never engaged in activities or behaviors that were inconsistent with accepted academic practices.

On January 15, 2010, Dr. Foley conveyed via email on behalf of the Inquiry Committee an additional request to Dr. Mann. Dr. Mann was asked to produce all emails related to the fourth IPCC report ("AR4"), the same emails that Dr. Phil Jones had suggested that he delete. On January 18, 2010, Dr. Mann provided a zip-archive of these emails and an explanation of their content. In addition, Dr. Mann provided a ten page supplemental written response to the matters discussed during his interview.

On January 22, 2010, the Inquiry Committee and Dr. Brune met again to review the evidence, including but not limited to Dr. Mann's answers to the Inquiry Committee's questions, both in the interview and in his subsequent submissions. Dr. Foley reviewed the relevant points of his conversation with Dr. Gerald North, a professor at Texas A&M University and the first author of the NAS 2006 report that included Dr. Mann's research on paleoclimatology. Dr. Foley also relayed the sentiment and view of Dr. Donald Kennedy of Stanford University and the former editor of Science Magazine about the controversy currently swirling around Dr. Mann and some of his colleagues. Both were

very supportive of Dr. Mann and of the credibility of his science. Dr. Brune gave his opinions and suggestions for next steps of the process, and then was dismissed from further discussion pursuant to RA-10 policy role which was consult to the rest of the Inquiry Committee members.

On January 26, 2010, Dr. Foley convened the Inquiry Committee, along with University counsel, Mr. Wendell Courtney, Esq., in case issues of procedure arose.

After a careful review of all written material, and information obtained from the purloined emails, the interview of Dr. Mann, the supplemental materials provided by Dr. Mann and all the information from other sources, the Inquiry Committee found as follows with respect to each allegation:

Allegation 1: "Did you engage in, or participate in, directly or indirectly, any actions with the intent to suppress or falsify data? "

> **Decision 1:** The Inquiry Committee determined there was no substance to this allegation and further investigation of this allegation was not warranted.

Allegation 2: "Did you engage in, or participate in, directly or indirectly, any actions with the intent to delete, conceal or otherwise destroy emails, information and/or data, related to AR4, as suggested by Phil Jones?"

> **Decision 2:** The Inquiry Committee determined there was no substance to this allegation and further investigation of this allegation was not warranted.

Allegation 3: "Did you engage in, or participate in, directly or indirectly, any misuse of privileged or confidential information available to you in your capacity as an academic scholar?"

> **Decision 3:** The Inquiry Committee determined there was no substance to this allegation and further investigation of this allegation was not warranted.

Allegation 4: "Did you engage in, or participate in, directly or indirectly, any actions that seriously deviated from accepted practices within the academic community for proposing, conducting, or reporting research or other scholarly activities?"

> **Decision 4:** The Inquiry Committee determined that "given that information emerged in the form of the emails purloined from CRU in November 2009, which have raised questions in the public's mind about Dr. Mann's conduct of his research activity, given that this may be undermining confidence in his findings as a scientist, and given that it may be undermining public trust in science in general and climate science specifically, an Investigatory Committee of faculty peers from diverse fields should be constituted under RA-10 to further consider this allegation."

An Investigatory Committee of faculty members with impeccable credentials was appointed and asked to present its findings and recommendations to Dr. Henry C. Foley within 120 days of being charged.

The charge to the RA-10 Investigatory Committee:

The Investigatory Committee was charged by Dr. Henry C. Foley, Vice President for Research, on March 4, 2010, as follows:

The Investigatory Committee's charge is to determine whether or not Dr. Michael Mann engaged in, or participated in, directly or indirectly, any actions that seriously deviated from accepted practices within the academic community for proposing, conducting, or reporting research or other scholarly activities.

Sources of support for the related research or publications:

Dr. Mann's research has been sponsored by many different agencies including the National Science Foundation, the Department of Energy and the National Oceanic and Atmosphere Administration.

Documents available to the Investigatory Committee:

- 376 files containing emails stolen from the Climate Research Unit (CRU) of the University of East Anglia and originally reviewed by the Inquiry Committee
- Documents collected by the Inquiry Committee
- Documents provided by Dr. Mann at both the Inquiry and Investigation phases
- Penn State University's RA-10 Inquiry Report
- House of Commons Report HC387-I, March 31, 2010
- National Academy of Science letter titled, "Climate Change and the Integrity of Science" that was published in Science magazine on May 7, 2010
- Information on the peer review process for the National Science Foundation (NSF)
- Department of Energy's Guide to Financial Assistance
- Information on National Oceanic and Atmospheric Administration's peer review process
- Information regarding the percentage of NSF proposals funded
- Dr. Michael Mann's *curriculum vitae*

Interview process:

The interviews were audio-taped and verbatim transcripts were prepared. All interviewed individuals were provided an opportunity to review the transcripts of their interviews for accuracy. The transcripts will be maintained in the Office for Research Protections as part of the official record. Statements or information relevant to the Investigatory Committee's findings are noted in the paragraphs below. The Investigatory Committee interviewed the following individuals:

April 12, 2010: Dr. William Easterling, Dean, College of Earth and Mineral Sciences, The Pennsylvania State University
April 14, 2010: Dr. Michael Mann, Professor, Department of Meteorology, The Pennsylvania State University
April 20, 2010: Dr. William Curry, Senior Scientist, Geology and Geophysics Department, Woods Hole Oceanographic Institution
April 20, 2010: Dr. Jerry McManus, Professor, Department of Earth and Environmental Sciences, Columbia University
May 5, 2010: Dr. Richard Lindzen, Alfred P. Sloan Professor, Department of Earth, Atmospheric and Planetary Sciences, Massachusetts Institute of Technology

Summary of Investigatory Committee's Interview with Dr. Michael E. Mann, Professor, Department of Meteorology, Penn State University – April 14, 2010

On April 14, 2010, the RA-10 Investigatory Committee (Assmann, Castleman, Irwin, Jablonski, and Vondracek) and Candice Yekel interviewed Dr. Michael Mann. In advance of the interview, the Investigatory Committee prepared several questions focusing on whether Dr. Mann "engaged in, or participated in, directly or indirectly, any actions that seriously deviated from accepted practices within the academic community for preparing, conducting, or reporting research or other scholarly activities." In addition to the prepared questions, Investigatory Committee members asked a number of follow-up questions. Dr. Mann answered the questions in a detailed manner.

The first question was "Would you please tell us what you consider in your field to be accepted, standard practice with regard to sharing data?" A follow-up question asked how Dr. Mann had dealt with requests for data that were addressed to him during the period covered by the stolen emails. Dr. Mann offered a brief historical perspective on the issue of sharing data in his field, concluding with the observation that data are made generally available (e.g., in the NOAA public database) after those scientists who obtained the data have had a chance to be the first to publish findings based on the data. He noted that sometimes data are made available on a collegial basis to specific scientists before those who collected the data have published their initial findings. Typically, this involves a request to not release the data to others until the data are made publically available by the scientists who obtained the data. Dr. Mann concluded his answer by stating that he has always worked with data obtained by other scientists, and that when such data were not already in the public domain, he made them available as soon as he was permitted to do so by those who initially obtained the data.

Dr. Mann drew a distinction between actual data and intermediate data that are produced as part of the analytic procedures employed. He indicated that while such intermediate data may occasionally be shared with colleagues, it is not standard practice to publish or make generally available this intermediate data (to which he and others refer to as "dirty laundry" in one of the purloined emails). Finally, he indicated that someone who wanted to reproduce his work would be able to independently reproduce this intermediate data and that, in fact, other researchers had done this.

The Investigatory Committee next inquired how he constructed his source codes and what he considered to be accepted practice in his field for publishing source codes. Dr. Mann indicated that in his field of study, in contrast with some other fields such as economics, publishing the source code was never standard practice until his work and that of his colleagues came under public scrutiny, resulting in public pressure to do so. He indicated that he initially was reluctant to publish his source codes because the National Science Foundation had determined that source codes were the intellectual property of the investigator. Also, he developed his source codes using a programming language (FORTRAN 77) that was not likely to produce identical results when run on a computer system different from the one on which it was developed (e.g., different processor makes/models, different operating systems, different compilers, different compiler optimizations). Dr. Mann reported that since around 2000, he has been using a more accessible programming style (MATLAB), and since then he has made all source codes available to the research community.

The next question was "Do you believe that the perceived hostility and perceived ulterior motives of some critics of global climate science influenced your actions with regard to the peer review process, particularly in relation to the papers discussed in the stolen emails?" Dr. Mann responded by affirming his belief in the importance of the peer review process as a means of ensuring that scientifically sound papers are published, and not as a means of preventing the publication of papers that are contrary to one's views. He elaborated by stating that some of the emails regarding this issue dealt with his concern (shared by other scientists, the publisher, and some members of the editorial board of the journal in question) that the legitimacy of the peer review process had been subverted.

Next, Dr. Mann was asked "Did you ever, without first getting express permission from the original authors, forward to a third party an in-press or submitted manuscript on which you were not a co-author?" In response to this question, Dr. Mann first responded by saying that to the best of his knowledge he had not done so. He then clarified that he may have forwarded such a manuscript to a specific, close colleague, in the belief that permission to do so had been implicit, based on his close collegial relationships with the paper's authors. An illustrative case of such a circumstance would have been the manuscript by Wahl and Ammann, which Dr. Mann forwarded to Dr. Briffa. In response to a follow-up question, Dr. Mann asserted that such judgments about implied consent are quite typical in his field, but they are made only as long as it is understood that such sharing would take place only among trusted colleagues who would maintain the confidentiality of the manuscript.

The next question for Dr. Mann was posed as follows: "What is your reply to the email statements of Dr. McIntyre (a) that he had been referred to an incorrect version of your data at your FTP site (b) that this incorrect version was posted prior to his request and was not formulated expressly for him and (c) that to date, no source code or other evidence has been provided to fully demonstrate that the incorrect version, now deleted, did not infect some of Mann's and Rutherford's other work?" Dr. Mann responded by

stating that neither he, nor many of his colleagues, put much reliability in the various accusations that Dr. McIntyre has made, and that, moreover, there is "no merit whatsoever to Mr. McIntyre's claims here." Specifically, Dr. Mann repeated that all data, as well as the source codes requested by Dr. McIntyre, were in fact made available to him. All data were listed on Dr. Mann's FTP site in 2000, and the source codes were made available to Dr. McIntyre about a year after his request was made, in spite of the fact that the National Science Foundation had ruled that scientists were not required to do so. The issue of an "incorrect version" of the data came about because Dr. McIntyre had requested the data (which were already available on the FTP site) in spreadsheet format, and Dr. Rutherford, early on, had unintentionally sent an incorrectly formatted spreadsheet.

In response to a couple of follow-up questions, Dr. Mann stressed that the stolen emails represent part of a larger context of active communication among scientists, and that he remains on friendly terms with scientists with whom he has had ongoing, and sometimes heated, disagreements about scientific matters. He also commented that he and other scientists fear that the stolen emails will have a chilling effect on the way scientists communicate with each other, partly because members of the public may not appreciate the lingo or jargon (e.g., "dirty laundry" or "trick") that scientists often use when communicating with each other about their science.

At the conclusion of the interview, Dr. Mann indicated that he would be very happy to provide additional information if the Investigatory Committee felt that this would be helpful.

Summary of Investigatory Committee Interview with Dr. William Easterling, Dean, College of Earth and Mineral Sciences, Penn State University – April 12, 2010

On April 12, 2010, the RA-10 Investigatory Committee (Assmann, Castleman, Irwin, Jablonski, and Vondracek) and Candice Yekel interviewed Dr. William Easterling, Dean of the College of Earth and Mineral Sciences, Penn State University. The Investigatory Committee had a number of prepared questions, starting with a request to learn how Dr. Easterling knew Dr. Mann. Dr. Easterling reported that he had known Dr. Mann for about six or seven years prior to his appointment at Penn State in 2008. In response to a question about when and how he had become aware of the allegations against Dr. Mann, Dr. Easterling reported that it was the week before Thanksgiving 2009, when he started receiving emails suggesting a connection between the stolen East Anglia emails and Dr. Mann's work.

The next question for Dr. Easterling was posed as follows: "In your judgment, are accepted and ethical research practices in scientific fields related to global climate change significantly different from such practices in other fields of scientific inquiry?" Dr. Easterling's response to that question was "Absolutely not!" In a follow-up question, Dr. Easterling was asked whether he saw any difference between certain kinds of experimental scientific fields and observational ones like paleoclimatology. He responded by stating that much of what we know about climate change is the result of a combination

of observation and numerical modeling, making the classic idea of falsification of a hypothesis, which may be applicable to a laboratory science, of limited applicability in the study of climate change. Thus, even though there are a number of highly sophisticated, physically sound models that are used to analyze and predict various features of the earth's climate system, human judgments are invariably involved, and a certain amount of subjectivity is introduced.

Another follow-up question inquired about the likely number of different statistical models that might be applicable to Dr. Mann's work. Dr. Easterling indicated that Dr. Mann and his colleagues were primarily interested in looking at historical data (which tend to be "noisy"), using a relatively small number of statistical models, such as principal components analysis, which has a long tradition in various sciences.

The next question addressed to Dr. Easterling was whether, in his judgment, Dr. Mann's work was very aggressive, very conservative, or somewhere in the middle in how it portrayed global warming. Dr. Easterling responded by stating that Dr. Mann's early work showed a more dramatic upturn in warming, but that his more recent work has led to the conclusion that the change has been slightly less dramatic. Moreover, Dr. Easterling added that Dr. Mann's findings have been replicated by independent teams of researchers.

Dr. Easterling was asked whether he knew of any other investigations related to the stolen emails other than the University of East Anglia and Penn State University, and he responded that he was unaware of any others.

The Investigatory Committee then questioned Dr. Easterling about various scientists in the field of climate science who might be interviewed by the Investigatory Committee regarding their views of what constitutes accepted and ethical practice with regard to the conduct of research in the field. The Investigatory Committee wanted a choice of scientists who had disagreed with Dr. Mann's findings as well as others who had agreed but who had not collaborated with Dr. Mann or his collaborators.

At the conclusion of the interview, Dr. Easterling offered to be available to the Investigatory Committee if the Investigatory Committee members thought that this would be helpful.

Summary of Investigatory Committee Interview with Dr. William Curry, Senior Scientist, Geology and Geophysics Department, Woods Hole Oceanographic Institution – April 20, 2010

On April 20, 2010, the RA-10 Investigatory Committee (Assmann, Castleman, Irwin, Jablonski, and Vondracek) and Candice Yekel interviewed Dr. William Curry, Senior Scientist, Geology and Geophysics Department, Woods Hole Oceanographic Institution. The Investigatory Committee had four prepared questions, but Investigatory Committee members were free to ask additional questions as well as follow-up questions as they saw fit.

The first question addressed to Dr. Curry was: "Would you please tell us what you consider in your field to be accepted standard practice with regard to sharing data and unpublished manuscripts?" With regard to sharing data, Dr. Curry indicated that standard practice is that once a publication occurs, the pertinent data are shared via some electronic repository. He stated that not all researchers actually comply with this practice, and that there may be special arrangements with the funding agency, or the journal that publishes the research, that specify when data need to be made available to other researchers. In Dr. Curry's case, for example, the National Science Foundation allows a two-year window during which he has exclusive rights to his data. After that period he must make it available to others.

On the issue of sharing unpublished manuscripts, Dr. Curry stated that if the manuscript was accompanied by a request to keep it confidential, he would not share it with anyone; if it was not accompanied by an explicit request for confidentiality, he might talk about it with colleagues but would not usually forward it.

Next, Dr. Curry was asked: "Would you please briefly explain how codes are developed in the process of evaluating data in your field, e.g., are these codes significantly different from published software packages? Then please tell us what you consider in your field to be accepted standard practice with regard to sharing codes." Dr. Curry reported that in his area, most codes are fairly basic and researchers use software packages to construct them. He also reported that he was not aware of any public archive for such codes, but that he was fairly certain that if he asked another researcher to share such codes, he would most likely get them. He added that overall compliance with requests to share codes would probably be equal to the rate of compliance with requests for sharing data.

Next, Dr. Curry was asked to respond to the following: "How do the processes of data acquisition, analysis and interpretation in paleoclimatology affect practices of data sharing in the field? Are any of these processes unique to paleoclimatology?" Dr. Curry asked for clarification and was told that the question referred to whether the laborious and expensive way in which most data are collected in paleoclimatology had an effect on data sharing. He then responded that requests for raw data would be the exception rather than the rule, because transforming the raw data into usable information is labor intensive and difficult. Nevertheless, because of NSF requirements, he would release all data after two years. He added that some scientists, however, do seek to maintain proprietary access to their data even after two years.

Finally, Dr. Curry was asked whether he wanted to share anything else with the Investigatory Committee. In his concluding comments to the Investigatory Committee, Dr. Curry noted that in the last ten years things have changed rather rapidly with regard to sharing data and information. He reported that he has become more aware of how he would be affected if people started asking him step-by-step details of his work, and that while he has always been diligent about documenting his work, ten years ago he would not have been able to document every single step in his analytical work. Thus, "accepted practices" are not fixed and are always evolving.

Summary of Investigatory Committee Interview with Professor Jerry McManus, Professor, Department of Earth and Environmental Sciences, Columbia University – April 20, 2010

On April 20, 2010, the RA-10 Investigatory Committee (Assmann, Castleman, Irwin, Jablonski, and Vondracek) and Candice Yekel interviewed Dr. Jerry McManus, Professor, Department of Earth and Environmental Sciences, Columbia University. The Investigatory Committee had four prepared questions, but Investigatory Committee members were free to ask additional questions as well as follow-up questions as they saw fit.

To start the interview, Dr. McManus was asked to respond to the following question: "Would you please tell us what you consider in your field to be accepted standard practice with regard to sharing data [and] . . . with regard to sharing unpublished manuscripts?" Dr. McManus responded by first drawing a distinction between published and unpublished data, noting, however, that there is a range of standard practices with regard to both. Nevertheless, the mode of behavior regarding unpublished data is to share "in a fairly limited fashion with individuals or groups who make specific requests and typically who are known to the researcher." Regarding published data, Dr. McManus indicated that standard practice is to make such data available through any of a broad range of means, including providing access to electronic repositories and institutional archives.

Regarding the sharing of unpublished manuscripts, Dr. McManus indicated that there is a broad range of typical and accepted behaviors, with such manuscripts commonly shared with a limited number of colleagues. In a follow-up question, it was inquired whether it may be considered standard practice to share an unpublished manuscript with others without getting express permission to do so from the author. Dr. McManus responded by saying "no" to such sharing as standard practice, but allowing that there is not necessarily only one acceptable practice, as permission may be given implicitly or explicitly. Without specific encouragement for wider distribution, however, it is generally understood, according to Dr. McManus, that unpublished papers are not intended for third-party distribution.

The next question was stated as follows: "Would you please briefly explain how codes are developed in the process of evaluating data in your field (e.g., are these codes significantly different from published software packages)? Then please tell us what you consider in your field to be accepted, standard practice with regard to sharing codes." Dr. McManus indicated that most, but not all, details of such methods are usually reported when research is published, and that some of these details may be shared in a "somewhat ad hoc basis." Generally, however, the tendency is to "try to provide the conditions by which any research can be replicated. . . ." Dr. McManus agreed that generally, codes are treated the same way as any other method.

Summary of Investigatory Committee Interview with Dr. Richard Lindzen, Alfred P. Sloan Professor, Department of Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology – May 5, 2010

On May 5 2010, the RA-10 Investigatory Committee (Assmann, Irwin, Jablonski, Vondracek; Dr. Castleman was not available) and Candice Yekel interviewed Dr. Richard Lindzen, Professor, Department of Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology. The Investigatory Committee had four prepared questions, but Investigatory Committee members were free to ask additional questions as well as follow-up questions as they saw fit.

Before the Investigatory Committee's questioning began, Dr. Lindzen was given some general background information regarding the process of inquiry and investigation into allegations concerning Dr. Mann, with a focus on the particular allegation that is the subject of the current review by the Investigatory Committee. Dr. Lindzen then requested, and was provided with, a brief summary of the three allegations previously reviewed. When told that the first three allegations against Dr. Mann were dismissed at the inquiry stage of the RA-10 process, Dr. Lindzen's response was: "It's thoroughly amazing. I mean these are issues that he explicitly stated in the emails. I'm wondering what's going on?"

The Investigatory Committee members did not respond to Dr. Lindzen's statement. Instead, Dr. Lindzen's attention was directed to the fourth allegation, and it was explained to him that this is the allegation which the Investigatory Committee is charged to address. Dr. Lindzen was then asked the first question formulated by the Investigatory Committee: "Would you please tell us what you consider in your field to be accepted, standard practice with regard to sharing data, and the second part of the question is would you tell us what you consider in your field to be accepted, standard practice with regard to sharing unpublished manuscripts?"

Dr. Lindzen responded by stating that "with respect to sharing data, the general practice is to have it available." With respect to unpublished manuscripts, he indicated that "those are generally not made available unless the author wishes to." In response to a number of follow-up questions, Dr. Lindzen indicated that if an unpublished manuscript is sent to a scientist by the author, it would be common practice to ask for permission before sharing it with others; if it was sent by someone else it would be common practice to ask if they had permission to share the paper. According to Dr. Lindzen, a scientist might conclude that there is implicit permission to disseminate an unpublished paper only when the author made it clear that the results may be disseminated.

The next question inquired whether, in Dr. Lindzen's view, climatologists normally make their codes (used in the analysis of data) available for other people to download. Dr. Lindzen responded by stating that "it depends." He elaborated, saying that if the codes are very standard, it is unnecessary to share them, but if it's an unusual analysis it would be his practice to make the codes available to anyone who wishes to check them. In a follow-up question, Dr. Lindzen was asked whether he would have issues with people

running into compatibility issues or compilation issues. He responded by saying that even if people "screw it up" or if you have reservations about sharing codes, "if somebody asks you how did you get this, you really should let them know."

The next questions presented to Dr. Lindzen were as follows: "How do the processes of data acquisition, analysis, and interpretation in paleoclimatology affect practices of data sharing in the field? Are any of these processes unique to paleoclimatology?" Dr. Lindzen indicated that he did not think that these processes are unique to paleoclimatology, and that since most of the data are acquired using public funds, there is no basis for investigators being proprietary with their data. In response to a follow-up question, Dr. Lindzen acknowledged that prior to publication, scientists may have a variety of reasons to keep things confidential, but after publication "there's an obligation to explain exactly how you got them, especially if they're controversial."

Standard of proof used by the Investigatory Committee:

Preponderance of the evidence (happen more likely than not or 51% certainty). All committee votes are unanimous unless otherwise indicated.

Level of intent considered by the Investigatory Committee:

The Investigatory Committee considered various levels of intent in order of increasing severity from *careless*, to *reckless*, to *knowingly*, to *intentional*. These terms are defined as follows:

- *careless* - a reasonable person would not have known better or honest error – this is not considered research misconduct.
- *reckless* - a reasonable person should have known better.
- *knowingly* - a reasonable person knew better but did it anyway.
- *intentional (purposeful)* – a reasonable person knew better but did it anyway with the intent to deceive.

The level of intent regarding the specific allegation will be addressed below.

Summary of Investigation:

The Investigatory Committee investigated the following potential acts of misconduct:

"Did Dr. Michael Mann engage in, or participate in, directly or indirectly, any actions that seriously deviated from accepted practices within the academic community for proposing, conducting, or reporting research or other scholarly activities?"

The Investigatory Committee was given access to 376 files that contained emails stolen from the Climate Research Unit (CRU) of the University of East Anglia. These emails were either sent by Dr. Mann, sent to Dr. Mann, copied to Dr. Mann, or discussed Dr. Mann (but were neither addressed nor copied to him). The Investigatory Committee also

reviewed the documents collected by the Inquiry Committee, as well as the Inquiry Committee's findings and report. In addition, the Investigatory Committee reviewed a number of documents provided by Dr. Mann in response to requests from both the Inquiry and Investigatory Committees. A number of public documents were also made available to the Investigatory Committee, including a number of editorials, both pro and con Dr. Mann, an open letter from 255 members of the National Academy of Sciences, published in *Science* magazine, May 7, 2010, and the full text of the British House of Commons' Science and Technology Committee report on "The disclosure of climate data from the Climatic Research Unit at the University of East Anglia," which was published on March 31, 2010.

In the course of the investigation, the Investigatory Committee interviewed Dr. Michael Mann, as well as his immediate supervisor, Dr. William Easterling, Dean of the College of Earth and Mineral Sciences at the Pennsylvania State University. Dean Easterling and Dr. David Verardo, National Science Foundation Program Director for Paleo Perspectives on Climate Change, agreed to suggest names of eminent scientists who might agree to be interviewed by the Investigatory Committee in its efforts to establish the range of "accepted practices within the academic community for proposing, conducting, or reporting research or other scholarly activities." As previously described, the Investigatory Committee contacted, and subsequently interviewed, three eminent scientists from the field of climate research: Dr. William Curry, Senior Scientist, Geology and Geophysics Department, Woods Hole Oceanographic Institution; Dr. Richard Lindzen, Alfred P. Sloan Professor, Department of Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology; and Dr. Jerry McManus, Professor, Department of Earth and Environmental Sciences, Columbia University.

Based on the documentary evidence and on information obtained from the various interviews, the Investigatory Committee first considered the question of whether Dr. Mann had seriously deviated from accepted practice in *proposing* his research activities. First, the Investigatory Committee reviewed Dr. Mann's activities that involved proposals to obtain funding for the conduct of his research. Since 1998, Dr. Mann received funding for his research mainly from two sources: The National Science Foundation (NSF) and the National Oceanic and Atmospheric Administration (NOAA). Both of these agencies have an exceedingly rigorous and highly competitive merit review process that represents an almost insurmountable barrier to anyone who proposes research that does not meet the highest prevailing standards, both in terms of scientific/technical quality and ethical considerations.

NOAA and NSF research grant proposals are both evaluated through similarly rigorous and transparent merit review (peer review) processes. To illustrate, we describe the NSF review process, which has two stages. In Stage 1, proposals are sent out to several external experts for merit review (mail review) based on the two NSF review criteria established by the National Science Foundation Board -- Intellectual Merit and Broader Impacts. In Stage 2, the proposal and its external expert reviews (mail reviews) are taken to a 8-15 person external expert panel and evaluated over a several day period (panel review). Panel review members are not the same persons as the mail review members. In

Stage 1, the external reviewers only see individual proposals and rate them on a 5-point scale in descending order from Excellent, Very Good, Good, Fair, and Poor. In Stage 2, the entire panel (except those members who have a conflict of interest with the proposal) see all the proposals in the competition (usually about 140 proposals in the NSF program to which Dr. Mann has typically submitted his proposals) and rate them based on the same two NSF criteria on the same rating scale, but at this stage they evaluate the proposals in comparison with all the other proposals that were submitted. All reviews are then taken under advisement by the director of the particular NSF program to which the proposal was submitted, who then recommends whether a project should be funded. The program director is guided by the expert reviews, but may also take programmatic balance and other NSF criteria into account before making a final recommendation. The rate of funding varies by program, but rarely exceeds 25 percent.

The results achieved by Dr. Mann in the period 1999-2010, despite these stringent requirements, speak for themselves: He served as principal investigator or co-principal investigator on five NOAA-funded and four NSF-funded research projects. During the same period, Dr. Mann also served as co-investigator of five additional NSF- and NOAA-funded research projects, as well as on projects funded by the Department of Energy (DOE), the United States Agency for International Development (USAID), and the Office of Naval Research (ONR). **This level of success in proposing research, and obtaining funding to conduct it, clearly places Dr. Mann among the most respected scientists in his field. Such success would not have been possible had he not met or exceeded the highest standards of his profession for proposing research.**

The second part of the Investigatory Committee's charge was to investigate whether Dr. Mann had engaged in any actions that seriously deviated from accepted practices within the academic community for *conducting* research or other scholarly activities. One focus of the committee's investigation centered on whether Dr. Mann had deviated from accepted practice with regard to sharing data and source codes with other investigators. First, the Investigatory Committee established that Dr. Mann has generally used data collected by others, a common practice in paleoclimatology research. Raw data used in Dr. Mann's field of paleoclimatology are laboriously collected by researchers who obtain core drillings from the ocean floor, from coral formations, from polar ice or from glaciers, or who collect tree rings that provide climate information from the past millennium and beyond. Other raw data are retrieved from thousands of weather stations around the globe. Almost all of the raw data used in paleoclimatology are made publicly available, typically after the originators of the data have had an initial opportunity to evaluate the data and publish their findings. In some cases, small sub-sets of data may be protected by commercial agreements; in other cases some data may have been released to close colleagues before the originators had time to consummate their prerogative to have a limited period (usually about two years) of exclusivity; in still other cases there may be legal constraints (imposed by some countries) that prohibit the public sharing of some climate data. The Investigatory Committee established that Dr. Mann, in all of his published studies, precisely identified the source(s) of his raw data and, whenever possible, made the data and or links to the data available to other researchers. These

actions were entirely in line with accepted practices for sharing data in his field of research.

With regard to sharing source codes used to analyze these raw climate data and the intermediate calculations produced by these codes (referred to as "dirty laundry" by Dr. Mann in one of the stolen emails) with other researchers, there appears to be a range of accepted practices. Moreover, there is evidence that these practices have evolved during the last decade toward increased sharing of source codes and intermediate data via authors' web sites or web links associated with published scientific journal articles. Thus, while it was not considered standard practice ten years ago to make such information publicly available, most researchers in paleoclimatology are today prepared to share such information, in part to avoid unwarranted suspicion of improprieties in their treatment of the raw data. Dr. Mann's actual practices with regard to making source codes and intermediate data readily available reflect, in all respects, evolving practices within his field. Dr. Mann acknowledged that early in his career he was reluctant to publish his source codes because the National Science Foundation had determined that source codes were the intellectual property of the investigator. Moreover, because he developed his source codes using a specific programming language (FORTRAN 77), these codes were not likely to compile and run on computer systems different from the ones on which they were developed (e.g., different processor makes/models, different operating systems, different compilers, different compiler optimizations). Since then, however, he has used a more accessible method for developing his source codes (MATLAB) and he has made all source codes, as well as intermediate data, available to the research community, thereby meeting and exceeding standard practices in his field. Moreover, most of his research methodology involves the use of Principal Components Analysis, a well-established mathematical procedure that is widely used in climate research and in many other fields of science. **Thus, the Investigatory Committee concluded that the manner in which Dr. Mann used and shared source codes has been well within the range of accepted practices in his field.**

The issue of whether Dr. Mann had engaged in any actions that seriously deviated from accepted practices within the academic community for *conducting* research or other scholarly activities was examined by the Investigatory Committee via a number of additional means. When a scientist's research findings are well outside the range of findings published by other scientists examining the same or similar phenomena, legitimate questions may be raised about whether the science is based on accepted practices or whether questionable methods might have been used. Most questions about Dr. Mann's findings have been focused on his early published work that showed the "hockey stick" pattern of climate change. In fact, research published since then by Dr. Mann and by independent researchers has shown patterns similar to those first described by Dr. Mann, although Dr. Mann's more recent work has shown slightly less dramatic changes than those reported originally. In some cases, other researchers (e.g., Wahl & Ammann, 2007) have been able to replicate Dr. Mann's findings, using the publicly available data and algorithms. The convergence of findings by different teams of researchers, using different data sets, lends further credence to the fact that Dr. Mann's conduct of his research has followed acceptable practice within his field. Further support

for this conclusion may be found in the observation that almost all of Dr. Mann's work was accomplished jointly with other scientists. The checks and balances inherent in such a scientific team approach further diminishes chances that anything unethical or inappropriate occurred in the conduct of the research.

A particularly telling indicator of a scientist's standing within the research community is the recognition that is bestowed by other scientists. Judged by that indicator, Dr. Mann's work, from the beginning of his career, has been recognized as outstanding. For example, he received the Phillip M. Orville Prize for outstanding dissertation in the earth sciences at Yale University in 1997. In 2002, he received an award from the Institute for Scientific Information for a scientific paper (published with co-authors) that appeared in the prestigious journal *Nature*; also in 2002, he co-authored a paper that won the Outstanding Scientific Paper Award from the NOAA Office of Oceanic and Atmospheric Research, and *Scientific American* named him as one of 50 leading visionaries in science and technology. In 2005, Dr. Mann co-authored a paper in the *Journal of Climate* that won the John Russell Mather Paper award from the Association of American Geographers, and in the same year, the website "RealClimate.org" (co-founded by Dr. Mann) was chosen as one of the top 25 "Science and Technology" websites by *Scientific American.* In 2006, Dr. Mann was recognized with the American Geophysical Union Editors' Citation for Excellence in Refereeing (i.e., reviewing manuscripts for *Geophysical Research Letters*). **All of these awards and recognitions, as well as others not specifically cited here, serve as evidence that his scientific work, especially the conduct of his research, has from the beginning of his career been judged to be outstanding by a broad spectrum of scientists. Had Dr. Mann's conduct of his research been outside the range of accepted practices, it would have been impossible for him to receive so many awards and recognitions, which typically involve intense scrutiny from scientists who may or may not agree with his scientific conclusions.**

The third area of investigation was to address whether Dr. Mann had engaged in any actions that seriously deviated from accepted practices within the academic community for *reporting* research or other scholarly activities. Dr. Mann's record of publication in peer reviewed scientific journals offers compelling evidence that his scientific work is highly regarded by his peers, thus offering de facto evidence of his adherence to established standards and practices regarding the reporting of research. To date, Dr. Mann is the lead author of 39 scientific publications and he is listed as co-author on an additional 55 publications. The majority of these publications appeared in the most highly respected scientific journals, i.e., journals that have the most rigorous editorial and peer reviews in the field. In practical terms, this means that literally dozens of the most highly qualified scientists in the world scrutinized and examined every detail of the scientific work done by Dr. Mann and his colleagues and judged it to meet the high standards necessary for publication. Moreover, Dr. Mann's work on the Third Assessment Report (2001) of the *Intergovernmental Panel on Climate Change* received recognition (along with several hundred other scientists) by being awarded the 2007 Nobel Peace Prize. **Clearly, Dr. Mann's reporting of his research has been successful and judged to be outstanding by his peers. This would have been impossible had his activities in reporting his work been outside of accepted practices in his field.**

One issue raised by some who read the stolen emails was whether Dr. Mann distributed privileged information to others to gain some advantage for his interpretation of climate change. The privileged information in question consisted of unpublished manuscripts that were sent to him by colleagues in his field. The Investigatory Committee determined that none of the manuscripts were accompanied by an explicit request to not share them with others. Dr. Mann believed that, on the basis of his collegial relationship with the manuscripts' authors, he implicitly had permission to share them with close colleagues. Moreover, in each case, Dr. Mann explicitly urged the recipients of the unpublished manuscripts to first check with the authors if they intended to use the manuscripts in any way. Although the Investigatory Committee determined that Dr. Mann had acted in good faith with respect to sharing the unpublished manuscripts in question, the Investigatory Committee also found that among the experts interviewed by the Investigatory Committee there was a range of opinion regarding the appropriateness of Dr. Mann's actions. Opinions ranged from one expert who contended that it is never acceptable to share an unpublished manuscript without first obtaining explicit permission from the author(s) to do so, to another expert who felt that, when working with close colleagues, it is sometimes acceptable to do so by assuming that implicit permission had been granted. **The Investigatory Committee considers Dr. Mann's actions in sharing unpublished manuscripts with third parties, without first having received express consent from the authors of such manuscripts, to be careless and inappropriate. While sharing an unpublished manuscript on the basis of the author's implied consent may be an acceptable practice in the judgment of some individuals, the Investigatory Committee believes the best practice in this regard is to obtain express consent from the author before sharing an unpublished manuscript with third parties.**

The Investigatory Committee would like to note that Dr. Mann, after being questioned by the Investigatory Committee about this issue, requested and received confirmation that his assumption of implied consent was correct from the author of one of the papers in question. This "after the fact" communication was not considered by the Investigatory Committee in reaching its decision.

Conclusion of the Investigatory Committee as to whether research misconduct occurred:

The Investigatory Committee, after careful review of all available evidence, determined that there is no substance to the allegation against Dr. Michael E. Mann, Professor, Department of Meteorology, The Pennsylvania State University.

More specifically, the Investigatory Committee determined that Dr. Michael E. Mann did not engage in, nor did he participate in, directly or indirectly, any actions that seriously deviated from accepted practices within the academic community for proposing, conducting, or reporting research, or other scholarly activities.

The decision of the Investigatory Committee was unanimous.

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