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THE LOW-LEVEL PLUTONIUM SPILL AT NIST–BOULDER: CONTAMINATION OF LAB AND PERSONNEL

HEARING

BEFORE THE

SUBCOMMITTEE ON TECHNOLOGY AND INNOVATION

COMMITTEE ON SCIENCE AND TECHNOLOGY

HOUSE OF REPRESENTATIVES

ONE HUNDRED TENTH CONGRESS

SECOND SESSION

JULY 15, 2008

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THE LOW-LEVEL PLUTONIUM SPILL AT NIST–BOULDER; CONTAMINATION OF LAB AND PERSONNEL

TUESDAY, JULY 15, 2008

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

The Subcommittee met, pursuant to call, at 11:07 a.m., in Room 2325 of the Rayburn House Office Building, Hon. David Wu [Chairman of the Subcommittee] presiding.

BART GORDON, TENNESSEE
CHAIRMAN

RALPH M. HALL, TEXAS
RANKING MEMBER

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE AND TECHNOLOGY
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http://science.house.gov

Hearing on

The Low-Level Plutonium Spill at NIST Boulder; Contamination of Lab and Personnel

Tuesday, July 15, 2008
11:00 a.m. to 1:00 p.m.
2325 Rayburn House Office Building

Witness List

Dr. James Turner
Acting Director
National Institute of Standards and Technology

Dr. Charles Miller
Director
Office of Federal and State Materials and Environmental Management Programs
U. S. Nuclear Regulatory Commission

Dr. Kenneth Rogers
Former Commissioner
U.S. Nuclear Regulatory Commission

Dr. Elmo Collins
Regional Administrator
Region IV Office
U.S. Nuclear Regulatory Commission

HEARING CHARTER

SUBCOMMITTEE ON TECHNOLOGY AND INNOVATION
COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

The Low-level Plutonium Spill at NIST–Boulder: Contamination of Lab and Personnel

TUESDAY, JULY 15, 2008
11:00 A.M.–1:00 P.M.
2325 RAYBURN HOUSE OFFICE BUILDING

I. Purpose

On June 9, 2008, researchers working at the National Institute of Standards and Technology (NIST) facility in Boulder, Colorado were working with a small sample of plutonium when some of the sample spilled from its container and contaminated the lab and personnel. Contamination spread to other areas of the building, and a small amount of the material was washed away in the lab sink. The purpose of this hearing is to examine the causes of the incident and the subsequent response to the situation by NIST employees, and to discuss improvements to environmental, health, and safety practices at NIST.

II. Witnesses

Dr. James Turner is the Acting Director of the National Institute of Standards and Technology (NIST).

Dr. Charles Miller is the Director of the Office of Federal and State Materials and Environmental Management Programs at the U.S. Nuclear Regulatory Commission.

Dr. Kenneth Rogers is one of five independent investigators appointed by NIST to review the June 9, 2008 plutonium spill and a former Commissioner of the U.S. Nuclear Regulatory Commission.

Dr. Elmo Collins is the Regional Administrator of the Region IV Office, U.S. Nuclear Regulatory Commission.

III. Brief Overview

- On June 9, 2008, researchers working with a 0.25 gram sample of plutonium noticed that the glass vial had cracked and some of the powder had spilled. Radiological contamination was found on the hands of two people, the shoes of 20 others, and the hallway and office space near the lab. The individuals were decontaminated and given medical tests to determine if any plutonium had been ingested or inhaled. The major health risk posed by the plutonium in this case is an increased long-term cancer risk from internal exposure. The area around the lab was cleaned and the lab itself sealed.
- Nearly one week following the incident, contamination was discovered in a laboratory sink, indicating that some plutonium had been washed down the drain to the municipal sewer system. Additionally, several new individuals were identified as possibly having been exposed to the plutonium and traces of contamination were discovered in other areas of the NIST facility.
- On June 27, NIST reported that sensitive medical tests for multiple individuals had returned results positive for internal exposure to plutonium. Under the advice of radiation health physicians, one individual began prophylactic treatment for exposure; the others are awaiting the results of further tests to determine if treatment is necessary. In total, 29 people are receiving these medical tests. However, NIST reports that initial test results show that individuals did not receive medically significant levels of internal radiation exposure.

- The spill likely could have been prevented had proper safety protocols and handling procedures been followed. Documentation provided to the Committee indicates that two individuals working with the plutonium sample—including one directly involved with the accident—had not received the required radiation safety training. Discussions with NIST personnel also revealed that the plutonium was not sealed in its original protective packaging, as it should have been. It is evident from the growing scope of the incident and the inadequate communication between NIST and State and local officials, NIST employees, and others that NIST did not have a comprehensive, practiced emergency response plan in place at the time of the incident.
- NIST relies on supervisors and lab directors to provide safety training to the researchers in their lab and ensure all work is undertaken safely. This system, clearly failed in this case. The FY 2006 Visiting Committee on Advanced Technology (VCAT) report noted a lax culture of environmental, health, and safety (EH&S) at NIST and recommended that NIST management devote more effort to engendering safety among the NIST staff. The Committee has asked for extensive documentation on EH&S practices at NIST and proof of current training for all employees to assess whether this incident reveals a larger problem at NIST.[1] Thus far, NIST has not provided many of these documents, raising the concern that the lapses in good EH&S practice that contributed to this incident are not isolated.

IV. Issues and Concerns

While a final account of the incident is forthcoming, initial reports that untrained personnel were working with radioactive material are troubling. In February 2007, NIST–Boulder applied to the Nuclear Regulatory Commission (NRC) to amend their materials license for plutonium. As part of the agreement to amend their license, NIST stated that personnel handling and working in the area with the nuclear material would follow strict training procedures. NIST claims that most of the individuals who required the two-hour training received it in 2007, but no documentation has been provided to show that the authorized user on the NRC license received the full eight hours of training required. Also, the NRC license lists two authorized users for the plutonium, neither of whom were supervising the experiment at the time of the incident.

On the NRC license amendment application, NIST references an emergency response plan and a contamination minimization program. NIST has not provided these documents to the Committee, but the handling of this incident shows poor implementation of both of these aspects of proper incident response. It is unclear from the training materials provided to the Committee what specific instructions employees received to minimize the extent of contamination and what specific steps they were to take in an emergency. The fact that radioactive material was discharged to the municipal sewer system—though the amount was later determined to be insignificant—and was undiscovered until nearly a week after the initial incident illustrates that personnel did not appreciate the basics of contamination minimization. Similarly, it appears that NIST–Boulder does not have a comprehensive, well practiced emergency plan. Communication with State and local officials was lax, and the lack of communication with employees working at an adjacent National Oceanic and Atmospheric Administration (NOAA) facility created unnecessary anxiety for those individuals.

The FY 2006 VCAT report stated:

> NIST has made solid improvements over the years to improve its laboratory safety. . . . However, there are still inconsistencies in application of safety procedures across the laboratories. Safety is a leadership activity that the senior NIST leadership must be actively involved in.

Although not associated with high-energy radiation, the nuclear material involved in this incident still poses a serious health risk, as illustrated by the treatment measures currently being taken by at least one individual involved. Given that NIST researchers also work with material more hazardous than plutonium, health and safety practices should not be taken for granted by NIST management. The Safety Office at NIST has seen inadequate funding in recent years and the safety officers have little authority to enforce safety procedures. The lack of oversight of safety by NIST management contributed to this incident, and while NIST has engaged outside experts to investigate the incident, they must commission an external panel to evaluate EH&S practices across all of the NIST laboratories and programs.

[1] Letter sent June 19, 2008 requesting these documents is attached.

This is a necessary step to ensure safety for NIST employees and the surrounding communities.

V. Background

The small plutonium sample was being used in a research project to develop improved radiation detectors for use in applications such as anti-nuclear proliferation enforcement, homeland security, and basic research. The work was being done in collaboration with Los Alamos National Laboratories.

The spilled plutonium weighed approximately 0.25g and was used as a reference material of known radioactivity. The type of radiation emitted by this sample is primarily alpha particles, which are easily shielded but have significant risks from internal exposure.

Attachment

BART GORDON, TENNESSEE
CHAIRMAN

RALPH M. HALL, TEXAS
RANKING MEMBER

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June 19, 2008

Dr. James Turner
Acting Director
National Institute of Standards and Technology
100 Bureau Drive, Stop 1070
Gaithersburg, MD 20899-1070

Dear Dr. Turner,

We are writing this letter to express our concern over the accidental release of plutonium at NIST's Boulder Laboratory on June, 9. We are relieved to learn there were no immediate injuries due to the incident, however we are troubled by changing information, that health and safety protocols were not strictly followed, and that clear and accurate information regarding this incident is still not available.

NIST congressional affairs staff and other agency personnel have updated Science and Technology Committee staff with new information on the incident as it is available. We are concerned that the scope of the incident has changed over the course of a week, from one where the contamination was contained and procedures followed, to one where contamination escaped the lab and procedures were not followed. NIST researchers are renowned for their exemplary scientific work. It is disappointing to learn that this leadership does not appear to extend to laboratory health and safety issues.

As we continue to oversee this incident, we request that NIST make available to Committee staff the following information:

- Copies of the radiation and chemical safety protocols followed by NIST employees, and verification of the status of training and refresher training for all current employees;
- Information regarding how NIST's radioactive substance handling and clean up protocols align with those followed by the Department of Energy (DOE) and Los Alamos National Laboratory;
- A summary of NIST environmental, health, and safety (EHS) incident reports for the past year, focusing specifically on chemical EHS incidents;
- Copies of notices sent to NIST employees regarding the incident;
- Copies of correspondences with the Nuclear Regulatory Commission (NRC) and the DOE;

- Copies of communications with Boulder, Colorado city officials and the appropriate county and state officials;
- Copies of any external safety audits done for NIST laboratories;
- And the completed reports on the incident by NIST's review team and the Independent Review Board.

NIST researchers handle radioactive substances and other, equally dangerous chemicals. Given both the real hazards of these materials, and the public's perception of danger, we want assurances that NIST personnel are taking all possible precautions when handling hazardous substances and that a culture of safety is evident and respected at all levels of NIST.

The Committee looks forward to receiving a full report of this incident in as timely a manner as possible.

Sincerely,

BART GORDON
Chairman
Committee on Science & Technology

DAVID WU
Chairman
Subcommittee on Technology & Innovation

MARK UDALL
Chairman
Subcommittee on Space & Aeronautics

Chairman WU. I want to welcome everyone to this morning's hearing. It is not unusual for the Subcommittee to hold oversight hearings about NIST. However, events over the past six months have revealed some serious flaws in the environmental, health, and safety programs at NIST.

This subcommittee has been the strongest champion of NIST in Congress, and its Members have spent a lot of time educating our colleagues on the outstanding scientific and technical work of NIST employees and the tremendous value of NIST's work. On a bipartisan basis, this subcommittee has championed increased funding for NIST's scientific and technical activities.

However, along with scientific and technical excellence, NIST needs an equal dedication to safe laboratory and general practices. This is especially true at the NIST labs where staff routinely work with hazardous materials and high-powered equipment such as radioactive material and lasers. In the past six months NIST has had at least two significant accidents.

The first involved the use of laser in Gaithersburg, Maryland, and the second was the accidental release of plutonium in Boulder, Colorado. Initial investigations revealed the same basic issue in both cases; a lack of training for the researchers performing the experiments and inadequate laboratory safety policies.

These might sound like minor incidents, but they have had medical ramifications for NIST employees, including one person who experienced eye damage from the laser and another who underwent prophylactic treatment for radiation exposure.

I am concerned that the laser event did not trigger an immediate review of all of NIST's safety training which might have prevented the subsequent incident in June. I am also concerned that NIST did not act on the Visiting Committee on Advanced Technology's, or VCAT's, 2006 recommendation that management needed to be more involved in and place more emphasis on environmental, health, and safety issues.

I am also deeply concerned that there did not seem to be a sensitivity and appropriate priority placed on communicating with the surrounding communities to prevent the dissemination of information which might be alarming and which may or may not be accurate to the surrounding communities.

The purpose of today's hearing is not to place blame. It is to understand how this situation developed, and what needs to be done to instill a culture of safety in the NIST laboratories while maintaining scientific excellence.

I want to thank our outside experts for assisting the Subcommittee in its endeavors, and I now would like to recognize my friend from Georgia, the Subcommittee's Ranking Member, Dr. Gingrey, for his opening statement.

[The prepared statement of Chairman Wu follows:]

PREPARED STATEMENT OF CHAIRMAN DAVID WU

I want to welcome everyone to this morning's hearing. It's not unusual for the Subcommittee to hold oversight hearings of NIST. However, events over the past six months have revealed serious flaws in the environmental, health, and safety programs at NIST.

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I especially want to thank our outside experts for assisting the Subcommittee in its endeavors.

I now recognize my friend from Georgia, the Subcommittee Ranking Member, Dr. Gingrey, for his opening statement.

Mr. GINGREY. Mr. Chairman, thank you for calling today's hearing to review the details and the causes of the June 9 spill of plutonium that occurred at the NIST labs in Boulder, and of course, you mentioned also the laser accident at Gaithersburg.

First and foremost, I am very thankful that those in proximity of the spill have thus far shown no adverse side effects from their exposure to plutonium, and of course, as I said, the other accident involving the laser. We—it will take time. Only time will tell the adverse effects of those two incidents.

That is not to say, however, that the sample containing 250 milligrams of various plutonium isotopes pose no health or safety risks when it was mishandled. I am very disappointed that the preliminary investigations of this incident to date have revealed not just a stunning lack of preparation but also a complete lack of understanding of the potential risks involved in the use of encapsulated plutonium samples.

It appears as though researchers were unaware of the potential risks and quickly went forward to obtain and use the samples without appropriate precautions in place. Of even greater concern, safety protocol was either not in place or not properly followed, that would have flagged this acquisition ahead of time or insured that proper training and equipment were available.

Mr. Chairman, this incident is absolutely unacceptable. It could have been avoided, and it should have been avoided. One of the NIST independent reviewers, Dr. Lester Slaback, notes in his report, the incident was the inevitable or at least highly likely and foreseeable end result of numerous individual and organizational failures.

I do applaud Dr. Turner for recognizing the gravity of the problem at NIST, and I am cautiously optimistic that employees throughout the agency will also heed this wake-up call.

However, this incident makes clear that simply having safety policies on paper does not ensure that they will be adequately executed. And I hope Dr. Turner recognizes, I am sure he does, that a fix will not come through onerous safety directions from top level officials. Rather, change must involve every employee or visiting affiliate at NIST adhering to documented safety procedures so that an incident like this does not occur again.

I expect that during the question and answer portion of today's hearing we will be able to discuss how NIST can ensure that their safety programs, including radiological safety, become examples of best practices instead of examples of shortcomings and inadequate preparation. Indeed, you know, when I think of NIST and what I have learned of NIST and visited at Gaithersburg in the time that I have been a Member of this committee, I have come to expect the very best of this age-old organization that is practically called for in our United States Constitution. I mean, it is hugely, hugely important, and it is just shocking that this would have occurred.

The Nuclear Regulatory Commission's investigation of this incident is, of course, still ongoing, so I am sensitive to the need of the Commission to complete that work before discussing their findings. I am thankful, though, that Dr. Miller and Dr.—and Mr. Collins have made themselves available to explain the NRC licensing requirements, safety guidelines, and process for responding to this event. Their expertise and insight will be extraordinarily useful to the Committee as we place this incident in its proper context and seek ways to improve the safety systems at NIST.

Mr. Chairman, NIST has a scientific legacy of achievement for which we are rightfully proud. I think we all agree that equal effort must go into safety considerations at NIST. We cannot accept a cavalier attitude towards safety. We are not using plutonium as if we are trying to send a DeLorean back in time like in the film, *Back to the Future.* There are greater safety concerns for which our researches at NIST should be prepared, and moving forward this agency should be better positioned to implement better training and safety protocols.

With that, Mr. Chairman, I yield back to you.

[The prepared statement of Mr. Gingrey follows:]

PREPARED STATEMENT OF REPRESENTATIVE PHIL GINGREY

Mr. Chairman, thank you for calling today's hearing to review the details and causes of the June 9th spill of plutonium at the NIST labs in Boulder. First and foremost, I am very thankful that those in proximity of the spill have thus far shown no adverse side effects from their exposure to plutonium. That is not to say, however, that the sample containing 250 milligrams of various plutonium isotopes posed no health or safety risks when it was mishandled.

I am very disappointed that the preliminary investigations of this incident to date have revealed not just a stunning lack of preparation, but also a complete lack of understanding of the potential risks involved in the use of encapsulated plutonium samples. It appears as though researchers were unaware of the potential risks and quickly went forward to obtain and use the samples without appropriate precautions in place. Of even greater concern, safety protocol was either not in place or not properly followed. That would have flagged this acquisition ahead of time or ensured that proper training and equipment were available.

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One of the NIST independent reviewers, Dr. Lester Slaback, notes in his report that, "[the incident] was the inevitable (or at least highly likely) and foreseeable end result" of numerous individual and organizational failures. I do applaud Dr. Turner

for recognizing the gravity of the problem at NIST, and I am cautiously optimistic that employees throughout the agency will also heed this wake-up call. However, this incident makes clear that simply having safety policies on paper does not ensure that they will be adequately executed. I hope Dr. Turner recognizes that a fix will not come through onerous safety directives from top level officials. Rather, change must involve every employee or visiting affiliate at NIST adhering to documented safety procedures so that an incident like this does not occur again. I expect that during the Question and Answer portion of today's hearing, we will be able to discuss how NIST can ensure that their safety programs, including radiological safety, become examples of best-practices instead of examples of shortcomings and inadequate preparation.

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Mr. Chairman, NIST has a scientific legacy of achievement for which we are rightfully proud. I think we all agree that equal effort must go into safety considerations at NIST. We cannot accept a cavalier attitude towards safety. We are not using plutonium as if we are trying to send a DeLorean back in time, like in the film *Back to the Future.* There are greater safety concerns for which our researchers at NIST should be prepared, and moving forward, this agency should be better positioned to implement better training and safety protocols.

With that, I yield back the balance of my time.

Chairman WU. I thank the gentleman. If there are any other Members who wish to submit additional opening statements, your statements will be added to the record at this point.

[The prepared statement of Mr. Mitchell follows:]

PREPARED STATEMENT OF REPRESENTATIVE HARRY E. MITCHELL

Thank you, Mr. Chairman.

On June 9, 2008, there was an incident at the National Institute of Standards and Technology (NIST) facility in Boulder, CO involving a plutonium sample spill which contaminated the lab and personnel.

Today we will examine the causes of this incident and how the NIST employees responded.

According to documentation provided for this committee, two NIST employees working with this plutonium sample did not receive the required radiation safety training, and this plutonium was not properly stored. Furthermore, NIST did not have a comprehensive emergency response plan in place at the time of the incident.

Even more troubling, even though the Committee has requested extensive documentation on the environmental, health, and safety practices at NIST, NIST has yet to provide many of these documents, which raises the concern that lapses that caused the incident in Boulder are not isolated.

I find this deeply concerning. Federal agencies like NIST have safety regulations in place for a reason.

I look forward to hearing more from our witnesses on what we can do to improve the environmental, health, and safety practices at NIST.

I yield back.

[The prepared statement of Ms. Richardson follows:]

PREPARED STATEMENT OF REPRESENTATIVE LAURA RICHARDSON

Thank you Chairman Wu for holding this very important hearing today, and our witnesses for their appearance. The purpose of today's hearing is to examine the causes of the plutonium spill at the NIST laboratories in Boulder, Colorado; the response to this spill; and the overall status of environmental, health, and safety practices ("EH&S") at NIST laboratories.

First and foremost let me begin by stating that I was concerned when I gained knowledge of this incident. I understand that mistakes happen, but what concerns me more than anything else was the subsequent response or the lack of an adequate response to the situation. This spill opened our eyes to a host of procedures that, had they been followed, would have negated the necessity of this hearing. Nonethe-

less here we are. Now let me state this, NIST is an excellent organization, with a group of scientist that are the best in the world, so I am shocked to discover that EH&S practices do not receive the attention they deserve at NIST laboratories.

When an institution like NIST applies to the Nuclear Regulatory Commission for a license to handle dangerous materials like plutonium, they make assurances. One of these assurances is that every individual who will work with the material, or come in close proximity to the material, receives adequate safety training. Furthermore, when NIST applied for the license to handle plutonium, the representation was made that only two individuals would be allowed to handle the plutonium. However, reports indicate that the visiting researcher who spilled the plutonium was not one of the individuals designated on the NIST application as a handler, he did not receive adequate training, his supervisor may not have received adequate training, and the chief scientist with the authorization to handle the plutonium was not in the room supervising the visiting researcher. In light of these facts it is obvious why we are here today.

Add to this the fact that the administrators at NIST failed to inform the elected officials of Boulder, and the neighboring NOAA facility (National Oceanic and Atmospheric Administration) of the spill leads me to believe that someone might have deliberately attempted to hide knowledge of the spill.

Likewise, the fact that the Visiting Committee on Advanced Technology (VCAT) noted the lax culture of EH&S at NIST, and recommended that NIST management address this matter, yet this incident still occurs, demonstrates sub-standard behavior on the part of the NIST administration.

I know that this hearing will produce results, and I expect the administration of NIST to deliver those results. There is NO room for compromise when it comes to public safety.

Mr. Chairman I yield back my time.

Chairman WU. I would like to introduce our witnesses, and I thank you all for appearing before the Subcommittee today. Dr. James Turner, who is the Acting Director of NIST, Dr. Charles Miller, who is the Director of the Office of Federal and State Materials and Environmental Management Programs at the Nuclear Regulatory Commission.

He is joined from the NRC by Mr. Elmo Collins, who is the Regional Administrator of Region IV based in Arlington, Texas. Mr. Collins is directly involved in investigating the June 9 incident at the Boulder Laboratories.

Lastly, Dr. Kenneth Rogers. Dr. Rogers was asked by NIST to provide an independent review, one of several individuals asked for independent reviews of the June 9 incident, and to offer recommendations, and Dr. Rogers is also a former Commissioner of the Nuclear Regulatory Commission.

As our witnesses know, spoken testimony is limited to five minutes, after which the Members of the Committee will have five minutes each to ask questions. Your written statements will be fully taken into the record.

And with that, Dr. Turner, if you would, please commence.

STATEMENT OF DR. JAMES M. TURNER, DEPUTY DIRECTOR, NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY, U.S. DEPARTMENT OF COMMERCE

Dr. TURNER. Thank you very much, Mr. Chairman. Chairman Wu, Ranking Member Gingrey, and Members of the Subcommittee, thank you for the opportunity to appear before you today to discuss the June 9, 2008, incident involving the release of plutonium at the National Institute of Standards and Technology, NIST, Boulder Laboratory, as well as NIST's environment, safety, and health practices.

Mr. Chairman, I deeply regret the incident. My top priority has been, and continues to be, the health and safety of our staff involved in this incident. According to the latest analysis of the medical testing of the personnel involved, the physicians have relayed that the increased overall risk for cancer based on dose estimates are so small they don't expect there to be any clinically-significant impact on either the short- or long-term health of anyone exposed. We will continue to provide our personnel with access to top medical care as well as we continue testing.

We have been able to ascertain through numerous interviews and reports that the incident involved a guest researcher who handled the radioactive source without appropriate training and supervision. My written testimony provides further details about the incident and the immediate response.

The researcher handling the source material at the time most certainly should have been—should have had the required training appropriate to the researcher's work and consistent with the commitments made under the NRC license. Partially as a result of a lack of this training, actions taken during the incident and immediately afterward by the researcher exacerbated the extent of the incident and complicated the response.

The incident and the conditions that permitted this incident to take place are unacceptable. I pledge to you and this subcommittee my personal assurance that we will do what is necessary to find the root cause or causes, take appropriate actions, and ensure to the best of our abilities that such a failure does not occur in the future.

The Department of Commerce is establishing a blue ribbon panel to look broadly at safety and training issues at NIST. Also, the Department's Office of Inspector General is conducting a broad review of management, training, safety, and response operations at all NIST facilities.

I have welcomed the involvement of external individuals and organizations to provide advice, guidance, counsel—tough counsel—as to what NIST could have done, can do in the short-term, and must do longer-term to address shortcomings in our safety, training, and emergency response preparedness.

As a direct result—as a direct follow-up to this incident, NIST's senior management has taken a variety of actions including requiring that each laboratory director and chief officer certify that all staff, employees, and associate have in place the required safety training prior to being allowed to continue their work. Issuing safety stand-downs, creating new lab teams to review hazards in the labs, initiating more systematic approaches to eliminating, reducing, or controlling the risks of different hazards, including emergency response and recovery.

I have taken several immediate actions, and we are conducting our own investigations. I have moved the Office of the NIST Safety, Health, and Environment Division into the Director's office so that it now reports to the NIST Deputy Director, who is our chief safety officer. I have asked my staff to revamp NIST's emergency communications procedures. I have also designated NIST's Chief Scientist as the Incident Response Director in order to provide stronger on-

site support in Boulder. He is currently on-site leading the effort and will be there indefinitely.

I have traveled to Boulder and plan to return there after this hearing. I am attempting to arrange meetings with State, county, and local officials during this visit. I have ensured that NIST–Boulder issue a stop work order for all radioactive materials in use, and a preliminary decision has been made to limit the use of radioactive materials in Boulder in the future to sealed sources.

At my request five eminent experts in radiation health safety conducted an assessment of the incident. An author of one of those reports, Dr. Ken Rogers, is on the panel today, and you will hear from him directly on his findings and recommendations. Their reports are sobering in their assessment of our challenges, and I take their words seriously. Their views about our shortcomings confirm my belief of the need to focus our efforts on NIST's entire environment, health, safety, and emergency response protocols and safety culture to ensure that we are measuring up to both the requirements and the highest expectations for a world-class organization. I expect that these experts will continue to provide insights to me and others at NIST in the coming weeks.

The lack of training provided disturbs me greatly, Mr. Chairman. I am committed to making the changes necessary to reduce to the maximum extent possible the opportunity for such a situation to occur in the future. This includes reevaluating our training to make sure it is appropriate, establishing testing mechanisms to ensure that training is mastered, and creating controls to document training. Our ongoing assessment will help us address critical areas for improvement.

Mr. Chairman, based on the information available at this time, this incident was preventable. NIST's culture and organizational structure contributed to an environment in which line supervisors failed to take adequate responsibility for safety issues, and safety personnel failed to assert a sufficient level of authority to ensure compliance with existing procedures and practices.

I, again, pledge to you my commitment to improve our safety practices, engrain a sustainable safety culture, and thereby ensuring the health and safety of our employees and local communities. I will report to you regularly and will keep you apprised of our findings and projects.

Thank you, Mr. Chairman. I will be pleased to answer any questions you may have.

[The prepared statement of Dr. Turner follows:]

PREPARED STATEMENT OF JAMES M. TURNER

Chairman Wu, Ranking Member Gingrey, and Members of the Subcommittee, thank you for the opportunity to appear before you today to discuss the June 9, 2008, incident involving the release of plutonium at the National Institute of Standards and Technology's (NIST) Boulder Laboratory—as well as NIST's environment, health, and safety practices.

Introduction

Mr. Chairman, I deeply regret the incident that occurred at the NIST–Boulder Laboratories on June 9, 2008. First, my top priority has been and continues to be the health and safety of our staff involved in this incident. I am pleased to report that, according to the latest analysis of the medical testing on the personnel involved, the physicians are relaying that no significant health risks are expected

based on the test results to date. I hope the affected individuals and their families are encouraged by these test results. The physicians are relaying that the estimated doses, and the increased overall risk for cancer based on these estimates, are so small we don't expect there to be any clinically significant impact on either the short- or long-term health of anyone exposed. We will continue to provide our personnel with access to top medical care as we continue testing.

However, the incident raises very serious and significant issues at NIST with regard to safety, safety culture, training, and emergency response policies, protocols, and NIST's implementation of and adherence to them. The incident and the conditions that permitted this incident to take place are unacceptable, Mr. Chairman, and I pledge to you and this subcommittee my personal assurance that we will do what is necessary to find the root cause or causes, take appropriate actions, and ensure to the best of our abilities that such a failure does not occur in the future.

The Department has taken a number of steps to ensure that independent reviews of NIST training, safety, and response protocols are conducted. Multiple investigations of the incident have been completed, are underway, or are to be conducted at NIST. These investigations include, but are not limited to: (1) the NIST Safety, Health and Environment Division (SHED) investigation; (2) the NIST Ionizing Radiation Safety Committee (IRSC) investigation; (3) the five preliminary individual experts' investigations ordered by the NIST Deputy Director; (4) the Department of Commerce (DOC) Inspector General (IG) investigation; and (5) the Nuclear Regulatory Commission (NRC) inspection. In addition, the need for a blue ribbon panel was identified by the Department, at the direction of Deputy Secretary John Sullivan, and work has already begun to establish such a panel. In addition, on July 1, 2008, Deputy Secretary Sullivan requested that the Department of Commerce's Inspector General conduct a broad review of management, training, safety, and response operations at all NIST facilities. We look forward to working with you as we institute these important additional reviews of NIST's safety practices.

We must be able to assure not just the Subcommittee, but the entire NIST family and the communities in which we live and work that NIST not only does cutting-edge, world-class research, but that we do so in accordance with the highest standards for safety, training, and emergency response preparedness. NIST science is renowned for its meticulous attention to detail; that same attitude must pervade our safety culture.

I am testifying today on the current status of this incident. We have made available information to this committee, our staff, the media, the public, and the NRC. This includes our 30-day report to the NRC and the reports to us by five individual experts we commissioned. We still have much to do and I will continue to keep you apprised of our progress as we gather more information.

Since the incident, NIST leadership in Gaithersburg and Boulder has been working to ensure our employees' safety and answer three key questions:

1) What happened on that day and how did NIST respond?
2) How could such an incident occur in the first place? and
3) What are we doing to ensure that we have the structure, policies and procedures in place to prevent such an incident from occurring in the future?

Although we do not have all of the answers to these questions yet—and I assure you that we will continue to work to get those answers, take appropriate actions, and keep you informed—we do know that this specific incident was the result of both significant individual and systemic failures.

An Overview of the Events on June 9th

Before I begin with an overview of the events on June 9, let me state that the facts that I am about to relay represent NIST's best understanding of the facts at this time, based on testimony of those with first hand knowledge, and a review of all the evidence available to us currently. NIST's and other investigations are ongoing, however, and we may learn more, or different, facts as we all continue to clarify our understanding of what happened.

Through interviews we have been able to ascertain that the incident involved a guest researcher who handled a radioactive source without appropriate training and supervision. During the course of this handling, the vial cracked and a portion of the approximately one-fourth gram of plutonium contained in the vial spilled out.

The affected laboratory and an adjacent lab were sealed off and personnel who were identified as working in or near the lab were asked to remain in the area and any radioactive material on their clothing or bodies was removed. The personnel were also subsequently given bioassay tests to determine if any internal contamina-

tion occurred. (Since that time, several additional personnel identified themselves as having potential exposure and have had these tests conducted.)

External trace contamination was found on some employees, and in most cases this contamination was easily removed using soapy water. The personnel were sent home with the exception of two individuals who evidenced very low levels of contamination on their hands. (These two were provided with gloves to wear—to prevent the spread of the material—until repeated hand washing eliminated the remaining contamination.) NIST radiation safety personnel supervised the testing of the adjacent areas leading to other parts of the building, a men's restroom and doorways leading out of the building. Some areas of trace contamination were discovered and these areas were cleaned and retested to ensure they were contamination free. At that time, there was no evidence that there had been any contamination aside from those areas.

The affected laboratory and the adjacent connecting laboratory continue to remain sealed off for further testing and remain so pending approval of the decontamination process by the NRC.

As our investigation continued, we conducted subsequent extended interviews and discovered trace contamination in other areas. These areas, too, were thoroughly cleaned and retested to ensure they were free of contamination.

Failures Leading to the Incident

Mr. Chairman, NIST's safety culture is deficient. Later in this testimony I will focus on our policy and system for safety and training. Some things are clear:

1) The NRC regulates the use of radioactive materials at all NIST laboratories and is investigating the plutonium spill at the Boulder Laboratory and NIST's response. Specifically, the NRC is currently conducting an inspection that will result in the definitive account of the spill and its aftermath.

2) In January 2007, NIST filed an amended Application for Radioactive Material, an Addendum to the NRC Form 313, for the purposes of using encapsulated plutonium in research. In that amended license, NIST committed to do certain things, particularly in the areas of training. It appears that we did not meet those commitments. Such a failure is a serious breach and must be dealt with accordingly. I must stress that at this point our main focus is the health of those affected.

The researcher handling the source material at the time most certainly should have had the required training appropriate to his work and consistent with the commitments made under the NRC application. Partially as a result of this lack of training, actions taken during the incident and immediately afterward by the researcher appears to have exacerbated the extent of the incident and complicated the response.

While we cannot necessarily extrapolate from a single incident, I am also looking at issues that this incident raises about cultural barriers in our environment, health and safety policies and procedures, including our training practices, system-wide.

Response Subsequent to the Incident

Mr. Chairman, I have already taken several immediate actions and we are conducting our own investigations and assisting with external assessments. I have welcomed the involvement of the NRC, the Department of Commerce's Office of Inspector General, and individual radiation safety experts to provide advice, guidance and counsel—tough counsel—as to what NIST could have done, can do in the short-term, and must do longer-term to address shortcomings in our safety, training and emergency response preparedness. I am moving the NIST Safety, Health, and Environment Division into the Director's office so that it now reports to the NIST Deputy Director, who is the agency's Chief Safety Officer. I have asked my staff to revamp NIST emergency communications procedures and we are developing a plan for moving forward which will include external input, participation and review.

In order to provide stronger on-site support to Boulder, I designated the NIST Chief Scientist, Dr. Richard Kayser, as the Incident Response Director, who took over for the NIST–Boulder Laboratory's Director, Dr. Thomas O'Brian, who served as the Incident Response Coordinator. I directed Dr. Kayser to be on site in Boulder indefinitely leading this effort. His team is developing—and has already been implementing portions of—an incident response plan which includes continuing to reach out to employees who have any concerns about their health, identifying any additional spaces that may need to be surveyed, better coordination of outreach and response to the Boulder community and other federal, State, and local agencies, and Congress, and moving forward on the development of a decontamination plan. That decontamination will take place once all the other bodies conducting their assess-

ment of the situation no longer need access to the lab—and once our decontamination plan has been reviewed and approved by the NRC.

I have traveled to Boulder and plan to return tomorrow. In addition, the Chief of the NIST Safety, Health and Environment Division, as well as the senior NIST health physicist from Gaithersburg have been stationed in Boulder for the past several weeks. Other NIST–Gaithersburg personnel have also been on-site in Boulder as needed and additional personnel have been provided to Boulder by National Oceanic and Atmospheric Administration (NOAA) and by the Department of Commerce. We will continue to have appropriate resources on site until this cleanup is completed.

Results of Internal Investigation

While we have investigations ongoing, they have at this point revealed that the probable cause of the incident was handler error. Source material was removed from its secondary containment, and its vial broke after contact with a hard surface.

However, I want to make clear that overall organizational failures contributed to this handler error. Specifically:

- Procedures for acquiring source material were not followed as line management was not always aware of source material acquisition.
- Individuals, both those handling source material and those working in the vicinity, were not provided proper training or the necessary information to allow them to evaluate and understand the risks involved.
- Available training was inadequate for the circumstances.
- Lack of an emergency response plan contributed to the potential spread of contamination beyond the spill zone. Employees were neither prepared nor equipped to respond to the situation, and safety personnel were forced to respond as events unfolded, rather than from established protocols.

NIST's organizational structure contributed to an environment in which line supervisors failed to take adequate responsibility for safety issues, and safety personnel failed to assert a sufficient level of authority to ensure compliance with existing procedures and policies. In sum, a culture has developed with respect to safety issues that NIST understands must be addressed broadly, beyond this specific event.

Preliminary analysis indicates that multiple organizational failures contributed to the incident. Specifically, proper procedures were not followed for acquiring a radiation source and line management was not aware of the inappropriate handling of the source material. As a result, a proper risk assessment was not conducted.

There were no procedures in place for source handling and utilization nor was there an incident response plan or an audit program for radiation safety at NIST–Boulder. Our investigation has revealed at this point that the scope of the hazardous materials programs expanded without reevaluation of the risks involved and without a commensurate strengthening of the radiation safety program. As a result, there was inadequate infrastructure to support the use of encapsulated sources. This clearly shows that we do not have systems in place to adequately identify and manage risks as they change. As we move forward and revise our safety program, we must integrate risk management into it. We must train our personnel so that when they are preparing to perform a task or proposing a new process/procedure that they are trained and have the resources to: 1. Identify the risks involved; 2. Identify the controls necessary to reduce or eliminate those risks; 3. Implement those controls; and 4. Monitor those controls to ensure the risks are in fact reduced or eliminated. If the fourth step identifies weaknesses in the controls or if the risk(s) have changed, our personnel will know they must go back to the first step and begin this process again.

Available training was inadequate and insufficient with respect to the number of individuals trained. Existing training requirements were ignored by researchers and not identified by safety personnel. Specifically, three individuals involved received inadequate or no training. We recognize that insufficient/inadequate training or training that was ignored, which are examples of management failures. We will integrate relevant training, with appropriate measures to document and evaluate the effectiveness of that training into our revised safety program. We will also include mechanisms to hold supervisors accountable for the training of their personnel.

Use of the posted radiation laboratory as a multi-use laboratory accessed by untrained and uninformed individuals contributed to risk, which was exacerbated by the lack of an accurate hazard posting on laboratory door.

In general, there was weak engagement by line management in overseeing personnel, programs, and safety-related activities. Similarly, safety personnel failed to identify and/or address obvious safety issues.

Timeline Since the Incident

Mr. Chairman, this section provides a summary of the communications and actions taken since the incident occurred.

Dr. William Anderson, Director of the NIST Electronics and Electrical Engineering Laboratory, sent an e-mail to the NIST Chief Scientist, Dr. Richard Kayser, and me, at 9 p.m. on June 9th. I did not see that e-mail until the following morning. Clearly, e-mail is not sufficient in case of emergencies. I understand that on June 10th the Director of the Boulder Labs called the City of Boulder to inform them of the situation and offered to brief the City on the incident. Managers at NOAA, housed in a physically separate building on the campus, and the National Telecommunications and Information Administration (NTIA), which has people in the same building as the affected lab, were also apprised of the situation and offered a briefing.

In this instance, some of the initial outreach was timely; in other cases it was not. The lack of a clearly articulated plan with names and contacts hampered the efforts by NIST–Boulder staff to inform those who must know or needed to know the situation. This is why immediately after the incident I directed the NIST Director of Emergency Services to develop a notification checklist for Boulder similar to what is kept in Gaithersburg. This can be used in an emergency to assure systematic notification and not rely on someone remembering something during a stressful situation. I will be happy to provide for the record more specifics on our emergency notifications procedures.

The Boulder staff was advised via an e-mail and has continued to receive updates as new information becomes available. In addition, on June 10th, NIST Congressional and Legislative Affairs notified this subcommittee and the staff of the local Colorado Representative and Senators of the incident. We have and will continue to provide updates as the assessment and investigation continues. In addition, a news release was provided to the local news media and posted on the NIST external Web site, and the NRC was advised about the incident, within the required 24-hour period.

The NRC arrived at NIST–Boulder for an initial assessment on June 11th and I dispatched a health physicist from NIST–Gaithersburg to assist the Radiation Safety Officer in Boulder.

As I mentioned earlier, the health physicists initiated the first of a series of bioassay tests for personnel either known to have trace external contamination or determined to be potentially contaminated, or for personnel who self-identified themselves to us as having a possible concern for their risk of exposure. Initial tests indicated no evidence of significant internal contamination of individuals. More sensitive follow-up tests as recommended by the Department of Energy (DOE) physicians and radiation experts showed some internal contamination for a small number of individuals. But as I mentioned, these results support our current understanding that the exposure level is very low and will accord no significant health risk to the personnel affected. We await additional test results.

Even more sensitive testing, known as a "TIMS" (thermal ionization mass spectrometry) test, has been initiated for all individuals who potentially have been exposed or who have requested to be tested. In addition, several other professionals who entered the lab as part of the investigation have been provided tests—which is a standard procedure for such radiation workers. These tests are complex and require several weeks to receive results. We hope to receive final results at the end of this month.

It is reported to me that on-going interviews on June 12th revealed that the guest researcher who had handled the plutonium had walked to other parts of the building before being decontaminated. Over the next few hours, the potentially affected areas were then surveyed. The resurvey showed trace amounts of contamination in one office on one desk, a lab notebook on the desk, and the chair associated with that desk, that had been used by the affected individual, as well as in a stairway leading to the office. As a precaution, the room was sealed until more thorough testing and evaluation could be completed. The hallway and stairway outside the affected room was surveyed and it was reported that no evidence of removable contamination beyond normal background was detected.

NIST provided notice of the new findings to Congressional staff, the City of Boulder, the media, the public, the NRC, and the Boulder NOAA and NTIA site. We called in and began our first consultation with the DOE National Nuclear Security Administration's (NNSA) Radiological Assistance Program (RAP).

Over that weekend, NIST health physicists (part of our safety operation) made the initial controlled entry into the sealed lab in order to conduct a radiation survey as part of NIST's internal investigation. Late Saturday, June 14th, the initial survey revealed contamination in the lab sink. It was subsequently learned—through a re-interview—that the researcher who worked most directly with the plutonium sample washed his/her hands in that sink during the incident, a critical fact that had not been initially reported.

I understand that a NIST–Boulder official contacted the City of Boulder's waste water treatment plant manager early on Monday, June 16th, to alert the city that there was a possible discharge into the city waste water system. NIST was not able to quantify the amount of the possible discharge at that time.

As a result of the finding in the lab sink, public notice of the discovery that some unknown amount of plutonium was discharged into the city waste water system also was made to the DOC Boulder campus, Congress, the media, the public and the City of Boulder City Manager. The Boulder Director offered to brief the City management, NOAA, and NTIA on the incident. All NIST–Boulder staff was invited to a briefing on the incident. We also initiated communications with the Department of Commerce OIG on the incident.

NIST worked to develop plans for the DOE RAP team to conduct a full radiation survey of the affected lab, to assist NIST's internal investigation, and to help determine the upper limit on the possible discharge of plutonium through the lab sink into the municipal sewer system. A briefing for NTIA staff also was scheduled.

Our latest information from the medical experts, based on the most recent test results, is that personnel with internal plutonium exposure are not expected to face significant health risks. As I mentioned, we are waiting on the most sensitive test, the TIMS, to confirm these findings. I am concerned for the health and safety of our personnel and we are getting advice from the best medical experts in the country and will do everything we can to ensure that the people affected get the best possible medical treatment.

Preliminary Corrective Actions Taken

First Mr. Chairman, I have ensured that NIST–Boulder has issued a stop work order for all radioactive materials in use, and a preliminary decision has been made to limit the use of radioactive materials in Boulder in the future to sealed sources.

At my request, five eminent experts in radiation health safety conducted an assessment of the incident. They were asked to report their initial findings individually directly to me. On July 9th, I received the last of these reports. An author of one of those reports, Dr. Ken Rogers, is on the panel today and you will hear from him directly on his findings and recommendations. I recently received the last of these reports and we transmitted them to this committee and made them public.

Their reports are sobering in their assessment of our challenges, and I take their words very seriously. Their views about our shortcomings confirm my belief of the need to focus our efforts on NIST's entire environment, health, safety, and emergency response protocols and safety culture to ensure that we are measuring up to both requirements and the highest expectations for a world-class organization. I expect that these experts will continue to provide insights to me and to others at NIST in the coming weeks.

Training Protocols for All NIST Employees

The lack of training provided disturbs me greatly, Mr. Chairman. I am committed to making the changes necessary to reduce to the maximum extent possible the opportunity for such a situation to occur in the future. This includes re-evaluating our training to make certain it is appropriate, establishing testing mechanisms to assure training was mastered, and creating the controls to document training.

Mr. Chairman, let me initially say what our NIST policy is, and what it is supposed to be. I will then discuss what we believe we know at this time as to how NIST complied with or acts in accord with its own policy in this matter.

It is NIST policy to establish, coordinate, and maintain a comprehensive and effective NIST Safety Operational System (SOS) consistent with the standards prescribed by Section 6 of the *Occupational Safety and Health Act of 1970,* ANSI–Z10 Occupational Health and Safety Management System (OHSMS), and other applicable regulations.

Every manager, employee, and associate in the organization has the responsibility for systematically identifying risks, hazards, or potentially unsafe situations or practices and for taking steps to ensure adequate safety. Emphasis is placed on identification of risks and implementation of measures to control those risks. Implementa-

tion of effective OHSMS programs relies on recognition and adoption of the following principles by management, employees, and associates:

a. Incidents/Accidents can and should be prevented.
b. Line management is responsible for the safe conduct of operations. Management systems can be designed to avoid unsafe acts, unsafe conditions, and incidents/accidents. Individuals are, however, responsible for their own safe behavior.
c. Management should establish challenging goals for safety, and take the responsibility to plan and implement actions to achieve the goals.
d. The keys to effective line safety performance are management procedures that create a culture of safety, while defining and expecting accountability for results and minimizing hazards. Safe behavior and actions are expected and should be recognized, while unsafe behavior is discouraged and must be promptly corrected. There also must be effective safety oversight to assure compliance.
e. One of the functions of the safety staff is to immediately stop any work where safety is questionable. Safety staff should be included in discussions of current and proposed operations to assist with identifying safety deficiencies within those operations and making recommendation to reduce the potential for incidents/accidents. Safety staff should develop safety programs that include documented training for line managers/supervisor, employees, and associates.

However, Mr. Chairman, in reality, the culture that existed at least in the laboratory involved in this incident was one in which safety was not the highest priority and led to an untrained guest researcher, improperly supervised, handling a dangerous radioactive source.

It is NIST policy that upon entrance on duty, new employees must attend a general safety orientation session presented by the NIST Safety, Health and Environment Division. One of the gaps that we have identified is that new associates (e.g., guest researchers from other institutions) are not currently required to attend this orientation. It is the responsibility of line supervisors to instruct all new or transferred appointees (employees and associates) assigned to their units, in the occupational safety, health and environmental requirements applicable to the specific job, preferably on the first day, but in any event during the first week of such assignment. Appointees who will be working in a laboratory must be instructed in NIST laboratory safety practices and be given a copy of the *NIST Laboratory Safety Manual* by their supervisor.

New or transferred appointees (employees and associates) who will be working in a laboratory or other hazardous environment, (e.g., mechanical shops), are to be provided adequate laboratory/shop-specific on-the-job training within one month of their employment. We are reviewing this requirement which currently would allow an individual to work in a lab for 30 days without appropriate training. Since functions differ among the laboratories/shops, each laboratory/shop is to develop its laboratory/shop-specific safety-training checklist to ensure that all safety areas are adequately covered. The laboratory/shop-specific safety checklist may be used to document the first month of employment safety training requirement. The safety checklist should identify the total number of hours necessary to cover all safety areas.

Line supervisors must ensure that pertinent safety and health instructions, relating to conditions and practices that may be necessary to eliminate or control specific job hazards, are routinely incorporated into regular operating procedures, shop orders, preventive maintenance instructions, etc.

A minimum of four hours of relevant safety training must be provided to all employees and associates on an annual basis. Not less than quarterly in all non-administrative units (typically including laboratory activities; warehousing; trades, craft, maintenance, labor, protective, and transportation services; etc.) line supervisors are to schedule and conduct a safety awareness meeting with all assigned unit personnel, for the specific purpose of discussing safety issues pertinent to the unit's operations. Brief written reports of such meetings are to be forwarded through the applicable division or office chief to the NIST Safety, Health and Environment Division. Where there is need for specialized safety training beyond the capability or resources of a unit, the scope and method of training is to be determined through the coordinated efforts of the unit involved, the training personnel, and the safety staff.

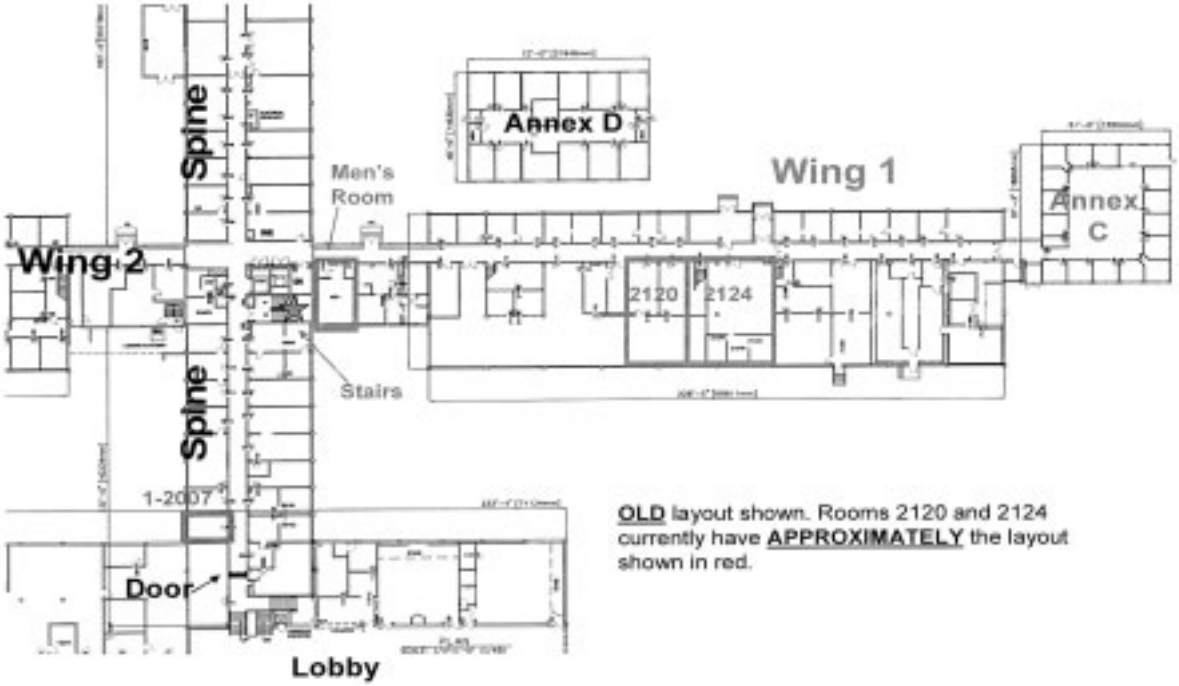
That is the policy. There must be effective controls to flag deficiencies, mechanisms such as testing to gauge mastery of the training material, and formal documentation of training. Our ongoing assessment will help us address critical areas for improvement.

Conclusion

Mr. Chairman, based on the information available at this time, this incident was preventable. Thankfully, the medical experts tell us that as of this time there are expected to be no significant health effects for the people involved. This incident is a sobering reminder of the importance of establishing clear, comprehensive and appropriate safety policies and rigorously adhering to safety protocols. As is abundantly clear, when we do not approach these matters with the necessary rigor, clarity and sense of purpose there can be serious consequences.

I again pledge to you my commitment to improving our environmental, health and safety practices, ingraining a sustainable safety culture and thereby ensuring the health and safety of our employees and local communities. I will report to you regularly and will keep you apprised of our findings and our progress. It is crucial to our ability to achieve our mission and ensure our workforce that they have a safe working environment.

Building 1, Floor 2



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BIOGRAPHY FOR JAMES M. TURNER

Dr. James M. Turner is the Deputy Director of the U.S. Department of Commerce's National Institute of Standards and Technology (NIST). He is also carrying out the responsibilities of the Director. (The NIST Director position is vacant.) Turner provides high-level oversight and direction for NIST. The agency promotes U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology. NIST's FY 2008 resources total $931.5 million and the agency employs about 2,800 scientists, engineers, technicians, support staff and administrative personnel at two main locations in Gaithersburg, MD and Boulder, CO. Along with the Department of Energy Office of Science, and the National Science Foundation, NIST is slated for substantial budget increases for its core research programs under the President's American Competitiveness Initiative.

Prior to joining NIST on April 16, 2007, Turner served as the Assistant Deputy Administrator for Nuclear Risk Reduction in the Department of Energy's National Nuclear Security Administration. In that position, he was responsible for major projects in Russia to permanently shut down their last three weapons-grade plutonium-production reactors. He also worked with foreign governments and international agencies to reduce the consequences of nuclear accidents by strengthening their capability to respond to nuclear emergencies.

Prior to that assignment, Turner held several senior management posts at DOE concerned with laboratory oversight and with nuclear safety and the safeguarding of nuclear weapons both here and abroad.

He holds degrees in Physics from the Massachusetts Institute of Technology (Ph.D.) and Johns Hopkins University (B.A.), and taught for five years as an Associate Professor of Physics and Engineering at Morehouse College.

Among other honors, he has received the U.S. Government Presidential Rank Award for Meritorious Service, three times received the U.S. Department of Energy Exceptional Service Award, and earned the Secretary of Energy Gold Award and the National Nuclear Security Administration's Gold Medal. Dr. Turner is an active member of the American Physical Society, the American Chemical Society, the American Nuclear Society, the American Association for the Advancement of Science, ASTM, the Council on Foreign Relations, IEEE, Phi Beta Kappa, Sigma Xi, and the World Affairs Council.

Dr. Turner is a native of Washington, DC, is married, and has five children and one grandchild. He enjoys doing yoga and Tai Chi. He and his wife, Paulette, reside in Olney, Maryland.

Chairman WU. Thank you very much, Dr. Turner.

Dr. Miller, please proceed.

STATEMENT OF DR. CHARLES L. MILLER, DIRECTOR, OFFICE OF FEDERAL AND STATE MATERIALS AND ENVIRONMENTAL MANAGEMENT PROGRAMS, U.S. NUCLEAR REGULATORY COMMISSION; ACCOMPANIED BY DR. ELMO E. COLLINS, REGIONAL ADMINISTRATOR, REGION IV OFFICE, U.S. NUCLEAR REGULATORY COMMISSION

Dr. MILLER. Mr. Chairman and Members of the Committee, I am honored to appear before you today to discuss the U.S. Nuclear Regulatory Commission's role in regulating and inspecting radioactive materials facilities. I hope that my testimony will be helpful to you in understanding the regulatory framework and the oversight of facilities such as NIST and how NRC responds to events at these facilities. My written testimony has been submitted for the record, and I will use my time this morning to highlight some of the key points.

Following that during the question and answer period, Mr. Collins and I would be happy to answer any questions with regard to our activities, including the inspection.

Under the authorities and responsibilities granted by the Atomic Energy Act of 1954, as amended, NRC issues licenses for use of radioactive material to qualified applicants that meet our regulatory

requirements. Primary responsibility for safety and security of the radioactive material lies with the licensees who possess and use the material.

NRC inspects the users of radioactive material for compliance with both safety of the regulations and any additional conditions made during the licensing. Perspective licensees wishing to possess and use radioactive material must submit a license application to the NRC, showing how their facility's personnel and program controls meet the regulations and protect the workers, the public, and the environment, and provide adequate security of the radioactive material.

Each application is reviewed by NRC technical staff. If the regulatory requirements are met, NRC issues a license outlining the conditions under which the radioactive material can be used. Licensees must request and obtain from NRC a license amendment to change its license or its condition. Because of the potentially serious consequences that can result from the failure to comply with NRC regulations, every licensee must conduct its radiation safety program according to the conditions of its NRC license, representations made in its license application, and NRC regulations.

NIST is licensed to use solid encapsulated plutonium in quantities less than critical mass. Use of the material must be done in accordance with explicit procedures. NIST's NRC license requires a Radiation Safety Officer, whose role is to ensure license conditions are met and radiation safety practices are followed. The NIST license also includes a commitment that all individuals working with license sources or those who frequent areas or license sources are present, shall receive annual radiation safety training at a level appropriate for their assigned duties.

It is the responsibility of the licensee's management and the radiation safety officer to ensure individuals who access these sources or facilities receive appropriate training. NRC conducts periodic inspections of licensees to ensure compliance with regulatory requirements and license conditions. The licensing decision was to assign an inspection frequency at the NIST–Boulder facility of every five years because of its activities, which are relatively low risk given the small amount of radioactive material that the lab is authorized to possess and the approved uses of the material within the lab.

NRC may supplement the periodic inspections with reactive inspections. A reactive inspection is a special inspection in response to an incident, an allegation, or information obtained by the NRC to focus on the sequences of events leading up to the incident, the contributing root causes of the event, corrective actions taken or proposed by the licensee, and a discussion of the regulations applying to the incident, and where they were not met. All NRC inspections are documented, and the results are provided to the licensee. With the exception of some security inspections, they are publicly available also.

Failure to conduct operations in accordance with the regulations and licensed conditions can result in enforcement action against the licensee or even individuals. NRC's enforcement program is built upon a potential or actual safety significance and considers program factors such as repeat violation, willfulness or disregard for the requirements.

The June—on June 10, NIST informed the NRC of the June 9 contamination event. Upon learning of the event, NRC dispatched a health physics inspector to the site on June 12, and followed that with a senior health physics inspector on the 19th. Upon the consideration and the feedback from those inspectors, we escalated our inspection activities to a special inspection team, and that was dispatched to Boulder on June 30.

The team's detailed inspection is in progress. Results of the special inspection and the team's work will be issued within 45 days upon the conclusion of the inspection. On July 2, we issued a confirmatory action letter (CAL), confirming the agreed-upon actions that NIST took and plans to take as a result of the event and the order. Pursuant to the CAL, NIST has agreed to take a number of actions. Those actions are outlined in my detailed written testimony.

Although we have yet to identify any safety aspects of the June 9, event with significant impacts on the worker or public health safety, we are continuing our evaluation of the circumstances of the event itself and how NIST's programs, procedures, and policies contributed to the event. NRC's efforts will ensure that if there were violations, NIST will develop and implement effective and lasting corrective actions.

I hope my testimony provides you with an understanding of our regulatory role at the NRC, how it fits NIST, and how the NRC responds to events at these facilities and the seriousness with which we take our duty to protect public health and safety in the environment.

Dr. Collins and I will be pleased to respond to your questions. Thank you, Mr. Chairman.

[The prepared statement of Dr. Miller follows:]

PREPARED STATEMENT OF CHARLES L. MILLER

INTRODUCTION

Mr. Chairman and Members of the Committee, I am honored to appear before you today to discuss the U.S. Nuclear Regulatory Commission's (NRC's) role in regulating and inspecting radioactive materials facilities. I hope that my testimony will be helpful to you in understanding the regulatory framework and oversight of facilities such as the National Institute of Standards and Technology (NIST), and how the NRC responds to events at these facilities. The NRC's work in response to the June 9, 2008 event at NIST's Boulder facility is ongoing. Mr. Elmo Collins, Regional Administrator for the NRC's Region IV office, and the home base for the agency's special inspection team for this event, is here with me today to answer any questions about our inspection activities up to this point.

On June 10, 2008, the NRC received a report of a contamination event at the NIST facility in Boulder, Colorado. The previous day, a junior researcher had broken a glass vial containing one-fourth of a gram of plutonium powder. The junior researcher and other individuals, working both inside and outside the specific laboratory suite were contaminated. The researcher apparently washed his hands to remove the plutonium contamination, thus introducing a small amount of plutonium into the sewer system. More importantly, analysis confirmed that the junior researcher, as well as others, ingested or inhaled some of the plutonium.

The NRC dispatched a health physics inspector to the site an June 12, who verified that the lab was acceptably isolated for the short-term. A second health physics inspector was dispatched by NRC an June 19. NRC's initial assessment of the event and NIST's follow-up actions indicated that there was no immediate threat to additional workers or to public health and safety. However on the basis of the inspectors' observations on-site, NRC management determined that an enhanced agency response was needed to ensure that the licensee conducted licensed activities safely in the short-term and that further inspection follow-up was needed

to more fully understand the circumstances, causes, and licensee actions. Additionally, on June 27, the licensee reported that the junior researcher received a potentially significant radiation dose. On June 30, a five-member Special Inspection Team (SIT), dispatched from NRC's Region IV Office in Arlington, Texas, began conducting a more detailed review of the event. I will further explain the SIT later in this testimony. The team's inspection is in progress. As I will discuss further elsewhere in this testimony, NIST—in consultation with NRC—has also agreed to suspend all use of plutonium sources pending NRC approval of the resumption of such activities.

NRC REGULATORY FRAMEWORK TO ENSURE SAFE USE OF RADIOACTIVE MATERIAL

Before I address the specifics related to the NIST license and the event, I would like to briefly describe NRC's structure and regulatory approach to licensing, inspection, and enforcement. Through the Agreement States Program, the NRC shares its regulatory authority to license and oversee the use of certain types of radioactive material. Although Colorado is one of the 35 Agreement States, NRC retains regulatory jurisdiction for NIST–Boulder because it is a federal facility. Therefore, this testimony will focus on NRC's program and not on the role of Agreement States.

OVERALL FRAMEWORK AND MISSION

The mission of the NRC is to license and regulate the Nation's civilian use of byproduct, source, and special nuclear material to ensure adequate protection of public health and safety, promote the common defense and security, and protect the environment. The *Atomic Energy Act of 1954,* as amended, grants NRC the authorities and responsibilities needed to accomplish this mission. NRC has issued regulations that are designed to protect the public and occupational workers from radiation hazards. NRC issues licenses for use of radioactive material to qualified applicants who meet regulatory requirements. The responsibility for safety and security of the radioactive material lies with the licensees who possess and use the material. NRC inspects the users of radioactive material to ensure compliance with both NRC safety regulations and any additional conditions imposed during the licensing. Enforcement against licensees as well as individuals can be pursued by NRC for noncompliance with these regulations and conditions.

Within NRC, the Office of Federal and State Materials and Environmental Management Programs, of which I am the Director, is responsible for the development, implementation, and oversight of the regulatory framework for industrial, commercial and medical uses of radioactive material, uranium recovery activities, and the decommissioning of previously operating nuclear facilities and power plants. NRC also has Regional Offices which conduct inspection, enforcement, investigation, licensing, and emergency response programs for radioactive material licensees. NRC currently has approximately 3,700 licensees for radioactive material, and conducts approximately 1,200 inspections annually.

LICENSING AND REGULATIONS

Prospective licensees wishing to possess and use radioactive material such as those possessed and used by NIST must submit a license application to the NRC showing how their planned facilities, personnel, program controls, and equipment meet NRC regulations and protect the workers, public, and environment, and provide adequate security of the radioactive material. Each application is reviewed by NRC staff according to established procedures and criteria, and if the regulatory requirements are met, NRC issues a license outlining the conditions under which the company or individual can possess the radioactive material. In addition, licensees must request and obtain a license amendment to alter a license or its conditions.

As mentioned above, the responsibility for safety and security of the radioactive material lies with the licensee. Assignment of this responsibility varies from licensee to licensee and facility to facility, but is delineated in the license application and license conditions. In general, each licensee's environmental health and safety (EH&S) officials and management have the responsibility for establishing the policies and procedures to ensure safe handling of radioactive material and compliance with regulatory requirements; for ensuring that those individuals using radioactive material have adequate training; and for oversight of the program and users to ensure adherence to established policies and procedures. Individuals using radioactive material have the responsibility to adhere to established policies and procedures, including reporting any deviations or issues to Radiation Safety Officer (RSO) and/or management.

NRC expects licensees to conduct their programs with meticulous attention to detail and a high standard of compliance and holds them accountable for doing so through inspections and enforcement. Because of the potentially serious consequences that can result from failure to comply with NRC regulations, every licensee must conduct its radiation safety program according to the conditions of its NRC license, representations made in its license application, NRC regulations, and NRC Orders. Specifically, licensees are subject to NRC regulations in 10 CFR Part 19, "Notices, Instructions and Reports to Workers: Inspection and Investigations," 10 CFR Part 20, "Standards for Protection Against Radiation," and other applicable regulations. The regulations also specify reporting requirements to inform the NRC of significant events, including loss of material, release of material to the environment, radiation exposures to workers or the public that exceed limits specified in the regulations, damaged sources or devices, equipment that fails to function as designed, and leaking sources.

The following items are the key requirements in NRC regulations that must be addressed by applicants before NRC issues a license authorizing possession and use of radioactive material:

- Applicants must be qualified by reason of training and experience to use special nuclear material of the types and quantities requested;
- Applicants must have the facilities and equipment to protect health and safety and minimize danger to life or property;
- Applicants must have the procedures to protect health and to minimize danger to life or property.

NRC INSPECTION AND ENFORCEMENT PROGRAM

NRC conducts periodic inspections of licensees to ensure compliance with regulatory requirements and license conditions. To enable NRC to apply its resources most effectively to the highest risk activities, an inspection priority code from 1 to 5 is assigned to each type of use authorized by a license. The priority code equals the normal inspection interval in years, with code 1 being the greatest potential risk to the health and safety of workers, members of the public, and the environment. In the licensing process, an inspection frequency of once every five years was assigned to the NIST–Boulder facility because its activities are relatively low-risk given the small amount of radioactive material that the lab is authorized to possess and the approved uses of this source within the lab.

If there are licensee performance issues, or events, NRC may supplement the periodic inspections with "reactive" inspections. A reactive inspection is a special inspection in response to an incident, allegation, or information obtained by NRC (e.g., report of a medical event or other federal agency interest). The scope of the reactive inspections is normally to focus on the sequence of events leading up to the incident, the contributing and root causes of the event, corrective actions taken or proposed by the licensee, and a discussion of the regulations applying to the incident and if and where they were not met. Reactive inspections can focus in on one or several issues, using more specialized technical or management expertise than a normal inspection, and thus do not necessarily examine the totality of a licensee's program.

All NRC inspections are documented and the results are provided to the licensee; with the exception of some security inspections, these documents are publicly available. If deficiencies are identified, the inspector brings them to the attention of licensee management at the exit meeting and also in the cover letter transmitting the inspection report or Notice of Violation (NOV). An NOV is a formal notification to the licensee that an apparent noncompliance with regulations or conditions has been identified. The NOV requires a written response including a description of the proposed corrective actions. It is the first step in the NRC's enforcement process.

Failure to conduct operations according to regulations and license conditions may result in enforcement action against the licensee as well as individuals. This could include more frequent inspections; issuance of a notice of violation; imposition of a civil penalty; and/or an order suspending, modifying, or revoking the license. NRC's enforcement program is built around potential or actual safety significance, and considers performance factors such as repeat violations, willfulness, or disregard for requirements.

Because of its relevance to today's hearing subject, I would like to mention that one of several tools that NRC uses with its licensees is a confirmatory action letter (CAL). A CAL documents agreed upon actions that the licensee will take to address concerns with their activities. These actions can either be permanent or can be on a temporary basis to address concerns until a final assessment can be made regarding the need for permanent changes. A CAL can also ensure a clear understanding of and commitment to necessary actions to control and assess an unexpected event.

In cases where a CAL is neither appropriate nor sufficient to ensure safety, the NRC may issue an Order requiring mandatory licensee action.

NIST LICENSE

Let me now turn to the specifics of the NIST facility in Boulder with respect to its license conditions and requirements, as well as the event that occurred on June 9, 2008.

NRC initially issued a Byproduct Material License (No–05–03166–05) for the Boulder facility to the Department of Commerce, National Bureau of Standards on December 19, 1968. The license has been amended a total of 29 times since it was issued. Amendment No. 28 added the special nuclear material (e.g., plutonium) to the existing research and development license and Amendment No. 25 authorized research and development activities on the license using sealed sources. The most recent amendment, Amendment No. 29, was issued to NIST on June 22, 2007 to increase the amount of Iron-55 and limit the amount of Nickel-63.

NIST is licensed to use solid, encapsulated plutonium in quantities less than critical mass. Use of the material must be in accordance with procedures. In the case of the NIST plutonium calibration source involved in the June 9 event, the material was contained in a glass vial. In addition, the glass vial was heat sealed in a plastic bag, and the resultant package was heat sealed in a second plastic bag. This package, composed of the sealed glass vial and the two heat-sealed plastic bags, was in turn placed in a third plastic bag by the NIST Radiation Safety Officer.

The NIST license includes a commitment that all individuals working with licensed sources or those who frequent areas where licensed sources are present shall receive radiation safety training at a level appropriate for their assigned duties. It is the responsibility of the licensee's management and RSO to ensure individuals who access those sources or facilities receive the appropriate training.

NIST's license requires an RSO whose role is to ensure license conditions are met and radiation safety practices are followed. Radiation Worker Training is required for any individual where there is a reasonable potential for an individual to receive doses greater than 100 millirem in a year. This training must be performed by the RSO or an appropriately trained designee. The RSO must assure documentation of Radiation Worker Training and maintain a list of trained and authorized radiation workers. Individuals using special nuclear material must also be trained pursuant to the conditions specified in NIST's letter dated February 15, 2007. NIST license conditions state that refresher training must be provided annually.

Radiation Worker Training covers fundamental practices and concepts in radiation protection, including: (1) basic regulatory requirements in 10 CFR Part 20 such as dose limits, posting and labeling, survey and monitoring, radioactive material control and security, and incident or emergency response; (2) radiation risks and protection strategies such as time, distance, and shielding from the source, and contamination control; and (3) general and job duty-specific training on the internal policies and practices for implementing the radiation safety program.

THE JUNE 9, 2008 NIST EVENT AND RESPONSE

On June 9, 2008, the NIST RSO was notified that a via] containing standard reference material was discovered broken in one of the research laboratory suites. The reference material contained plutonium. NIST's health physics personnel responded to the area and determined that low levels of contamination were spread outside of the laboratory suite into the adjoining hallway. The hallway was decontaminated and the lab was isolated. Environmental sampling and bioassays and urinalyses of individuals affected were initiated.

On June 10, 2008, NIST's Boulder, Colorado, facility reported the plutonium contamination event to NRC. This event resulted in contamination of certain areas within the facility and radioactive contamination of at]east two employees.

Once the initial significance of the event was understood by the RSO, NIST's initial efforts were to protect workers and the public. NIST restricted access to the lab suite, and began to evaluate the extent of contamination to the lab and the potential for exposure to workers and members of the public. NIST informed NRC of the event and has cooperated with our agency staff and the other regulatory authorities in support of inquiries and inspections.

Upon the initial inspectors' observations and consideration of risk significance, complexity, and generic safety implications, NRC determined, in accordance with our internal procedures, that a Special Inspection Team (SIT) was warranted. The SIT process allows NRC to assess an event and its causes and to quickly elevate the NRC response if the findings reveal more significant concerns (e.g., an apparent release of plutonium that results in an exposure to a member of the public or a

worker in excess of the allowable limit). As mentioned earlier in this testimony, on June 29, a five-member SIT was dispatched from NRC's Regional Office in Arlington, Texas, to conduct a more detailed review of the event at the Boulder facility. The team consists of the Region IV Division Director for Nuclear Materials Safety, a Branch Chief, for Nuclear Materials Safety, and three health physicists. On July 2, NRC staff executive management met with the SIT and determined that additional escalation was not warranted at that point in time. The team's inspection is continuing. A report documenting the results of the special inspection team's work will be issued within 45 days of the team completing their inspection effort.

On July 2, 2008, NRC issued a CAL to NIST confirming the agreed upon actions that NIST took and planned to take as a result of the June 9 event in order to ensure safety and to adequately evaluate the event in a timely manner. Pursuant to the CAL, NIST has agreed to take several actions, including: (1) suspending use of the plutonium sources pending NRC approval and determination of procedural adequacy for safety and procedural compliance; (2) thoroughly determining the radiation doses to all individuals potentially exposed by August; (3) reviewing and assessing training and procedural adequacy prior to using any licensed material; (4) providing NRC, for review and approval, a written plan for stabilizing the contamination within the laboratory; and (5) obtaining authorized services for the decontamination of the facility and NRC approval of the licensee's decontamination plan.

Although our inspection team has not completed its work and we have not finalized our inspection conclusions, the NRC staff is concerned about a number of issues. These include: the amount of radiation dose received by individuals as a consequence of the event; the amount of radioactive materials released into the sewer; the use of procedures at NIST's Boulder facility—particularly those related to the handling and storage of radioactive material; and the training of the individuals performing NRC-licensed activities.

SUMMARY

In conclusion, Mr. Chairman and Members of the Committee, it is the policy of the U.S. Nuclear Regulatory Commission to ensure that significant operational events involving reactor and materials facilities licensed by the NRC are investigated in a timely, objective, systematic, and technically sound manner; that the factual information pertaining to each event is documented; and that the cause or causes of each event are ascertained; and that corrective actions are implemented to preclude recurrence.

I hope my testimony provides you with an understanding of NRC's regulatory role with regard to facilities such as NIST, how the NRC responds to events at these facilities, and the seriousness with which we take our duty to protect public health and safety and the environment.

Our assessment to this point has not identified any aspects of the June 9, 2008 event which would result in significant impacts to public and health safety, and we are continuing our investigation into the circumstances of the event itself, including whether NIST's programs, procedures, and policies may have contributed in some way to the event. NRC's efforts will ensure that, if and where violations occurred, NIST will be required to develop and implement effective and lasting corrective actions.

Mr. Collins and I would be pleased to respond to your questions.

BIOGRAPHY FOR CHARLES L. MILLER

Dr. Miller is the Director, Office of Federal and State Materials and Environmental Management Programs. Prior to this appointment he was the Director, Division of Industrial and Medical Nuclear Safety, in the Office of Nuclear Material Safety and Safeguards (NMSS). Prior to that appointment, he was the Deputy Director, Licensing and Inspection Directorate in the Spent Fuel Project Office, NMSS.

Since joining the NRC in 1980, Dr. Miller also held a number of positions in the Office of Nuclear Reactor Regulation, including: Project Manger; Technical Assistant; Section Leader; Project Director, Standardization Project Directorate; Project Director, Project Directorate I–2; Chief, Emergency Preparedness and Radiation Protection Branch; and Deputy Director, Incident Response Operations. He also served as the Technical Assistant to former Commissioner Bernthal.

Prior to joining NRC, he worked for Science Applications International Corporation (SAIC) for four years in various nuclear fuel cycle and defense activities. He began his professional career at Bechtel Power Corporation, where he spent two years working on the design of nuclear power plants.

Dr. Miller received a B.S. degree in Chemical Engineering from Widener University, and an M.S. and a Ph.D. in Chemical Engineering from the University of Maryland.

BIOGRAPHY FOR ELMO E. COLLINS

Elmo E. Collins was assigned as the Regional Administrator for the Region IV Office of the Nuclear Regulatory Commission (NRC) in September 2007. NRC Region IV is one of four, large regional offices. NRC Region IV is responsible for overseeing the inspection of 14 nuclear power plants in 22 States, overseeing the inspection and licensing of medical, academic, and industrial users of radioactive materials in Western United States, overseeing the Agreement States in implementing the NRC's materials inspection and licensing programs in 16 of those 22 States, and overseeing the licensing of operators of the controls of nuclear power reactors. Mr. Collins, originally from Oklahoma, graduated from the U.S. Naval Academy at Annapolis, MD in 1976.

Mr. Collins has broad and extensive experience in the nuclear industry. He served for six years in the U.S. Navy as a nuclear trained submarine officer, serving on the USS Thomas A. Edison (SSBN 610). Mr. Collins completed his qualification to serve as engineering officer on nuclear powered submarines in May 1980. After leaving the Navy, Mr. Collins worked in the commercial nuclear industry as a startup engineer with General Electric from 1983 to 1987, receiving certification as a Senior Reactor Operator.

Mr. Collins joined NRC Region I in 1987 as a resident inspector at Oyster Creek, where he later became the Senior Resident Inspector. In 1991, Mr. Collins transferred to NRC Region IV as a Senior Project Engineer. In Region IV, he subsequently held positions as Inspection Team Leader, Senior Reactor Analyst, Reactor Projects Branch Chief, and Nuclear Materials Branch Chief. Mr. Collins was appointed to Senior Executive Service in May 2000 as the Deputy Director for the Division of Reactor Projects. In February 2003, Mr. Collins was assigned the position of Director, Division of Nuclear Materials Safety in Region IV. In July 2004, Mr. Collins was re-assigned to NRC Headquarters Office of Nuclear Materials Safety and Safeguards (NMSS) in Rockville, MD. as the Deputy Division Director for the licensing and inspection of the high-level radioactive waste repository at Yucca Mountain. In October 2006, Mr. Collins was assigned to the Office of Nuclear Reactor Regulation (NRR) as the Director, Division of Inspection and Region Support.

During his career, Mr. Collins has been involved in inspection and oversight of nuclear power plants, licensing and oversight of users of radioactive materials, and licensing of the high-level radioactive waste repository. In NRR, Mr. Collins was responsible for the operating reactor inspection and assessment, operator licensing, and operating experience programs. Mr. Collins has participated with the International Atomic Energy Agency Teams evaluating the performance of nuclear regulatory programs and assessment of nuclear plant operational safety performance in other countries.

Chairman WU. Thank you very much, Dr. Miller.

Dr. Collins, please proceed.

Dr. MILLER. Mr. Chairman, Dr. Collins is with me today to answer any questions that the Committee had but our testimony at this time is complete, our oral statement.

Chairman WU. Okay. Thank you, Dr. Miller. Dr. Collins, you are temporarily spared until the Q and A period.

Dr. Rogers, please proceed.

STATEMENT OF DR. KENNETH C. ROGERS, FORMER COMMISSIONER, U.S. NUCLEAR REGULATORY COMMISSION

Dr. ROGERS. Chairman Wu, Ranking Member Gingrey, and Members, because you have already heard a great deal about this, I am going to confine my presentation to general findings and recommendations. And they are preliminary. They are based on one day there and a review of materials that was supplied to us at that time and since then.

There is no uniform system supported at all levels of management to nurture and support a culture of safety awareness as a high priority in every NIST–Boulder activity. Policies and personnel exist at NIST that might have prevented this particular mishap, for example, the NIST administrative manual, the NIST laboratory safety manual, the Safety, Health, and Environment Division, the Division Safety Representatives, and the Ionizing Radiation Safety Committee.

However, safety procedures have not been consistently understood, applied, and enforced at both Gaithersburg and Boulder. Some parts of the organization appear to have regarded safety formalities as interfering with creativity and safety activities as somewhat unwelcome competitors for scarce resources.

The Boulder Safety Organization, particularly its training activities, has been minimally supported and has had to function with inadequate technical and human resources. However, there has been some improvement in the last year or so.

There were numerous instances in the evolution of this incident in which important information should have been, but was not, communicated up one level or down one level or horizontally. People failed to ask essential questions. They made incorrect assumptions and acted upon them.

Several persons we interviewed felt uncertain as to how the safety organizations were supposed to work and one described the safety culture at NIST as dysfunctional. The NIST–Boulder Organization has not met a central leadership challenge to successfully blend and maintain the enthusiasm of a collection of very talented people for cutting-edge research, with a deep respect for personal and community safety.

My preliminary recommendations are as follows: NIST must proceed apace with the decontamination, and if necessary, the decommissioning of all laboratory areas affected by the spill, employing experienced, well-regarded professionals.

Consistent, open, and clear lines of communication providing up-to-date, factual information about the incident must be created and maintained to the NIST–Boulder staff and to all interested government and concerned public interest entities.

A comprehensive root causes and lessons learned analysis must begin immediately and involve experienced, recognized experts in such analyses from outside of NIST.

Use of radioactive material at Boulder should only take place in laboratories specifically qualified for such purposes in accordance with well-established standards and requirements. Room 1–2124 in which the spill occurred did not meet those standards.

A new cost benefits analysis should be carried out that includes continuing conducting the research for the detector program requiring plutonium or other special nuclear material at laboratories well qualified to work with such materials.

The use of the plutonium sources, CRM 133, 138–1, and 138–2, that are on site, should not resume in any research at NIST–Boulder, and alternative, safer sealed sources must be used in any further work at Boulder.

Resumption of the research project should only occur after all staff connected with it are thoroughly trained and qualified for the

safe use of any radioactive or non-radiological material or equipment to be used in their work.

The Radiation Safety Officer should be required to routinely check on staff compliance with the Safety Procedure Hazard Analysis Considerations that he lists in form 364 as well as the practices planned and occurring in the relevant laboratories.

A systematic study of all potential and actual hazards at NIST should be carried out across the board as soon as possible. On the basis of that analysis, a safe practices protocol should be developed for the guidance of all users of materials and equipment.

The NIST staff training policies and practices should be thoroughly reviewed and modified to correct deficiencies. Staff must understand the hazards and their potential consequences of every new activity as well as ongoing projects and become familiar with staff, with NIST administrative procedures as well as the safety requirements related to their work.

All managers should be held accountable for promoting a safety culture within their purviews, and management performance reviews should include a consideration of how effective they have been in that regard.

The functionality of the line management relationships at NIST–Boulder to NIST–Gaithersburg should be examined as a possible contributor to this unfortunate event. The study could take place in parallel with the root causes analysis. Lines of communication and authority clearly broke down.

Equally important is an examination of the functionality of the relationships between the Boulder Safety Organization and the other Groups, Divisions, and Projects at Boulder and Gaithersburg. A clear understanding of how those relationships are envisioned by NIST's top-level management has not been successfully communicated to staff at Boulder and is a serious weakness that should be corrected.

Thank you very much. I am happy to take on any questions.

[The prepared statement of Dr. Rogers follows:]

PREPARED STATEMENT OF KENNETH C. ROGERS

Chairman Wu and Members:

Before joining the U.S. Nuclear Regulatory Commission in 1987 as a Commissioner, I spent thirty years in the academic world as a Physics professor and as the President of an Institute of Technology.

During my ten years as a Commissioner, I had numerous occasions to visit the NIST Center for Neutron Research. After leaving the NRC, I have served, on a pro bono basis, on several review committees for the Center. I am quite familiar with the activities and modes of operation of the Gaithersburg Center, but until recently, I never had any occasion to visit or learn about the work at the Boulder laboratory.

Sometime during the week of June 9, 2008 I received a call from Patrick Gallagher, the Chair of the NIST Ionizing Radiation Safety Committee, in which he asked me to serve with a small group of external experts to look into the circumstances of the June 9 Plutonium spill at the NIST–Boulder Laboratory and to provide comments and recommendations for avoiding such an event in the future. I agreed to do so as did four other independent experts in nuclear safety. The charge to the group was to: identify the causes of the incident and any contributing factors; evaluate the NIST response; evaluate the report on the incident that will be produced by NIST; and provide to the Deputy Director of NIST by June 30 our individual recommendations for corrective actions to avoid future incidents and to improve NIST safety performance and incident response.

We all worked from the same documents and testimonies, but we were asked not to attempt to produce a consensus report.

On June 23 and 24 in Boulder we met as a group with ten different people for approximately one hour each, and were given copies of electronic mail exchanges as well as copies of any documents we requested. There was a high degree of openness and cooperation in our interactions with the NIST Staff.

I have given the Committee a copy of my report.

Because the Committee has already heard this morning about the incident itself I will confine my presentation to general findings and recommendations.

Preliminary Findings

There is no uniform system, supported at all levels of management, to nurture and support a culture of safety awareness as a high priority in every NIST–Boulder activity.

Policies and personnel exist at NIST that might have prevented this particular mishap: for example, the NIST Administrative Manual, the NIST Laboratory Safety Manual, the Safety Health and Environment Division, the Division Safety Representatives, and the Ionizing Radiation Safety Committee. However, safety procedures have not been consistently understood, applied and enforced at both Gaithersburg and Boulder. Some parts of the organization appear to have regarded safety formalities as interfering with creativity and safety activities as somewhat unwelcome competitors for scarce resources.

The Boulder Safety Organization, particularly its training activities, has been minimally supported and has had to function with inadequate technical and human resources. However, there has been some improvement in the last year or so.

There were numerous instances in the evolution of this incident in which important information should have been, but was not, communicated up one level or down one level or horizontally. People failed to ask essential questions. They made incorrect assumptions and acted upon them.

Several persons we interviewed felt uncertain as to how the safety organizations were supposed to work, and one described the safety culture at NIST as dysfunctional.

The NIST–Boulder organization has not met a central leadership challenge: to successfully blend and maintain the enthusiasm of a collection of very talented people for cutting edge research with a deep respect for personal and community safety.

Preliminary Recommendations

- NIST must proceed apace with the decontamination and if necessary the decommissioning of all laboratory areas affected by the spill, employing experienced well-regarded professionals.
- Consistent, open and clear lines of communication, providing up to date factual information about the incident, must be created and maintained to the NIST–Boulder staff and to all interested government and concerned public interest entities.
- A comprehensive Root Causes and Lessons Learned analysis must begin immediately and involve experienced recognized experts in such analyses from outside of NIST.
- Use of radiological material at Boulder should only take place in laboratories specifically qualified for such purposes in accordance with well-established standards and requirements. Room 1–2124, in which the spill occurred, did not meet those standards.
- A new Costs/Benefits analysis should be carried out that includes continuing conducting the research for the detector program requiring Pu or other SNM at laboratories well qualified to work with such materials.
- The use of the Plutonium sources CRM 133, CRM 138–1 and CRM 138–2 should not resume in any research at NIST–Boulder, and alternative safer sealed sources must be used in any further work at Boulder.
- Resumption of the research project should only occur after all staff connected with it are thoroughly trained and qualified for the safe use of any radiological or non-radiological material or equipment to be used in their work.
- The Radiation Safety Officer should be required to routinely check on staff compliance with the SAFETY PROCEDURE/HAZARD ANALYSIS CONSIDERATIONS that he lists in Form 364 as well as on the practices planned and occurring in the relevant laboratories.
- A systematic study of all potential and actual hazards at NIST should be carried out across the board as soon as possible. On the basis of that analysis

a safe practices protocol should be developed for the guidance of all users of materials or equipment.

- The NIST staff training policies and practices should be thoroughly reviewed and modified to correct deficiencies. Staff must understand the hazards and their potential consequences of every new activity as well as ongoing projects and become familiar with NIST administrative procedures as well as the safety requirements related to their work.
- All managers should be held accountable for promoting a safety culture within their purviews, and manager performance reviews should include a consideration of how effective they have been in that regard.
- The functionality of the line management relationships at NIST–Boulder to NIST–Gaithersburg should be examined as a possible contributor to this unfortunate event. This study could take place in parallel with the Root Causes Analysis. Lines of communications and authority clearly broke down.
- Equally important is an examination of the functionality of the relationships between the Boulder Safety Organization and the other Groups, Divisions and Projects at Boulder and Gaithersburg. A clear understanding of how those relationships are envisioned by NIST top-level management has not been successfully communicated to staff at Boulder and is a serious weakness that should be corrected.

Kenneth C. Rogers, Ph.D.

[redacted]
Bethesda, MD 20817-3348
[redacted]

July 2, 2008

James Turner, Director
National Institute of Standards and Technology
100 Bureau Drive, Stop 1000
Gaithersburg, MD 20899-1000

Dear Dr. Turner:

On June 23 and June 24, 2008 at NIST Boulder I participated in a number of interviews with NIST Boulder staff as a member of a group of experts assembled to examine the events leading up to and following the Plutonium spill on June 9, 2008. The other members of the group were Dr. J. Michael Rowe, Dr. Paul S. Hoover, Dr. Richard E. Toohey, and Mr. Lester A. Slaback. In addition to the interviews, which were conducted by the group as a whole, we were provided with copies of e-mail communications and reports related to the research project involved with the spill. We were assured that any other materials we might want to examine would be available to us.

On the evening of June 23 Tom O'Brian (Director of the Boulder laboratory), [redacted] (Head of Health Physics, NIST Gaithersburg), [redacted] (Radiation Safety Officer, Boulder laboratory) and Patrick Gallagher (Chair, Ionizing Radiation Safety Committee, NIST) briefed the group on the spill and the current status of the laboratory's response to it, which was still in progress. R[redacted]) was also present, but did not make a presentation.

The following day the group as a whole met with eleven NIST personnel. We talked to persons at all levels of management up to one level below the Director of NIST. The interviews lasted approximately fifty minutes each, and every member of the expert group had ample time to pose as many questions as he wished. The interviews were conducted in the following order:

[redacted] Chief Safety Officer for the incident
[redacted] Radiation Safety Officer (RSO), Boulder
[redacted] Principal Investigator (PI) of the research project
[redacted] foreign guest researcher (GR), user of the Plutonium source of interest
[redacted] NIST Boulder Safety Officer
[redacted]
supervisor of [redacted] and [redacted]

[redacted] supervisor of [redacted]
[redacted] Division Chief and supervisor of [redacted]
[redacted] Director of the EEEL and supervisor of [redacted]
[redacted], Chair, Ionizing Radiation Safety Committee

In general, I found the scientists and NIST staff members involved to be experienced, dedicated and competent professionals deeply concerned with the accident and with its implications for all those directly touched by it as well as for the possible seriously damaging long-term consequences. They were cooperative and forthright in their statements. In my view, the single exception was the visiting researcher most directly involved in the accident, GR. He appeared not to fully appreciate the implications of his activities and of the accident for himself and for others. His statements to the experts group and to [redacted] regarding his actions up to, during and after the spill lacked the details essential for precisely reconstructing what he did on the day of the accident.

My observations here will focus more on the circumstances leading up to and including the accident itself, rather than the immediate actions following it, for which my expertise is less relevant. I wish to emphasize that my comments are based on limited information gleaned from the interviews and my review of the copies of e-mails and other documents supplied to the group, They have not been independently checked for accuracy.

Observations Specifically Related to the Spill

On April 28, 2007, [redacted] the Boulder RSO, sent [redacted] the Principal Investigator (PI), an e-mail informing him that the NRC license amendment to possess U-235 and Thorium had arrived. Also the RSO stated to the PI that, before he ordered sources, training would have to take place, and that they should get together to set up some times. He also stated that he would be helping the PI to "set up your lab for the safe handling of the sources". [redacted] the PI's supervisor, was not copied on that memo.

On August 20, 2007, in an e-mail to the PI with a copy to [redacted] but not to [redacted] the RSO stated, " The sources you are requesting are within our license limitations, therefore it is perfectly okay to purchase them". Had [redacted] received that information he might have raised questions about the nature of the sources and precisely how they were to be used.

On September 21, 2007, the RSO expressed his concerns in a memo to the PI with a copy to [redacted] about a lack of training of the PI and his staff on handling of open source material once they acquire and begin using sources in screw top bottles. He suggested considering some sealant on the bottles to prevent their being opened. The PI's Supervisor, [redacted] was not copied on that memo. Once again he was uninformed of a serious safety concern and therefore had no opportunity to intervene.

On October 11, 2007, in a memo to the PI and to [redacted], the RSO stated that he would go over some Pu packaging issues with him and included in the message,"I'll go over some of this when we do the training next week". However, the PI stated to the expert group that he had not received any special training related to his use of the Pu sources.

The Pu Sources were received at Boulder on October 11, according to a memo dated October 12, 2007 from the RSO to [redacted] of DOE with a copy to the PI, but not to his Supervisor, [redacted].

On October 16, 2007 the PI sent a memo to the RSO, to [redacted], and to [redacted] informing them that he had ordered a fire resistant set of shelves for the sources and expected the set to arrive in two weeks.

The RSO told the experts group that he had helped the PI with storing the sources in the fire resistant cabinet and had arranged a lead brick barrier on the shelf where they were to be stored. Therefore, he was in the lab with the PI sometime in late October or early November. We did not hear from the RSO about the extent to which he reviewed the experimental set up and the procedures that were going to be followed, or of any training he gave to the PI.

The PI did not formally inform the RSO who the new people were who would be joining the team, although the RSO apparently learned through a casual conversation with the PI that there would be new staff added to the project. The RSO did not find out who these people were and whether they needed training in Radiation Safety or when they would join the team. He stated in the interviews that the very first time he met GR was in the afternoon following the accident.

GR joined the PI's team in December. Ultimately, he was allowed to work with the Pu source with no radiation training from NIST. He was totally unaware of the policies at NIST Boulder that would have required him to be badged and trained. He said that he had mentioned to someone that he had no radiation badge even though those who were working with him were badged, and he claimed to have asked to have one, but that did not take place. It wasn't clear to whom he made that request.

The PI and his supervisor should have ascertained what GR actually knew about radiation safety and NIST policies respecting use of radioactive sources and how they might apply to the work he was about to begin. They didn't understand that while the RSO had the responsibility of delivering training, they had the responsibility for arranging for it to take place. They should not have permitted him to begin using the Pu sources without having had specific training.

GR was permitted by the PI to work alone in the laboratory with the Pu sources outside of normal working hours. The PI's Supervisor was unaware of this.

We saw no evidence that the experimental procedures to be followed in using the Pu source were carefully planned and documented.

The RSO stated that he had told the PI that the Pu source should be kept in the sealed plastic bags and in the labeled can in which it was stored. It is not clear whether that warning was actually conveyed to GR.

GR, while working alone in the lab on the weekend before the spill, removed the source from the can and bags and held it in his hand while adjusting its position relative to the detector so as to find the optimum position. He appears to have been unaware that he should have checked with the PI, before embarking on such an approach to conducting the laboratory studies. Consequently the PI had no opportunity to prevent it.

Precisely how the source glass container became damaged and the spill occurred on the following Monday were not described by GR to the expert group, although he did comment that he may have struck the encapsulated source in its unprotected glass container against a lead brick while moving it back and forth with one hand while he observed the readout on a computer screen. It is clear that he was unaware of the serious consequences of a release and spill of the Pu powder. He did not act in a prudent manner in handling the source. Moreover, because he was untrained in such matters, he was not aware of the course of action that should be taken in the event of a release to the environment of the Pu powder.

Following disclosure to the PI that there was a problem with the source and the subsequent discovery by the PI that contamination of the lab workspace had occurred, the RSO was notified. Based on his very limited training and knowledge, the PI initiated steps (some of which may have been questionable) to deal with the situation.

The RSO responded and initiated a check line and control process. However, the equipment and trained human resources available to him on site were extremely limited and inadequate to characterize and deal completely with what happened.

It became apparent after some time that additional help was needed. The NIST Boulder and Gaithersburg laboratory management responded very positively to meeting those needs. Nevertheless, there were serious delays in initiating the necessary controls and procedures to deal with the spill and its aftermath. Apparently no one at Boulder considered a spill of Pu powder as a possibility, and therefore they were unprepared to deal with it.

The plan for going forward was under intense development but not yet totally clear before I left the site on June 24.

Observations Relating to NIST Systems

In recent years the use of sources of radioactivity at NIST Boulder had been minimal and involved sealed non-dispersible sources. There was no resident staff health physicist at NIST Boulder until [redacted] was hired in October 2006. Detection equipment on site was minimal and budget lines for equipment acquisition and training materials were very difficult to obtain.

However, the decision to proceed with the detector research program, which ultimately involved the use of Plutonium sources on site at Boulder, was not taken lightly. Several layers of management were involved, as was the Ionizing Radiation Safety Committee (IRSC). A Costs/Benefits analysis performed at the Division level turned out to be very favorable. Some time after the Costs/Benefits analysis was done, a decision was made to acquire unsealed (but encapsulated) Plutonium sources, in particular encapsulated powdered sources. *Encapsulated* appears to be a loosely defined term easily misinterpreted as equivalent to sealed. The decision to use such sources should have triggered a new Costs/Benefits analysis, but it did not. The Division Director, based in Gaithersburg, was unaware of the decision to order encapsulated powdered Plutonium sources. The NIST Form 364 Proposal to Acquire a Radioactive Source was prepared by the RSO and processed without his knowledge or signature. One can only wonder why.

The IRSC Committee was cognizant of the Boulder plans for acquiring small amounts of Plutonium for testing the detector system being developed and discussed the matter at some length. The Boulder RSO is a member of the IRSC. However, the description of the sources as "encapsulated" appears to have misled the IRSC and others into a belief that the sources were robust and very difficult to break open. The IRSC apparently was not aware that the Plutonium sources would be in powder form in unsealed screw top glass containers. Perhaps because they believed it to be relatively safe, the IRSC did not aggressively follow the details of the evolving work on this project. However, that proved to be a serious mistake.

In 2006, Boulder Health Physics had no funding for the acquisition of equipment. The minutes of the June 27, 2006 IRSC Meeting noted without comment that the Boulder Health Physics Invested Equipment (IE) request list, which included a smear counter, would not be in the HP IE List for FY 07. This was not the Committee's decision but was a decision by the NIST Budget Office.

However, this took place before the hiring by the Boulder site of [redacted] in early October 2006. He became the Boulder RSO. His efforts led to a decision by the Boulder Office of Health Safety and Environment (OSHE) to sacrifice other equipment needs and to purchase two G-M detectors and to borrow from Gaithersburg two additional G-M detectors and an alpha/beta counter. He also developed a list of needed ionizing and non-ionizing equipment for the Boulder HP IE 2007 budget request. We did not learn about the outcome of that list.

It is clear that no one at NIST Boulder realized that embarking on a program that would use Pu in an encapsulated source (not a precisely defined technical term) entailed serious

potential hazards and new equipment and other resource requirements. The hiring of a health physicist indicates an awareness that something new was occurring, but assigning laboratory workspace to the project in a busy mixed-use laboratory suggests that no one considered the work to be radioactively hazardous. Senior managers confirmed that in their interviews with the experts group. It is not clear that the RSO understood that this decision did not conform to the NRC amended NIST license conditions.

While some of the weaknesses, which led to this accident, involved a lack of technical training, a lack of familiarity on the part of newly acquired staff with the administrative policies and procedures of the laboratory was also a significant contributor.

> The PI did not know that he was responsible for seeing that his assistants had the necessary training for handling radioactive materials.
>
> He was also unaware that as Custodian of the sources it was his responsibility to see that only qualified individuals had access to them.
>
> The RSO did not know that he must have the approval of a Division Director before approving the purchase of a radioactive material.

There is no uniform system, supported at all levels of management, of nurturing and supporting a culture of safety awareness as a high priority in every NIST Boulder activity.

The Boulder Safety Organization has not been adequately supported and has had to function with inadequate human and technical resources, although there has been some improvement in the last year or so.

While the spill was probably the direct result of the actions of unsupervised and inadequately trained individuals who did not understand the hazards of the radioactive material they were working with and conducted their laboratory procedures in a manner that violated some specific instructions given to them, underlying weaknesses in the Laboratory fostered an environment which left open the possible occurrence of such an event.

These weaknesses stem partly from the failure of some key individuals at various levels of authority to personally embrace and consciously support an institutional culture which seriously considers the safety implications of every aspect of their work and makes decisions based on avoiding unsafe practices while also preparing for the possibility of unlikely yet possible safety challenges. While scientific and technical analyses at NIST generally receive the highest possible quality of thought, safety considerations do not enjoy that status. (There are or course exceptions.)

In fact there were indications that some researchers and their managers, when in hot pursuit of an important scientific objective, might set safety aside for consideration at a

later date, if at all. Some of the staff involved in the promotion and assurance of safety described the Safety Culture at NIST as dysfunctional.

Apparently, the NRC did not follow up (either by a formal communication or a site visit) its issuance of a license amendment to the lab to use Pu and other SNM in order to check on the capability of the individuals, the laboratory management and the equipment and facilities involved to handle these materials. It might have flagged training and equipment deficiencies relating to this project and might have prevented the accident. However, the responsibility for compliance with NRC requirements and safe practices rests with the licensee. NRC's failure to act in no way reduces the responsibility of NIST.

Preliminary Recommendations

- NIST must proceed apace with the decontamination and decommissioning (if advisable) of all laboratory areas affected by the spill by employing experienced well-regarded professionals. Credibility of the quality of the final results is extremely important.

  Consistent, open and clear lines of communication, providing up to date factual information about the incident, must be created and maintained to the NIST Boulder staff and to all interested government and concerned public interest entities.

  A process should be established immediately for assisting NIST Boulder staff in coping with any physical and psychological trauma occasioned by the accident and its aftermath. NIST's people are its most valuable resource.

- A comprehensive Root Causes and Lessons Learned analysis must begin immediately and involve experienced recognized experts in such analyses from outside of NIST. It must be penetrating and highly credible.

- A new Costs/Benefits analysis should be carried out that seriously considers alternative modes of conducting the research required for continuing the detector program. It should include performing any studies requiring Pu or other SNM at laboratories well qualified to work with such materials.

- The use of the Plutonium sources CRM 133, CRM 138-1 and CRM 138-2 should not resume in any research at NIST Boulder, and alternative safer sealed sources must be used in any further work at Boulder. The CRM 133, 138-1 and 138-2 sources should be properly disposed of off site.

- Resumption of the research project should only occur after all staff connected with it are thoroughly trained and qualified for the safe use of any radiological or non-radiological material or equipment to be used in their work.

- The RSO should be encouraged to routinely check on staff compliance with the SAFETY PROCEDURE/HAZARD ANALYSIS CONSIDERATIONS he lists in Form 364 as well as on the practices planned and occurring in the relevant laboratories.

- Use of radiological material at Boulder should only take place in laboratories specifically qualified for such purposes in accordance with well-established standards and requirements. Room 1-2124, in which the spill occurred, did not meet those standards.

- A systematic study of all potential and actual hazards at NIST should be carried out across the board as soon as possible. All potentially hazardous materials and equipment at any NIST site should be identified and analyzed. On the basis of that analysis a safe practices protocol should be developed for the guidance of all users of the materials or equipment. This may require the assistance of additional experts outside of NIST.

- The NIST staff training policies and practices should be thoroughly reviewed and modified to correct deficiencies. Safety training must be based on a clear understanding of the hazards and their potential consequences of every new activity as well as ongoing projects. Attention should be directed to familiarizing all staff with NIST administrative procedures as well as the safety requirements related to their work.

- There is no uniform system, supported at all levels of management, of nurturing and supporting a culture of safety awareness as a high priority in every NIST Boulder activity. All managers should be held accountable for promoting a safety culture within their purviews, and manager performance reviews should include a consideration of how effective they have been in that regard. The Boulder Safety Organization has not been adequately supported and has had to function with inadequate human and technical resources, although there has been some improvement in the last year or so. That improvement should continue.

- The functionality of the line management relationships at NIST Boulder to NIST Gaithersburg should be examined as a possible contributor to this unfortunate event. This study could take place in parallel with the Root Causes Analysis. Lines of communications and authority clearly broke down.

- Equally important is an examination of the functionality of the relationships between the Boulder Safety Organization and the other Groups, Divisions and Projects at Boulder and Gaithersburg. A clear understanding of how those relationships are envisioned by NIST top-level management has not been successfully communicated to staff at Boulder. This lack of clarity is a serious weakness and should be corrected.

Once again I wish to emphasize the preliminary nature of these comments and recommendations. With further information and more opportunity for reflection I might change some of them. I appreciate the opportunity to be of assistance to NIST and will be happy to continue to do in the future.

Sincerely Yours,

Kenneth C. Rogers

BIOGRAPHY FOR KENNETH C. ROGERS

OVERVIEW

I served as a Commissioner of the United States Nuclear Regulatory Commission (NRC) for ten years. First appointed by President Reagan for a five-year term I was reappointed for a second five-year term by President George Bush. Both appointments were subject to Senate confirmation. In my capacity as Commissioner, I was deeply involved in a wide range of policy issues involving science and technology and public policy. I represented the NRC for nearly ten years at the National Association of Regulatory Utility Commissioners and was a member of their Executive Committee. I have experience in working with international organizations in nuclear safety matters; have met with legislators of several foreign countries to assist them in formulating national policies on nuclear safety, and served on a small international group of experts to provide advice for the long-term to the Secretary-General of the international Organization for Economic Cooperation and Development (OECD).

In total, I have more than forty years experience in the conduct and successful management of scientific, technological and educational activities related to technology. I have had direct experience in the oversight of nuclear power plants' operations from the standpoint of strengthening their safety to the public. I have served on state-wide commissions established to promote the public interest in educational accountability and in the employment of technology to better serve the needs of a state. I have had broad exposure to policy questions relating to the control and use of science and technology for the improvement of the human condition. I have constantly worked to emphasize the necessity of including humanistic aspects in the application of technology and have been and continue to be deeply interested in the professional education of engineers and scientists so as to heighten their concerns in this regard.

DATE OF BIRTH: March 21, 1929

PLACE OF BIRTH: Teaneck, New Jersey, USA

EDUCATION:

Columbia University, NY, NY; 1952–1956, Ph.D. (physics), date of degree: 1956

Columbia University, NY, NY; 1950–1952, M.A. (physics), date of degree: 1952

St. Lawrence University, Canton, NY; 1946–1950, B.S. (physics), date of degree: 1950

EMPLOYMENT

Government

2002–2006—Member, National Research Council Board on Assessment of the National Institute of Standards and Technology (NIST) Programs Sub-panel for the NIST Center for Neutron Research

2001–2004—Chairman, Screening Panels for new members of the Advisory Committees on Reactor Safety and Nuclear Waste, U.S. Nuclear Regulatory Commission

2001—Member, External Audit Panel of Energy Research Activities at the Paul Scherrer Institute, Villigen, Switzerland

2000–2001—Chairman, Expert Advisory Group to the U.S. Nuclear Regulatory Commission on The Role and Future Directions for Nuclear Regulatory Research

2000–2002—Reviewer of Proposals to the U.S. Department of Energy in nuclear energy programs: Innovations in Nuclear Infrastructure and Education (INIE) and Nuclear Energy Research Initiative (NERI)

1999–2000—Member, Blue Ribbon Advisory Panel to the Department of Energy to Analyze the Future of University Nuclear Engineering and Research Reactors

1997–1998—The U.S. Member of an international High Level Advisory Group to the Secretary-General of the Organization for Economic Cooperation and Development (OECD) on the Future Role of the OECD Nuclear Energy Agency, Paris, France

1987–1997—Commissioner, U.S. Nuclear Regulatory Commission, Washington, DC

Academic

1999–2002—Member of the Board of Visitors, A. James Clark School of Engineering, University of Maryland

1971–1987—President and Chief Executive Officer, Stevens Institute of Technology, Hoboken, NJ

1971—Provost & Dean of Faculty, Chief Academic Officer, Stevens Institute of Technology, Hoboken, NJ

1998–1971—Head, Department of Physics, Stevens Institute of Technology, Hoboken, NJ

1967–1968—Visiting Research Scientist, Princeton University, Plasma Physics Laboratory, Princeton, NJ

1957–1967—Faculty Member, Teaching & Directing Research Teams in Plasma &Particle Physics, Stevens Institute of Technology, Hoboken, NJ

1955–1957—Research Scientist, Cornell University, Newman Laboratory of Nuclear Physics, Ithaca, NY

Industry

2002–2006—AECL Technologies Inc. Mississauga, Ontario, Canada, Consultant on U.S. Licensing Matters Pertaining to New Reactor design certifications

2000—Nuclear Energy Institute, Washington, DC, Consultant on Nuclear Regulatory Commission Policies and Procedures

1974–1986—Public Service Electric & Gas Co., Newark, NJ, Director & Sole Director Member of Nuclear Oversight Committee

1986–1987—Public Service Enterprise Group, Newark, NJ, Director and Chairman of Membership Committee of the Board of Directors

1973–1987—First Jersey National Bank, Jersey City, NJ, Director

1962–1970—Vitro Laboratories, West Orange, NJ, Consultant

1960–1963—Stanford Research Institute, Menlo Park, CA, Consultant

1962–1963—Grumann Aircraft Engineering Corporation, Bethpage, NY, Consultant

1970–1972—Photochem Industries, Fairfield, NJ, Consultant

HONORS AND AWARDS

President Emeritus, 1987, Stevens Institute of Technology

Honorary Degrees

Doctor of Engineering, 1987, Stevens Institute of Technology

Doctor of Humane Letters, 1983, St. Lawrence University

Awards

Elected Fellow of the American Nuclear Society, 2001

Recipient of the Institute of Electrical and Electronic Engineers Millennium Award Medal, 2000

Senior Member, Institute of Electrical & Electronics Engineers, 1989

Recipient of the first Hudson County (NJ) Humanitarian Award, National Conference of Christians and Jews, 1985

Elected Fellow of the American Association for the Advancement of Science, 1983

Elected Member of the Cosmos Club, Washington, DC, 1975

PROFESSIONAL MEMBERSHIPS

American Association for the Advancement of Science, Member & Fellow, 1968–Present

Institute for Electrical Electronics Engineers, Senior Member, 1978–Present

American Physical Society, 1954–Present

American Nuclear Society (ANS), Fellow, 1988–Present. Vice Chairman Public Policy Committee and of the Local Sections Committee, 2002–Present. Chairman Washington, DC Local ANS Section, 1999–2000

Honorary Chairman, PSA '99 (International Conference on Probabilistic Safety Assessment)

Assistant Chairman, Year 2000 Joint American Nuclear Society-European Nuclear Society International Conference, Washington DC, November 2000

The Food Safeguards Council (Treatment of Foods by Ionizing Radiation), Board of Advisors, 1998–Present

National Association of Regulatory Utility Commissioners 1989–1997, Member of the Executive Committee

Sigma Xi (Honorary Research Society), 1954–Present

Sigma Pi Sigma (Honorary Physics Society), 1949–Present

National Science Teachers Association, 1960–1970

American Association of Physics Teachers, 1960–1970

American Association for Higher Education, 1970–1980

American Society for Engineering Education, 1970–1990

Scientists & Engineers for Secure Energy, 1977–1987

NY Academy of Sciences, 1970–1988

Newcomen Society in America, NJ Coordinator, 1975–1988

MOST RECENT PUBLICATIONS AND TALKS

The Past and Future of University Research Reactors, SCIENCE 295, 2217 (2002)

Nuclear Power in a Regulatory Environment, Nuclear & Radiological Engineering Graduate Seminar Talk, University of Cincinnati/The Ohio State University, 2002

PUBLICATIONS (prior to 1988)

Approximately fifty refereed publications in Particle Physics, Nuclear Instrumentation, and Plasma Physics and holder of two patents on stabilized high electric current arc discharges.

MEMBERSHIPS (prior to 1988)

Appointed

Governor's Commission on Science & Technology (NJ), Chairman, Task Forces on Telecommunications, 1983–1985

New Jersey Governor's Commission on Science & Technology, Commissioner, 1985–1987

New Jersey Commission on Academic Accountability in Higher Education, Commissioner, 1979–1980

New Jersey Science & Technology Center, Advisory Board, 1980–1987

Regional Plan Association, Member of the New Jersey Committee, 1982–1987

Research & Development Council of New Jersey, 1980–1987

Ex Officio

Association of Independent Technological Universities, President (1976–1978), 1972–1987

Independent College Fund of New Jersey, Trustee, 1972–1987

Associated Colleges & Universities of New Jersey, Trustee, 1973–1982

Hudson County Community College Consortium, Trustee, 1972–1976

New Jersey State Chamber of Commerce, Director, 1976–1987

Christ Hospital Foundation, Jersey City, NJ, Trustee 1980–1986

Christ Hospital Foundation, Jersey City, NJ, Vice Chairman, 1980–1986

Hoboken Chamber Orchestra, Hoboken, NJ, Trustee, 1985–1987

Royal Society of Arts (London), 1970–1990

The University Club (of NY), 1972–1987

Other

Cosmos Club, 1975–Present

American Association of University Professors, 1958–1972

American Civil Liberties Union, 1970–1980, 2000–Present

Phi Sigma Kappa, Social Fraternity 1947–Present

DISCUSSION

Chairman WU. Thank you very much, Dr. Rogers.

It is traditional at this point for the Chairman to recognize himself for the first five minutes of questioning. I do so, and I now yield my time to Mr. Udall, the gentleman who represents the Congressional District directly affected by this spill. He is a Member of the Full Science and Technology Committee and Chair of the Space Subcommittee.

Mr. Udall, please proceed.

Mr. UDALL. Thank you, Chairman Wu, and welcome to the panel. I want to thank you, Chairman Wu, for holding this hearing today on this incident that occurred in my district in Colorado. I am very disappointed, just like the Ranking Member and the Chairman, that we are here today. This incident shouldn't have occurred in the first place, and I am far from satisfied with NIST's response, both initially and as the situation has continued to develop. The apparent lack of an adequate emergency response plan and clearly inadequate protocols for handling toxic materials are just a few or the first, I should say, of many serious problems that NIST must resolve.

Now, let me just make it clear. NIST has done great work, and I am proud to represent the labs and its employees here in Congress. But I intend to see these problems addressed.

I want to turn my line of questioning, if I might, to Dr. Turner. Dr. Turner, the communication from NIST to the public and the State and local officials was inadequate. You didn't contact the State or county officials until I specifically asked you to a week and a half after the incident.

And I would like to find out more about your communication with your employees. The incident occurred on the afternoon of June 9, but for some reason NIST and the other Department of Commerce employees were not informed until almost 24 hours later. That makes no sense. Why did it take so long to inform employees about the incident?

Dr. TURNER. Yes, sir. First of all, let me say I fully agree with you that our response was inadequate and was one of the major failures that we had. There is no question about that.

I have done several things. One, I have directed our head of Emergency Services to prepare an emergency notification checklist that would apply to Boulder. It would include things like State and county officials on it, because I think during an event is not the time to have to think about, you know, who to call, when to call, and so forth, but to have that checklist in front of them so they would know it right away. So we have taken that step.

Also——

Mr. UDALL. Dr. Turner, if I might, let me, I appreciate what you are putting in place, but if I could just continue, and I would welcome other additional information in that, along that line. But I am just curious, why couldn't you just have been frank with your employees, even a simple announcement that a spill had occurred and that we are going to move to understand what happened as soon as possible? That would have been helpful.

Do you have a plan in place if something similar occurs?

Dr. TURNER. Yes, sir. The whole incident was very slow to evolve and——

Mr. UDALL. If I could interrupt you one more time. What if something happened tomorrow? Do you have a plan in place? A yes or no answer would be sufficient.

Dr. TURNER. Yes, sir. We have certainly streamlined our communications. I have made, I have directed that changes be made in our emergency communications process so that senior managers like myself are immediately made aware of situations as they occur that warrant our attention.

Mr. UDALL. The reason I ask is that I have heard from a lot of constituents in Boulder and those who work at NIST that they are not confident that you have fixed all these communication and safety problems. And after I hear Chairman Wu mention the serious laser incident that occurred in Gaithersburg in December, I would have thought that that would have made you as the head of the agency aware that critical safety protocols were not being followed at the NIST laboratory complex.

And on that note I would like to request that you provide all e-mails between Boulder and Gaithersburg relating to how and when employees, the press, and local and State government will be notified and what needed to be clarified as you said.

Dr. TURNER. Well, sir, let me answer your question in two parts. First of all, one of the ways that we can assure ourselves of whether we have fixed the problem or not, is to do exercises. And so that is one of the things that we will plan to do, and I will play in those exercises to make sure that, you know, I am aware of what is going on and what is happening.

Mr. UDALL. That is a yes? You are saying a yes that you are going to put that all in place and——

Dr. TURNER. Yes, sir. Absolutely. Because, again, I think, as with anything else, the plans are only as good as the execution.

Mr. UDALL. Certainly.

Dr. TURNER. And if our execution is flawed, you know, we should find that, and if there are flaws in the execution or lessons learned,

doing an exercise is the venue where you can find those things out before you, in fact, are in an actual situation.

Mr. UDALL. Let me move to another line of questioning. I see my time is going to expire fairly soon.

I would like to know what you and the rest of the leadership at NIST plan to do to restore the trust of the employees given, in particular, that I have, since I have learned that NIST is already planning to terminate certain individuals in response to the incident?

Now, the investigation isn't even complete, yet it seems like you are beginning to assign blame. Do you plan to make any personnel changes before the analysis is complete?

Dr. TURNER. Sir, let me first of all, if I could give a fairly detailed answer to your question.

Mr. UDALL. I know my time is running out, so maybe a yes or no would be——

Dr. TURNER. Well, first of all, there will be no personnel actions against anyone until I have had an opportunity to make sure that whatever—that the process is fair and consistent.

Mr. UDALL. That is what I wanted to hear. Thank you.

Thank you, Mr. Chairman, for yielding.

Chairman WU. I thank the gentleman and now the Ranking Member, Dr. Gingrey.

Mr. GINGREY. Mr. Chairman, thank you.

Dr. Miller, let me go back to your testimony if I can. You, I think, said that, I think I heard you say that the NRC, the Nuclear Regulatory Commission, has inspections about every five years or on a five-year basis.

First of all, I want to know if that is accurate, and when the last inspection of NIST–Boulder occurred, and were there any deficiencies found at that particular time, and if so, was a corrective action plan submitted to NIST–Boulder?

Dr. MILLER. Thank you, Congressman. I guess I would start to answer your question in that the five-year inspection frequency, we have a graded approach to our inspection frequency based upon the—what we consider to be the safety and the risk aspects of any licensee using materials. And that ranges from: we have inspectors at certain facilities, they are on site every day, to a five-year frequency. The quantities and material that NIST was authorized to use were considered of low safety risk, so the inspection frequency was five years.

The license by which they were given an amendment to get the plutonium was only within the last couple years, and so the inspection frequency hasn't triggered to actually go out there yet. However, before that NIST had a license with the NRC for doing small amounts of work that would not have required us to actually do anything other than a telephone type of inspection activity.

So they, when they changed their license, it triggered the five-year frequency. So the NRC actually hadn't been to the Boulder facility for a large number of years, I think going back to some time in the 1990s.

Mr. GINGREY. In the light of—in light of this incident, would you, any of you agree that possibly even with this minimal licensee in regard to the amount of nuclear material that they would be working with, obviously they don't have an active reactor on-site——

Dr. MILLER. Right.

Mr. GINGREY.—and I can understand that you, your explanation of that, but would any of you think that maybe every five years was not sufficient? I want you to answer that question.

And then let me ask one last, which I think is particularly important in light of what my colleague from Colorado was saying in regard to the timeliness of the response of NIST–Boulder and its Acting Director, you knew about, I think I heard you testify that you were aware of this spill on June the 9th, and that an inspector was actually sent on June the 12th. This is an occurrence on Monday, going to the site to inspect on Thursday. If I am right on that timeline, that seems a little bit slack, if I may say so. Can you explain that for me as well?

Dr. MILLER. I will start, and I will let Dr. Collins, who was directly involved in dispatching the inspector augment, the reporting requirements for an event of this type would require that it be reported to the NRC within 24 hours, and this met that obligation. So I believe that it was on June 10 that we actually learned about it.

And Dr. Collins can tell you the deliberation that he took in dispatching an inspector to the site.

Mr. GINGREY. Well, yes. You are saying that NIST met the 24-hour reporting requirement.

Dr. MILLER. Right.

Mr. GINGREY. Now, what is the requirement for you to physically respond to an incident, have somebody on site? Is it more than 24 hours?

Dr. MILLER. It depends on the incident, and it depends on the travel arrangements, depending upon what we determine we need with regard to the response.

Mr. GINGREY. Well, I would think travel arrangements, you know, I can get a flight any time——

Dr. MILLER. Right.

Mr. GINGREY.—day or night. I might have to wait awhile, and you guys probably can attest about——

Dr. MILLER. Dr. Collins can tell you his deliberative process.

Mr. GINGREY.—transportation than I do.

Dr. MILLER. Right. He can tell you his deliberative process and how he chose to respond.

Dr. COLLINS. After we received notification of the incident from NIST on June 10, we based our, I mean, we knew we needed to send in an inspector, that we needed some on-site confirmation of the circumstances. We based that at the time, and that is all we have is the description of the event and the extent and the existence of any immediately safety issues associated with that event. We would not wait to get an inspector on-site to make sure immediate safety issues are addressed had they been described to us that day.

The description we got was that the rooms were isolated, that people had been identified, and that NIST had initiated actions to ensure that the radiation doses or potential radiation doses for those people were determined.

So that became the basis for our timeline.

Mr. GINGREY. My time is about expired, Dr. Collins, but I would say that since you extended or NRC extended this license to NIST to be able to handle this low-level amount of plutonium, there had not been a periodic inspection to make sure that they were doing the job right, that they were adequately trained and following all the protocol, guidelines whatsoever. And so what they told you I don't think you, I would be reluctant to rely on that, having no track record in regard to their prior performance.

So I am just going to close by saying, you don't have to respond but maybe later you can, that maybe your response wasn't quite as timely as it should have been.

Chairman WU. I thank the gentleman.

The gentlelady from California, Ms. Richardson, recognized for five minutes.

Ms. RICHARDSON. Yes. Thank you, Mr. Chairman.

First of all, let me start off with my question to Dr. Turner. I am sorry. Dr. Turner. How long have you been Acting Director?

Dr. TURNER. I have been Acting Director since around Labor Day of 2007.

Ms. RICHARDSON. Okay. And do you agree with the recommendations of Mr. Rogers, Dr. Rogers?

Dr. TURNER. Yes, ma'am, I do. I am in substantial agreement with him. I certainly would like to, I would welcome the opportunity to discuss it with him further just to make sure that we both have a similar understanding, but I have no, I see nothing in his report that I would disagree with.

Ms. RICHARDSON. Do you have the adequate funding to meet those recommendations?

Dr. TURNER. We will provide the funding, because safety is going to be a priority for us, and that is one of the reasons why we moved the Safety Office into the Office to report to the Director so that we could make sure that they had the resources they needed.

Ms. RICHARDSON. Who oversees the safety personnel? How does the recent reductions in funding for the Safety Division affect their duties? And at the time when NIST's funding has been increased significantly, why hasn't NIST devoted more resources to environmental, health, and safety?

Dr. TURNER. Well, the resources that they, they basically have the same situation that all the rest of our labs were in. We received a modest increase in fiscal year 2008, which did not cover the salaries and raises for all our employees, and so that covered—all our employees received the raises that they were entitled to, but we had to take some of that out of the base programs.

But, again, I would like to emphasize, though, that one of the reasons why I moved the Safety Division to report now into the Director's office is to assure that, one, we are aware of what their needs are, two, they are properly prioritized, and three, again, they have the adequate resources that they need.

Ms. RICHARDSON. Are all your labs the same?

Dr. TURNER. I am not sure if I——

Ms. RICHARDSON. In terms of the work that is done. Are all of your labs the same?

Dr. TURNER. No. Our labs are quite different and diverse.

Ms. RICHARDSON. Well, then, will you be evaluating the difference in terms of—you said that, first of all, you said they all got basically the same amount of money, and so if they are not all the same, and if they are all doing different duties, shouldn't it be somewhat different?

Dr. TURNER. No. What I meant, what I intended there was, that the amount of increase that we received in—we needed about $13 million in fiscal year 2008 to cover the increase in salaries and wages. We got about $6.5 million. And so everyone took some of that out of their base and so that——

Ms. RICHARDSON. I am not talking about the nuts and bolts of if a person received a two percent increase. I am talking about if a lab has a difference in terms of its responsibility which has been discussed now in this committee, and so if now you are doing work that you weren't doing before, have there been changes done in terms of your safety personnel for those labs appropriately is the question.

Dr. TURNER. Well, first of all, we wanted to impress on all of our laboratories that the responsibility of safety, for safety starts with line management and that they are responsible for that. Each lab has a Division Safety Representative.

Ms. RICHARDSON. Dr. Turner, I apologize. I don't know if this is the first time you testified, but as Members we only get five minutes to ask questions.

Dr. TURNER. I am sorry.

Ms. RICHARDSON. So my question is very specific to you. I understand safety is important. I understand it all goes to line management. I get all that. However, I just asked you the question, are all the labs the same? You said, no. If the labs are different and if they have different levels of responsibility and danger, my question to you is has that now been met at this particular lab and any other labs that might have a unique situation? And have you appropriated the appropriate funds to do so? That is my question.

Dr. TURNER. Yes, ma'am, we have. We have done a hazards analysis, and that has been done.

Ms. RICHARDSON. Okay.

Dr. TURNER. I apologize for that.

Ms. RICHARDSON. I understand. I understand. When did you learn of the incident?

Dr. TURNER. I learned the morning of June 10.

Ms. RICHARDSON. Okay. What process do you have in place to rectify that?

Dr. TURNER. I directed that some changes be made in our emergency response capability for communication, that our 24-hour, seven days a week Emergency Services Office in Gaithersburg, if they received a call that should have been forwarded to me, there would be a mechanism set up for the office to patch them through.

Ms. RICHARDSON. Are you now going to be notified immediately?

Dr. TURNER. Yes, ma'am, I am.

Ms. RICHARDSON. Okay.

Dr. TURNER. And the important thing is that there is one number that anyone needs to remember.

Ms. RICHARDSON. Okay. My last question is to Dr. Rogers, and I think I have got about 15 seconds. You had an opportunity to go

to this location, do an evaluation. How often would you recommend that inspections should incur so that that way we don't have this same situation again.

Dr. ROGERS. Well, I don't know how often. Regularly-scheduled inspections should occur, but it does seem to me that the license changes, the changes in the NRC license should have triggered an inspection.

Ms. RICHARDSON. Immediately or within——

Dr. ROGERS. Yes. With the introduction of special nuclear material and plutonium sources on-site, even though they were small quantities, even though they were in encapsulated form, and encapsulated is not a well-defined, technical term, it seems to me that there should have been a question about, well, now, this is something new. This is really a totally different situation from what they were dealing with before in my opinion.

The introduction of plutonium was totally new, and the type of source that they were going to use was totally new, and in my opinion NRC should have paid more attention to any possible changes that were taking place in the laboratory and how those materials were going to be used.

Ms. RICHARDSON. Thank you, sir, and I appreciate your time, Mr. Chairman.

Chairman WU. I thank the gentlelady.

The gentleman from Nebraska, Mr. Smith, five minutes.

Mr. SMITH. Thank you. Dr. Rogers, several of your colleagues who provided independent reviews to Dr. Turner singled out the Radiation Safety Officer for responding commendably given the scope of the incident and the shortage of resources. How would you characterize the containment and cleanup effort by Boulder safety personnel?

Dr. ROGERS. Well, first, let me say that my expertise really lies in the general management of nuclear safety of organizations. I have a technical background, and I know something about these matters, but I would say that I would have to really rely on my expert—the expertise of my colleagues on whether the specific actions, one-by-one, day-by-day, minute-by-minute, were the best or were appropriate. It seems to me that they were a little slow, they were a little confused, but they did get back on track and proceeded in a reasonable way once that took place. But it did take a day or two.

Mr. SMITH. Okay. Thank you. In your testimony you, I wasn't sure whether it was your own words or words of others that you said the safety culture at NIST is dysfunctional. Were those, was that your characterization?

Dr. ROGERS. That was a quotation. That was not my own analysis necessarily, but it was a quotation of one of the people involved with safety at NIST.

Mr. SMITH. Involved in safety at NIST and admitted to his or her own dysfunction in relation to that?

Dr. ROGERS. That this, that in other words—I think the statement has to be interpreted in this way, that there were pockets of very, very fine attention to safety at NIST, and there were pockets of—where it was just the opposite, that the safety organizational people had difficulty getting the attention of some of the middle-

level managers with regard to safety issues with others they found very excellent cooperation.

So I think the judgment of dysfunctional is perhaps to be interpreted as not uniformly good.

Mr. SMITH. But the individual did try to raise the issue prior to the incident?

Dr. ROGERS. I don't know about that. That was, that came out in our interviews with people. I don't know to what extent. I think there was a level of frustration.

Mr. SMITH. I mean, if it was self-identified and nothing was done about it, that would seem——

Dr. ROGERS. Well, I have to, Congressman, all I can say is that I did not have an opportunity to spend enough time to pursue it in any depth but really took it to be a signal that a hard look has to be taken at safety organization and how it is responded to by the researchers at NIST.

Mr. SMITH. But the comment was made that it was dysfunctional, and you chose not to look into it further?

Dr. ROGERS. Well, I didn't make any choice on this one way or the other. We spent as much time as we had to and available to us, and we interviewed ten individuals that day, each for an hour. This was something that came out in one of the interviews.

Mr. SMITH. More anecdotal in nature?

Dr. ROGERS. Yes.

Mr. SMITH. Okay. Thank you.

Dr. Miller, back to my previous question. How would you characterize the containment and cleanup effort by Boulder safety personnel?

Dr. MILLER. Dr. Collins has got a team on site. He can tell you the current activities that are going on and how we characterize that, sir.

Dr. COLLINS. I think the highest priority for the Special Inspection Team was to make sure that NRC had a good understanding and that the right actions were being taken to evaluate the extent of the spread of contamination, understand what the situation was, whether or not it was stable, understand the radiation doses which could be associated with that.

What we have found to date is while our work is still in progress, NIST has reasonably determined the extent of the plutonium spill. Rooms which are contaminated have been isolated, and we have commitments from NIST in our confirmatory action letter to present to the NRC a stabilization plan and decontamination plan for approval before those activities begin.

Mr. SMITH. Okay. Thank you. Thank you, Mr. Chairman.

Chairman WU. I thank the gentleman, and now in the regular order it is appropriate to recognize the gentleman from Colorado, Mr. Udall.

Mr. UDALL. Thank you, Mr. Chairman. Again, I want to turn back to Dr. Turner, and Dr. Turner, I was eager to get a number of questions in, and I didn't, to confirm that you will provide to use the e-mails that occurred after the incident here to the Committee. Will you do that?

Dr. TURNER. Yes, sir. Absolutely.

Mr. UDALL. Thank you. Before I was elected to the Congress, I served as the CEO and previous to that the COO of the Colorado Outward Bound School. We had some 60,000 days a year in the mountains of Colorado, the rivers, and in the canyon country, and safety was bottom line, top line, it was everything.

And you have to, as the leader, be ultimately responsible for what happens——

Dr. TURNER. Yes, sir.

Mr. UDALL.—even if you aren't in the field yourself, and you said this incident is unacceptable, and I wholeheartedly agree with that.

But what do you mean? Are you taking full responsibility for what happened?

Dr. TURNER. Yes, sir, I am.

Mr. UDALL. That is terrific. Specifically, where do health and safety standards fit in your priorities, and what changes are we going to see from your office? The initial reviews I think clearly point out that the incident was the result of an overall institutional failure——

Dr. TURNER. Yes, sir.

Mr. UDALL.—to properly train employees. That is your responsibility.

Dr. TURNER. Yes, sir.

Mr. UDALL. The NIST safety operational system is your responsibility. Have you read that document, and how does it need to change to reflect the lessons learned in this incident?

Dr. TURNER. Sir, I think there are gaps that certainly are evident. There are some things in the operations and safety manual that are good, other things are gaps; for example, the fact that right now there is a, people have up to 30 days—I guess new researchers have up to 30 days before they need to get training. We need to close that gap and make that appropriate. Then nobody works on anything until they are appropriately trained for that.

So there are a number of things that we are going to do, but we also want to take in and have the benefit of the evaluations of the outside experts. The Department of Commerce is also putting together a blue ribbon panel. The Inspector General is also looking as there is feedback that we would get from the NRC. So we want to be able to incorporate all that.

But let me assure you, sir, I, first of all, take responsibility for this, and I am determined to fix it.

Mr. UDALL. I also appreciate hearing that, number one, and number two, I appreciate when Congresswoman Richardson talked about budgets, that you made it clear, I believe you made it clear that even though your agency has had some cutbacks, as have all federal agencies, that you are going to find the dollars, you are going to find the resources.

Dr. TURNER. Yes, sir.

Mr. UDALL. Because there is no excuse to jeopardize——

Dr. TURNER. Yes, sir. Absolutely.

Mr. UDALL. How many safety officials work the Boulder labs, and who do they report to?

Dr. TURNER. I don't know the exact number, sir. We can certainly get that back to you, but they report to the head of the Safety, Environment, and Health Division in Gaithersburg.

Mr. UDALL. Gaithersburg. Why don't they report to someone in Boulder? That doesn't really make sense to me as a long-time safety officer in my old, my last career. I would encourage you to look at changing that as NIST learns from the incident, and I would like to also encourage you as I did a few weeks ago to respond quickly and directly to requests by my staff and the Committee staff. We still haven't received some simple things we have requested like a timeline. It has been more than a month since the incident.

Dr. TURNER. Yes, sir. Let me just say that, first of all, I apologize, you know, if we have been slow in responding, but also, I have, I will be leaving for Boulder this evening, and one of the things I want to do when I am there is to have a discussion about the rules and responsibilities and reporting structure that we have for our Site Director out there, because quite frankly, I think that was a contributing cause for the slowness of our responses, you know, the incommensurate responsibility without authority. And that is one of the things that we are looking to fix.

Mr. UDALL. That may go to my point about maybe having a Safety Officer on the ground in Boulder, but we want to pursue that further as you, if you——

Dr. TURNER. But let me just mention, I apologize for, I hope, I didn't mean to cut you off, but we do have a Safety Office there in Boulder. They report to the Safety Division in Gaithersburg.

Mr. UDALL. Who know that NIST has plutonium in the lab before the incident? I have heard that some people that work there didn't know, and I am just curious why. Did employees fully understand what they were dealing with? I know a Committee staff member was there a few weeks before, and she was in that very room, and she was not aware that that was what was being undertaken, that research with plutonium and the other materials that were there.

Dr. TURNER. Well, the plutonium was there to do work on developing detectors that weapons inspectors could be using, and as I understand it, NIST has about, in order of magnitude, better capability for those detectors than anywhere else in the country.

But clearly, it was a major failing that there was research going on with plutonium in that laboratory, and other people doing other business in that laboratory were not aware.

Mr. UDALL. Can I ask that you will get us that information for the record when it is available, and we can get the exact questions to you after the Committee hearing.

Dr. TURNER. Yes, sir.

Mr. UDALL. Mr. Chairman, I thank you for the time and yield back the time I have remaining, which is no time.

Chairman WU. I thank the gentleman.

Mr. Smith.

Mr. SMITH. Thank you, Mr. Chairman.

Dr. Miller and Dr. Collins, if you would, either of you, in your testimony you state that the confirmatory action letters document mutually agreed-upon corrective actions. How did the NRC and NIST come to an agreement on the actions taken through the July 2, letter, and how would you characterize NIST's cooperation with the NRC since the event?

Dr. MILLER. Dr. Collins will answer that question because he was directly responsible in issuing the confirmatory action letter to NIST.

Dr. COLLINS. We became aware of the need for a confirmatory action letter. That is a mechanism we have to put in place actions and commitments immediately when we feel they are warranted to make sure that the situation is safe and remains safe.

We became prompted to do that the more we became aware of what appeared to be broad breakdowns in the procedures and programmatic radiation safety program controls at NIST. We began our discussions with NIST before the Special Inspection Team arrived on site, and after that team arrived on-site and began its initial work, we had continuing discussions and were able to dialogue face to face with NIST officials to obtain their commitments prior to the finalization of that letter on July 2.

Mr. SMITH. Okay. Thank you. And Dr. Rogers, other than safety training and education, what else do you believe could be done to insure that guest researchers certainly fully appreciate the implications of their actions?

Dr. ROGERS. Well, supervision certainly is an important aspect there of their initial work. A guest researcher is someone who comes with high credentials, but it has been my long experience that an excellent technical credential does not necessarily confer with it, either common sense or detailed knowledge that is not involved with the work that is to begin.

So that it seems to me immediate supervision of any new guest researcher by experienced people at the lab would be an important addition to training and whatever else you mentioned.

Mr. SMITH. Okay. Did you want to repeat, no, I am just joking, what you said earlier.

And perhaps you kind of answered this partially, but would there be any specific recommendations on how to insure that the scientists at NIST facilities are adequately prepared for dealing with the radioactive sources?

Dr. ROGERS. Well, there is a great deal existing in the way of policies, procedures, organizational structures, and so on and so forth. They just haven't been used consistently. To me the central question is developing an attitude of safety on the part of every single person in the place. And that is a very big challenge. It is not simply imposing a collection of new requirements. It is something that has to come almost automatically when people start to work, that they think of safety along with whatever else they are doing.

And in this particular instance it seemed to me that elementary questions were not asked. There wasn't sort of a sense of intellectual curiosity on the part of key individuals that they would understand what it is they were dealing with. Maybe not having the training was important, an important flaw but also not having an inquiring mind to ask, well, what is this stuff I am dealing with? Is it dangerous or not? It is plutonium. What is that?

And these are people with scientific backgrounds that should sit down and go and do a little reading before they begin working.

Mr. SMITH. Well, I have a memo here that I think would be particularly instructive based on what is at stake here, and I appreciate the hearing today, and I would assume that most folks would

understand, especially those with excellent credentials would understand the implications of what has happened or what could happen.

So I appreciate that. Thank you.

Chairman WU. I thank the gentleman. I understand the gentlelady does not have any questions at this point in time.

Then the Chair recognizes himself for five minutes.

We are dealing with a situation with, about .25 grams of plutonium. Dr. Miller, did I hear you correctly that the terms of the license between the NRC and the NIST, and NIST would potentially permit NIST to ask for up to any sub-critical amount of plutonium?

Dr. MILLER. I don't believe that I said that, Congressman, but——

Chairman WU. I thought I heard it.

Dr. MILLER.—the terms of the license do have specific provisions in them, and I can tell you, I can turn to the license and tell you exactly what they are. But they are not authorized critical amounts of material.

Chairman WU. No. I said sub-critical. I thought you said——

Dr. MILLER. But it is less——

Chairman WU.—amounts——

Dr. MILLER.—the terms of their license is, there is a margin between the terms of their license and what would be authorized for criticality. It is not right up to it.

Chairman WU. But potentially it could be, it could have been a much larger amount of plutonium that was——

Dr. MILLER. The terms of their license not only restrict them with regard to the total amount of plutonium they are authorized to possess and use, but there is restrictions in the license with regard to what each individual source that is used can contain. So they could not contain that amount of plutonium in any one given source given the terms of the license.

Chairman WU. Okay. Well——

Dr. MILLER. The total amount of plutonium that they were authorized to possess on that license was significantly less than what would be that critical amount.

Chairman WU. It is bad enough when we are dealing with .25 grams. I am concerned about the terms by which the laboratories may have multiple sources adding up to significantly more and perhaps our staffs can get together to see precisely what those amounts——

Dr. MILLER. Yes.

Chairman WU.—might add up to.

Dr. MILLER. Yes. And we can certainly answer that information. They have that information, and we can tell you, you know, why the terms of the license for what they were given the amounts that they were possessing.

Chairman WU. Thank you, Dr. Miller. And you referred to a five-year period of——

Dr. MILLER. Yes.

Chairman WU.—inspection. In either, it is either a NIST internal rule or an NRC term of the license, I believe that there is supposed to be annual trainings for personnel handling these materials. Is that correct?

Dr. MILLER. I can, the terms of the license require annual training.

Chairman WU. Yes.

Dr. MILLER. The terms of the NRC license impose that requirement on this through the license.

Chairman WU. Okay. Well, Dr. Turner, Dr. Rogers, do you have at hand the last time that the personnel involved were actually trained?

Dr. TURNER. I can get that for you, sir, but one of the things I wanted to mention was that the, all work with radioactive sources has been stopped at NIST in Boulder.

Chairman WU. Yes. Yes.

Dr. TURNER. Until we get assured that——

Chairman WU. I understand.

Dr. TURNER.—we are meeting all the terms of the license.

Chairman WU. I understand that you have taken those steps, cautionary steps appropriately going forward. I am looking back now before this incident, and it is my understanding that there was one training in 2007, and that prior to that the prior training was in 2005, but no one has records as to the intensity, duration, or the content of those trainings. At least that is what I have been briefed on, and if you all have any contrary information or supplemental information, I would be interested in that.

Dr. TURNER. I would be happy to provide it. I saw a list of the training. Most of the training was, at least on the list that I saw, up to date. There were a few cases, you know, for example, the researchers involved in this situation where the training had not taken place.

Chairman WU. So other folks were up to date, but the subject individuals were not up to date?

Dr. TURNER. Yes, sir.

Chairman WU. Okay. The consequence of this management environment, if you will, there are a couple of things that I saw in the train of events which at least to me seem like it could have been prevented by adequate training. In one of the documents prepared by NIST as a report to the NRC, I believe that post-incident a number of the employees decided to stay in a hallway and then one person suggested that they take their shoes off.

It is commendable to not, to think about not tracking materials around on their shoes, but net, net by taking the shoes off, you expose socks and feet to the materials. The other one was washing hands over an open drain.

Dr. Rogers, Dr. Turner, Dr. Miller, do you agree with me that those are some of the things that are prevented by adequate training and a complete program and culture of training?

Dr. TURNER. Yes, sir. I totally agree and also I think the assumption of responsibility and leadership on the part of my management, as well as having in place a firm, aggressive, positive safety culture.

Dr. ROGERS. Well, I quite agree that, you know, elementary training would have avoided some of this. Information was not conveyed to the person most directly involved with this incident, that I would say could have been figured out by that individual, but it was not transmitted to that individual.

So that you had a situation where the guest researcher, who was unfamiliar with, one, the laboratory, general administrative management requirements of the lab, and two, not familiar with the details of the technical aspects of the work involving radioactive materials which that person was going to be engaged.

Chairman WU. Thank you. I see that my time has expired. My understanding is that Mr. Udall has a follow-up question.

Mr. UDALL. I do. Thank you, Mr. Chairman, for yielding, and before I ask my question, I would ask unanimous consent that a letter from the city of Boulder be entered into the record. It expresses the city of Boulder's concerns about the incident and what they believe should be the path forward.

Chairman WU. So ordered.

[The information follows:]

CITY OF BOULDER

OFFICE OF THE CITY MANAGER

July 14, 2008
Via Facsimile: 202-225-6375
First Class and Electronic Mail

The Honorable Bart Gordon, Chair
Committee on Science and Technology
U.S. House of Representatives
2320 Rayburn Building
Washington, DC 20515

RE: July 15, 2008 Oversight Hearing on Plutonium Spill at NIST-Boulder

Dear Chairman Gordon and Members of the Committee on Science and Technology:

Since the early 1950s, the Boulder community has served as home for a number of scientific and research facilities affiliated with the Federal Government and the University of Colorado. The city of Boulder has been fortunate to enjoy long term working relationships with these federal laboratories who are valued members of our community including the National Institute of Standards and Technology (NIST), National Oceanic and Atmospheric Administration (NOAA), and the Institute for Telecommunication Services (ITS), a division of the National Telecommunications and Information Administration (NTIA). The quality of the city's relationship with each of these federal facilities is due in part to the belief that these laboratories and their research will be guided by the strictest of scientific protocols, federal oversight, and regulations aimed at maximizing the safety of its respective employees and our community. While the city of Boulder continues to value the presence of each of these important research facilities, the recent incident at the NIST Boulder campus warrants our individual and collective concern.

On June 10, 2008, NIST informed the city that a low level radiation incident had occurred at its Boulder campus. The June 9, 2008 incident, reported to the Nuclear Regulatory Commission, was initially described as one in which researchers in a laboratory room discovered a vial holding approximately 0.25 of a gram of a plutonium-powder had cracked and spilled. NIST initially indicated that the spill was contained with no contamination outside the affected laboratory room and the adjacent hallway area. However, days later the city learned that the plutonium was not contained and had been released into the city's sanitary sewer system. In addition, since the incident, the city has learned that NIST does not have an identified containment laboratory that can provide protection from release of radioactive or hazardous materials into the outside environment. The city has also learned that any safety

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protocols in place were violated and failed to adequately address the magnitude of the material being handled. The city finds the lack of containment facilities and compliance with safety protocols unacceptable.

Since the incident, Director of Boulder Laboratories Dr. Tom O'Brian has maintained communications with the city. In addition to a number of ongoing correspondence between the city and Dr. O'Brian, the city participated in a June 23, 2008 conference call with representatives of NIST, Congressman Mark Udall's staff, and Committee on Science and Technology staff as well as a July 10, 2008 meeting with Dr. O'Brian, Sonja Ringen, NIST Office of Safety, Health and Environment Manager and John Guenther Legal Counsel for the Department of Commerce.

While we appreciate the level of communication with Dr. O'Brian since the incident, this situation has highlighted for the city the need for increased communication between NIST, city of Boulder and agencies issuing licenses for the use of radioactive materials, including the Nuclear Regulatory Commission (NRC) and the Colorado Department of Public Health and Environment/Radiation Control Division. The city has commenced the process of formulating an improved communication plan with Dr. O'Brian and NIST. In addition, the city respectfully requests the Committee's assistance in requiring the following actions relative to the NIST Boulder Laboratories:

1. The city supports the current prohibition on the receipt, storage, and use of all radioactive materials in NIST research and laboratory activities at the NIST Boulder facility.
2. An appropriate decontamination plan for the June 9, 2008 incident must be developed which ensures that the NIST facility and the city of Boulder are not subject to further plutonium release or contamination. A copy of the decontamination plan should be provided to the city immediately.
3. The immediate completion of a thorough inspection and assessment of all radioactive materials, chemicals and hazardous materials (including storage containers to ensure that other types of leakage or cracks have not occurred) at the NIST Boulder facility with documentation provided to the city and made available to the public.
4. Dr. O'Brian has indicated that NIST is in the process of completing an audit of safety and training procedures for the handling of any and all hazardous materials utilized or stored at the Boulder facility. The city requests the completion of this audit within the next ninety days with a copy provided to the city and made available to the public.
5. Development of a full containment facility that is capable of an immediate and full containment of any on-site radioactive or hazardous material (gas, liquid or solid) for testing and evaluation for safe decontamination and disposal. If this can not be achieved in the existing facility, the city requests the development of a full containment laboratory facility in conjunction with the new NIST building that is currently under construction. If a full containment facility cannot be included in the current construction, building plans should be

modified immediately to allow for this type of facility to be retrofitted and completed in the future.

6. The development of an appropriate communications plan between the city, NIST and multiple-jurisdictions involved in the regulation of activities conducted and materials stored at the Boulder facility. The plan should address matters including but not limited to the identification of agencies to which particular information should be reported.
7. The development of a rigorous safety training program which requires all employees and researchers to attend and complete on a regular and routine basis. Such program and compliance must be annually reported to and monitored by the appropriate federal agency.
8. The requirement that NIST annually report to the city a comprehensive list of all radioactive licensed material (type and quantity) stored and used at the NIST facility. The city's industrial pretreatment program issues a discharge permit to NIST regulating chemicals and pollutant discharges to the city's sanitary sewer system. Compliance with this permit is evaluated in part through annual inspections and NIST self-reporting requirements of on-site process operations. The radioactive material information is requested to be included in annual reporting requirements in the pretreatment permit. Copies of all radioactive material licenses are also requested to be provided to the city immediately.
9. The city has and will incur additional expense to test and monitor the sanitary sewer system (including its wastewater treatment plant and biosolids product) to help assess the level of impact and potential mitigation that may be needed as a result of the plutonium discharge. The city has requested of local NIST staff full cost recovery for this additional expense subject to final determination. NIST has indicated its intention to comply with this request.

As initially indicated, the city proudly serves as home to a number of federal laboratories. The NIST Boulder incident of June 9, 2008 presents an opportunity for the Committee and appropriate federal agencies to review the safety and training protocols in each facility to maximize the safety of the employees of each respective facility as well as the general Boulder community. The city respectfully requests that the Committee take the appropriate steps necessary to require the completion of these important assessments in a timely fashion.

Finally, the city supports the requirements detailed in the NRC's July 2, 2008 Confirmatory Action Letter, as amended on July 10, 2008. We will continue to review and evaluate NIST Boulder's July 11, 2008 response entitled *"Estimate of Release to the City of Boulder Sanitary Sewer"* and the report pursuant to paragraph 4 of the July 2 Confirmatory Action Letter and discuss it with local and regional experts from the Nuclear Regulatory Commission and the Colorado Department of Public Health and Environment/Radiation Control Division. Following the completion of that review, as well as consideration of testimony and comments at the July 15 Committee Oversight hearing, the city respectfully requests the ability to submit supplemental comments to the Committee.

On behalf of the city of Boulder, please accept my sincere appreciation for the opportunity to present our concerns and requests during this important hearing before the House Committee on Science and Technology. We welcome the opportunity to work collaboratively to maximize the ability of these laboratories to continuing their important research while also ensuring the protection and enhancement of Boulder and our region.

Sincerely,

Stephanie A. Grainger
Interim City Manager

Cc: The Honorable Mark Udall
Shaun McGrath, Mayor
Crystal Grey, Deputy Mayor
Suzy Ageton, Council Member
Matt Appleblum, Council Member
Macon Cowles, Council Member
Angelique Espinoza, Council Member
Lisa Morzel, Council Member
Susan Osborne, Council Member
Ken Wilson, Council Member
Dr. James M. Turner, Deputy Director, NIST
Dr. Tom O'Brian, Director of NIST Boulder Laboratories
Paul J. Fetherston, Deputy City Manager
Maureen Rait, Executive Director, Public Works
Ned Williams, Director, Public Works/ Utilities

Mr. UDALL. Thank you, Mr. Chairman.

I want to turn to both Dr. Miller and Dr. Turner and ask you is there anything in the NIST protocols, anything in NIST procedures that would prevent NIST from releasing a list of radioactive and hazardous material at the labs to the city of Boulder and the public in general?

Dr. Miller or maybe someone else here would be better prepared to answer the question.

Dr. MILLER. From the NRC's perspective traditionally NRC's licenses have all been public except for aspects which are security matters. Following the events of 9/11, we had to take a look at what information would be public and what would not be. And to some degree as a result of all that we have not publicized those amounts.

However, that said, we certainly at every turn, the NRC has always cooperated with State and local government officials to make sure that they are fully informed and have access to that information. Colorado itself is an NRC-agreement state. Because this is a federal facility, we regulate it, but we have a relationship with our State partners in the State of Colorado. We certainly would be happy to share any information with them.

But there is a certain amount of what we are now doing that is not made publicly available with regard to these types of licenses. And, again, it goes back to national security matters, Congressman.

Mr. UDALL. What I hear you saying if there isn't a national security concern, and that is important, we all——

Dr. MILLER. Uh-huh.

Mr. UDALL.—acknowledge, then there is nothing that would prevent NIST from releasing the list of these radioactive and hazardous materials? Depending on the state, depending where the activity is occurring.

Dr. MILLER. Yes. I mean, they certainly, certainly the local officials should have access to that information. Okay. Because of a number of reasons, including their duties as it would relate to emergency response.

Mr. UDALL. Uh-huh. Dr. Turner, you care to respond?

Dr. TURNER. Yes, sir. I became aware of the letter this morning, and I asked one of my staff in Boulder to see if they could arrange a meeting between me and some of the city officials so that we could discuss the content of that letter and what an appropriate response would be. And also, you know, we have had so many missteps because of lapses in communication, and I really wanted to make sure that this was not another situation where we had a misstep because of a lapse of communication. That is why I wanted to meet directly with city officials to make sure we had an agreement on exactly what was being requested and what an appropriate response would be.

Mr. UDALL. So what I hear you saying is you would be willing to consider their request. You want to sit down and talk with them. You want to complete your analysis, the various reviews that are underway, and I would, and you will consider that.

What I would add is we certainly have a tradition in the world of public policy and public information, everything from FOIA to other protocols of letting the public know as much as we possibly can about materials that could affect the safety or welfare or health of the public. And I think in the long run we all agree this is, it is better to err on that side than——

Dr. TURNER. Yes, sir.

Mr. UDALL.—to keep these materials hidden from view or lessen the awareness that communities may have of those materials.

Dr. TURNER. Yes, sir. We want to be a good, responsible neighbor to the community that has been so good to us.

Mr. UDALL. Yeah. Well, let me, I want to thank the Chairman again for holding the hearing. Let me just end on this note.

This is a very serious incident. As I have said here today, I am very disappointed in the way it has been handled.

Dr. TURNER. Yes, sir.

Mr. UDALL. And I have assurances from you that you are going to move with dispatch, that you are going to be——

Dr. TURNER. Yes, sir.

Mr. UDALL.—open and that we are going to find out what happened and then we are going to put protocols in place and even take a look at the culture in this because——

Dr. TURNER. Yes, sir.

Mr. UDALL.—that may be a part of what has to change, and NRC personnel who hear are very well versed in that. But I did want to also emphasize the very important work that NIST does, how proud we are to have you in our community, how proud we are to have so many, all of the scientists and the engineers and the great personnel there. And to underline the work you do in a whole host of areas that make modern life what it is and the important work

that was being done in this situation, which is to better understand how to prevent proliferation of nuclear materials, nuclear weaponry. And we want that work to go ahead. We want to understand how we can even be better at analyzing and identifying people who are comporting with international standards and those who aren't. So that is why it is so important to get this figured out and get back on track, because that work has to continue.

Dr. TURNER. Yes, sir. Absolutely, and let me just say that this has shaken NIST to its core. As you are aware, our employees are fiercely proud, as am I, of being NIST employees, and this has shaken all of us. I have been personally very heartened by the response of our Laboratory Directors. Also I met yesterday with the group that represents the researchers as well as NIST fellows, and I really, I outlined to them the importance of what we are doing and, you know, that we needed their help. And I was really heartened by their response, that they are taking this seriously and that they are committed, as am I, to fixing this.

Mr. UDALL. Thank you, Mr. Chairman, for holding this important hearing.

Chairman WU. I thank the gentleman from Colorado.

Mr. Smith.

Mr. SMITH. Yeah. I was just wondering if it would be possible for the minority to review the letter. I don't necessarily want to object, but if it would be possible for the minority to review the letter and then allow for the consent at a later time.

Chairman WU. Is the gentleman referring to the letter from the city of Boulder?

Mr. SMITH. The city of Boulder. Yes.

Chairman WU. I would be happy to make the letter available to the gentleman, but I believe that without a timely objection it is entered in the record. But if you, if the gentleman has any concerns about the letter, please enter that into the record also.

Mr. SMITH. Well, this is just the first I have seen it, and I would like, you know, to review it a little further.

Chairman WU. I would be delighted to make the letter available to the gentleman.

Mr. SMITH. Okay. Thank you.

Chairman WU. I thank the gentleman, and the Chair recognizes himself one last time.

Dr. Turner, you referred to an e-mail notice to you, which I believe came in on a Monday night, and then you did not see that e-mail until Tuesday morning. E-mail has terrific utility in permitting us to time shift our communication, but there is some things which I think we all agree, can rise above that and need immediate attention. And you have referred to fixing these communication systems within NIST.

Dr. TURNER. Yes, sir.

Chairman WU. And I am going to ask you just very briefly that I assume that this form of e-mail communication for exigent circumstances has been replaced by something which for all of us in these jobs can reach us 7 by 24.

Dr. TURNER. Yes, sir. That is why there is one number for people to remember to call, and that is it.

Chairman WU. And that number ultimately winds up at an appropriate place in the chains of notification and command?

Dr. TURNER. Yes. It goes directly to our Emergency Services Office and then they, in turn, relay the call to, whether it is me or whatever the appropriate official is, but there is one, the important thing is there is one number to call and then they will do the rest to contact us.

Chairman WU. Well, this committee, this subcommittee, the Full Committee, and the Committee staff will continue to work with NIST to make sure that these, that the information is reported appropriately, both within NIST, to other agencies, and to oversight bodies such as this one.

Dr. TURNER. Yes, sir.

Chairman WU. I want to turn back to the laser incident in Gaithersburg, and what is troubling to me about the laser incident is that I did not know about the laser incident, and it appears that no one in an oversight position was aware of the laser incident until this plutonium incident came to light.

Did NIST take any steps to notify its own employees or Congress or anyone else about the Gaithersburg laser incident?

Dr. TURNER. Yes, sir. Let me describe the process that we have done. One of the things that I did after I became the Acting Director was to institute a standing policy at our NIST leadership meetings where we begin each meeting with a five-minute safety topic. Each one of our leaders has to report on something, so, again, it is to infuse in them the idea that they are responsible, as a line manager for safety. We also, for accidents which occur, we also have the Lab Director who was involved——

Chairman WU. Dr. Turner, I am asking specifically about the laser incident in Gaithersburg.

Dr. TURNER. Yes, sir. And the Lab Director who was involved gave a presentation to our leadership board because there are lasers used throughout NIST, and so that way we are able to make sure information is exchanged and also were changes made, for example, in the set up at our facility that we shared with the University of Colorado, because they had a very similar set up. And so that information, lessons learned and information sharing resulted in precautions being taken at other laboratories as a result of hearing about and learning about the causes and the actions taken in the laser——

Chairman WU. You are saying that that did occur with respect to the Gaithersburg laser incident. It is just that it did not rise to the level that there would be any notification of this committee or Committee staff?

Dr. TURNER. Yes, sir. If we had a misstep in informing this committee, I apologize for that, sir.

Chairman WU. Now, these are different devices, but could that first incident have had lessons learned beyond laser uses that could have helped with the plutonium incident?

Dr. TURNER. Yes, sir. I think this is one of the things that we have done. Yeah. We are not looking at this situation as a Boulder only. We are looking across NIST because of this. We are not looking at this as a radiation safety issue only. We are looking at radiation safety, hazardous materials. We are also looking at equip-

ment, we are also looking at machinery, things which pose risks. You know, we are including that in our comprehensive review of safety and safety policies.

Chairman WU. Going forward, and Dr. Turner, you have made many commitments today to start making changes appropriate in procedure and in the culture of safety at NIST. What are your expectations about the timeline? What are your expectations about appointing appropriate panels in addition to the folks that you have already appointed to look into this incident?

Dr. TURNER. Well, first of all, I have made clear to everyone that this is a high priority for us. Our highest priority. I have also made it clear to everyone that this is not a short-term problem. This, you know, changing cultures is a long, difficult thing to do as Dr. Rogers referred to. So I have made that clear that this is something that we are going to be, you know, that is going to be on our radar screens for quite some time to come and that I am determined to fix it and make it right. And so, you know, people are aware of that. People understand the enormity of the challenge that we face and our determination to fix it, and I think our colleagues in this share that same determination that it get fixed.

We wanted to make clear. This is not a temporary, fleeting issue. This is something that we need to engrain and have sustainable.

Chairman WU. Dr. Rogers, since you are the one outside representative group or Dr. Miller, if you would care to comment, to this point in time should we be feeling good about the steps that NIST has initially taken to change the safety culture, or should we have further concerns or some combination of each?

Dr. ROGERS. Well, with respect to NIST it seems to me everything I have heard has been very positive, very professional. It is going to take some time, and there are steps along the way. It does seem to me that Dr. Turner's explanation of how NIST is viewing this incident is exactly correct, that it is not just a small incident in one laboratory. It is a manifestation of an underlying problem that needs to be worked on.

But there is not going to be a quick fix totally. We are talking here about a cultural issue. It is not just rules and regulations, and culture is something that is engrained in people. So that it is going to take some time to be absolutely confident, if ever one can be, that this cultural change has taken place. But it does seem to me that Dr. Turner's explanation of the approach that is being taken is entirely correct.

Chairman WU. Thank you, Dr. Rogers.

Dr. MILLER. Mr. Chairman, the NRC is very happy to hear Dr. Turner's remarks and commitments. However, we were very concerned about the nature of this event also. That is why we responded in the way that we do.

As you know from our testimony we have currently suspended NIST's authority through the confirmatory action letter to use these materials, and we want to be convinced that they have these things in place and gain our trust before we are going to allow them to renew any use of that.

But the statements that Dr. Turner has made today and his commitments are a beginning, convincing the NRC that NIST is serious about doing this. I can assure you that the NRC will stay on

top of this until we feel comfortable and that they have our confidence to renew any use of these materials.

Chairman WU. Thank you very much. I want to touch on one final topic, because I think we are all agreed, and Dr. Turner, I am gratified to hear about the steps that you are taking and as we all agree, this is a long-term process of cultural change and building in, and educating for appropriate, prompt action.

I want to as forcefully as I can state in my own quiet way that I would be deeply concerned about viewing this situation as one where picking out one or a couple of wrong actions and one or a couple of wrong actors and then taking punitive steps in that direction would be viewed as, "solving the problem."

I think that that is something which would be demoralizing to an excellent agency. You might lose good people that way. The gentleman from Colorado, Mr. Udall, referred previously to employee morale issues. I think that inculcating a culture of learning from past mistakes and incorporating lessons learned into a changed culture is the hallmark of a good or great organization.

I have certainly appreciated the work that NIST has done over many years. I am fond of saying that in economics or in science if you can't measure it, it's not real, and NIST helps us do that. NIST helps us standardize things, and without your good work we would be doing things in faith where we need to be doing things in technology or science. Nothing wrong with faith. It is just it doesn't necessary move blocks where we need to move blocks.

So this committee, this subcommittee and the Full Committee, will continue to work with NIST, with the NRC, and with outside review panels for, I believe, a good while to come, to insure, Dr. Turner, that you and perhaps your successors to come over many years, continue to build a better culture of safety in addition to the intellectual and technical excellence that you all have clearly built at NIST.

So as we bring this hearing to a close, I want to thank each of the witnesses and Dr. Collins for being here today and testifying before the Subcommittee. The record will remain open for additional statements from Members and for answers to any follow-up questions the Committee may ask, and there will be further questions from me and from other Members and from Committee staff for you all and the agencies that you all represent.

And with that I thank you very much for being here on this very important and very difficult subject. This hearing is adjourned. Thank you.

[Whereupon, at 12:35 p.m., the Subcommittee was adjourned.]

Appendix:

Answers to Post-Hearing Questions

ANSWERS TO POST-HEARING QUESTIONS

Responses by James M. Turner, Deputy Director, National Institute of Standards and Technology, U.S. Department of Commerce

Questions submitted by Chairman David Wu

Q1. How do you believe an atmosphere developed at NIST where, as you stated, "line supervisors failed to take adequate responsibility for safety issues, and safety personnel failed to assert a sufficient level of authority to ensure compliance with existing procedures and practices"?

A1. Several factors contributed. First, there are many NIST line supervisors who take safety seriously. Obviously there are some who do not. Some saw it, correctly, as line management's responsibility to provide a safe workplace; others believed that it was the Safety Division's job to make everyone safe. The Safety Division had not always been paid attention to over the years and some in that division felt that management did not fully support them. There is some justification for this view. Thus they were not assertive in elevating concerns.

Q2. In Dr. Rogers' testimony he stated that Room 1–2124, where the spill occurred, did not meet standards and requirements to qualify a lab space for use of radioactive materials. Did the management that assigned the lab space consider that this research group would be working with radioactive materials? When lab space is assigned at NIST, how is safety and the adequacy of the workspace considered?

A2. The lack of a rigorous safety culture provided the atmosphere in which neither line management nor safety officials took the necessary steps to ensure that all appropriate officials knew what approved materials were being used in laboratories, whether or not those laboratories were appropriate for the materials being used, and what training was or was not required and taken by the individuals handling the materials and working in the immediate area. If there had been a rigorous safety culture at NIST, then precautions to isolate the work, to ensure appropriate training and preparedness measures, to restrict traffic through and near the area, and to respond to the incident in a safe manner should have been in force.

Once hazards are identified, steps should be taken to reduce the risk-before the work begins. These steps could include protective equipment, special handling instructions, access controls, work procedures, training of all workers, and procedures for emergency situations. Line Management, supported by the Safety Division, would then take actions to assure that the lab space, including access controls, was safe. Line Management is also expected to do "walkdowns" (announced and unannounced) to assure that work is being done according to procedures and training and to question the workers on their jobs, use of protective equipment, and what they should do in an emergency. Line management last conducted a walkdown of Room 1–2124 in January of 2008 with the Safety Office. Clearly, the reviews undertaken and communications between line management and the safety division staff were inadequate.

Q3. Dr. Rogers suggested that performance reviews should hold managers accountable for promoting a safety culture within their purview. Since safety performance is already a required part of these reviews, how will the criteria be changed to make sure it is prioritized and that it provides factual and useful information? Please provide the current safety related criteria used in performance reviews.

A3. As it currently appears in many employee performance plans, safety is one of several activities under a broad critical element. The Chief Human Capital Officer has recently been charged with developing a separate, stand-alone critical element dealing with safety for all performance plans for the 2009 rating year, which begins October 1, 2008. The new safety critical element will provide incentive and state expectations for NIST staff to work safely, raise safety issues and concerns promptly, and take appropriate actions to resolve unsafe conditions or practices. The safety critical element will also provide a basis for holding line managers and employees accountable for increased safety awareness and performance through results-based measures and outcomes that permit element ratings of exceeds expectations, fully successful, minimally meets expectations, or unsatisfactory.

The *current* safety related criteria vary by position and organization. The table, below, contains typical criteria used in performance reviews of NIST researchers.

Critical Element	Required Activity/Results	Success Measures
Institutional Health or Research Implementation	Conduct experiments and maintain laboratory and office spaces in accordance with safety policies and procedures.	▪ All experiments conducted safely; ▪ no major safety violations; ▪ attendance at safety seminars; ▪ participation in Safety Day.

Q4. Please provide the Committee with a full account of the laser safety incident that occurred in Gaithersburg, as well as a description any follow-up activities performed regarding the incident's implications for health and safety at NIST.

A4. Laser Incident Overview

- On March 5, 2008, there was an injury to the right eye of a NIST research associate in the Atomic Physics Division of NIST's Physics Laboratory. There were two NIST associates involved in the incident. A third researcher was present in the lab but in another area behind a curtain.
- The injury was caused by a lack of communication between the researchers present that resulted in the associate's exposure to a laser. The second associate was not experienced with the hands on procedures of this experiment and was assisting. Normally, the injured associate performed the entire procedure alone. At an undetermined point the laser was left on when it should have been off. The injured research associate was placing a slide onto a microscope stage and putting a drop of immersion oil onto the objective lens. This NIST associate believed the laser to be off and therefore inadvertently exposed the right eye to the laser without protective eyewear.
- The incident occurred during the conduct of a joint project between the Chemical Science and Technology Laboratory and the Physics Laboratory. The goal of the project is to study certain aspects of mitochondria, which are membrane enclosed organelles found in the cells of most complex life forms. The DNA of mitochondria is distinct from the DNA in the cell nucleus and is inherited exclusively from the mother, which means it can be used to trace maternal lineage far back in time. Optical tweezers are used to isolate individual mitochondria in order to quantify the variation of the genetic information among mitochondria from a single cell.

Remedial Actions Taken in Response to Report on Laser Incident Investigation

- A detailed hazard and mitigation analysis of all of the optical instruments (microscopes) that use Class 3B and Class 4 lasers has been conducted. Revised standard operating procedures have been developed, and, where possible, engineering controls to eliminate the risk of exposure have been implemented.
  - — Each laser system has been inspected to ensure that it is in proper working condition, that laser power levels are as indicated on the devices, and that the laser emission on/off switches are working properly.
  - — A laser curtain has been installed to separate the wet chemistry side of the laboratory from the optical instrumentation side. This separation eliminates the risk of laser exposure to any researcher on the wet chemistry side of the laboratory, and also prevents any researcher from inadvertently walking from the wet chemistry area to the laser area without proper laser-safety eyewear.
- Under the recently adopted Health and Safety Instruction for Laser Safety, NIST is working to ensure that all optical instruments that use Class 3B and Class 4 lasers have their own warning light indicating that the lasers are on.

— The signs will be prominently displayed so that they can be seen by any operator of a particular instrument during normal use of that instrument.

— Standardized signage and warning lights will be prominently displayed to prevent entry into the laser side without proper safety eyewear.

- Interlocks have been installed on all optical instruments where the condenser can be tilted back allowing line-of-sight access to the objective lens. The interlocks shutters or blocks the laser beam when the condenser is tilted back.
- Laser safety inspections have been—and will be routinely—performed by the Group Laser Safety Representative to ensure that necessary laser safety measures and standard operating procedures are in place.

— A laser safety inspection will be performed by the Group Laser Safety Representative prior to any new system being put into operation.

— A laser safety inspection was made during the 3rd week of April, 2008—and will be made annually—by the Division Laser Safety Representative.

— Occasional inspections by the Laser Safety Officer of the Safety, Health, and Environment Division are being scheduled.

Q5a. When will the Department of Commerce (DOC) appoint the Blue Ribbon Panel to perform a review and analysis of environmental, health and safety procedures and practices at the NIST labs?

Q5b. When will they begin their work and how long is the assessment expected to take?

A5a,b. The Department of Commerce is working to establish the NIST Blue Ribbon Commission on Management and Safety and have it complete its work as expeditiously as possible. Attached is a Federal Register Notice of the establishment of the Commission.

Q5c. Also, when will the DOC's Inspector General issue its report on NIST management, training, safety and response operations?

A5c. The DOC OIG has requested that inquires regarding their report be made to Mr. Dan Bechtel, the Assistant Regional Inspector General for the Denver Region, 303–312–7660 or John Bunting, Regional Inspector General for the Denver Region, at 303–312–7663.

Q6a. Prior to the June 9th incident, to whom did the Safety, Health, and Environment Division (SHED) report at NIST's Gaithersburg and Boulder Facilities?

A6a. SHED reported to the Chief Human Capital Officer.

Q6b. What have the operating budgets been for SHED and the Boulder Safety Office for fiscal year 2004 through fiscal year 2008?

A6b. SHED and the Boulder Safety Office operating budgets for fiscal year 2004 through fiscal year 2008 are reflected in the table below:

	FY2004	FY2005	FY2006	FY2007	FY2008
SHED ($K)	3,821.7	3,676.0	3,900.4	3,838.1	5,041.7*
Boulder Safety Office ($K)	409.2	448.7	427.6	533.1	0.0
Full Time Equivalent (FTE)	22.2	23.2	24.8	23.7	23.5

* The Boulder Safety Office became part of SHED beginning in FY 2008

Q6c. How have budgets cuts impacted the number of staff employed by these offices?

A6c. The number of staff has remained fairly constant as laboratory programs grew, resulting in more work for the staff on hand. However, NIST has decided to immediately add seven specialists to work under contract for the next six months to supplement NIST's own safety and health staff.

Q7. Committee staff learned that the initial medical tests done on the affected personnel to determine if they had received internal exposure to plutonium were either incorrectly performed or performed too late to give useful results.

Q7a. Who was initially responsible for ensuring the medical safety of these individuals?

A7a. It is always line management's responsibility to ensure medical safety.

Q7b. When were radiation health experts contacted?

A7b. At 16:43 a call came into the Office of Safety, Health and Environment. At 17:15 the NIST Boulder Radiation Safety Officer, who was on annual leave, responded to a message left on his cell phone and arrived on campus at 18:00 to provide additional support. The Gaithersburg Radiation Health Physicist arrived in Boulder on Wednesday, June 12th.

Questions submitted by Representative Phil Gingrey

Q1. On pages 9 and 10 of your testimony, you list five different safety principles that you expect NIST personnel to embrace. These include the need for effective safety oversight, requirements that safety staff immediately stop questionable work, and that individuals are responsible for their own safe behavior. Dr. Turner, can you explain to the Committee who you would consider as "safety staff"? Does this include all line management or only those with specific safety functions? Where does the responsibility of individual researchers and that of "safety staff" begin?

A1. Safety staff would include all staff within the Safety, Health, and Environment Division (SHED). Their role is to develop NIST-wide safety policy and identify the means by which Line Management can show it is complying with the policy. SHED also conducts annual site inspections as required by 29 CFR 1960 and provides technical assistance and support to Line Management in order to anticipate, recognize, evaluate, and control hazards in their work areas. Line Management has the primary responsibility for safety of work within their facilities.

Q2a. What functions are performed at the two NIST labs by the Safety, Health, and Environment Division?

A2a. Functions performed: Occupational Safety and Health, Radiation Safety, Environmental Management, Employee Assistance Program, Fire Safety, Continuity of Operations Planning, Safety Engineering and Industrial Hygiene.

Q2b. What is the annual budget for this division, and how many staff do they have?

A2b. The annual budget for the Safety, Health, and Environment Division in fiscal year 2008 is $5,041.7K and current staffing consists of 23.5 FTEs, of which there are currently three vacancies.

Q2c. Do you believe that this division has had the resources during the past two years to effectively complete their responsibilities?

A2c. No. SHED has recently assessed its staffing and has submitted a prioritized list of additional resources it needs. It is currently under consideration by NIST.

Q2d. Do you believe it is appropriate for this division to be held responsible for the safe design and execution of laboratory experiments?

A2d. While SHED assists with safety design on individual experiments, the line management in the individual labs is responsible for the proper design and execution of experiments.

Questions submitted by Representative Mark Udall

Q1. Please provide the Committee with copies of all of the e-mails between Boulder and Gaithersburg relating to how and when employees and city, county and State officials would be notified of the incident.

A1. NIST is in the process of complying with this request.

Q2. Please provide the number of current full-time-equivalent employees in NIST–Boulder's Safety Office. To whom does the Boulder Safety Office report?

A2. Five employees are in the NIST Boulder Safety Office. The NIST Boulder Safety Office reports to the Safety, Health, and Environment Division which is headquartered in Gaithersburg, MD.

Q3. Please provide a list of all radioactive and hazardous materials used at the NIST–Boulder facility.

A3. Lists provided to the Committee; deemed too lengthy to print.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Charles L. Miller, Director, Office of Federal and State Materials and Environmental Management Programs, U.S. Nuclear Regulatory Commission; accompanied by Elmo E. Collins, Regional Administrator, Region IV Office, U.S. Nuclear Regulatory Commission

Questions submitted by Chairman David Wu

Q1. It was noted by several witnesses that no one at NIST seemed to appreciate the difference between a sealed source and an encapsulated source, which, as Dr. Rogers noted, is not a technical term.

Q1a. Was the failure to pursue precise information regarding the source consistent with the lax manner in which NIST handled these materials?

A1a. NIST did not procure the plutonium source in question until approximately six months after the U.S. Nuclear Regulatory Commission (NRC) approved NIST's license amendment request to use and possess special nuclear material of less than a critical mass, including plutonium in any solid, encapsulated form. The NRC is still reviewing the circumstances associated with NIST's procurement of the plutonium sources, including NIST's efforts to verify that the model numbers 137 and 138 plutonium sources met the conditions of its license. However, the NRC preliminarily has determined that NIST personnel did not apply the appropriate controls to which NIST committed in its license amendment request and which are recommended by the source supplier (U.S. Department of Energy New Brunswick Laboratory). Specifically, the source supplier asked NIST whether or not the plutonium sources would be removed from the outer cardboard tubes in order to conduct the subject research. New Brunswick Laboratory staff understood that the sources would not be removed from the outer cardboard tubes. The supplier cautioned NIST in an e-mail message that if the plutonium sources were removed, then the plutonium reference material sealed in plastic bags should be considered contaminated and should only be handled in a glove box. Similar written information was provided to NIST in the form of a material safety data sheet. The NIST–Boulder staff did not develop specific handling procedures for the plutonium sources, contrary to its commitment to the NRC. At some point after obtaining the plutonium sources in October 2007, one or more members of the NIST–Boulder staff removed the sources from the outer cardboard tubes. On June 6, 2008, NIST researchers removed the two plastic bags that contained the plutonium source in question. A glove box was not used, nor was a handling procedure or instruction provided for this activity.

Q1b. How do you think this lack of distinction between sealed and encapsulated contributed to this accident? Does the definition of the term "encapsulated" need to be clarified?

A1b. The term "sealed source" is defined in 10 CFR Part 30.4, Definitions, as "any byproduct material that is encased in a capsule designed to prevent leakage or escape of the byproduct material." The definition requires the capsule to be designed to prevent contact with and dispersion of the radioactive material under the conditions of use for which it was designed. The term "encapsulated" is not defined in the regulations. However, NRC maintains a database, NUREG/CR 5569 Health Physics Positions (HPPOS), of NRC staff positions on a wide range of topics involving radiation protection, including encapsulated sources. HPPOS–311 states that certain low energy and low activity calibration and reference sources have been confined by using glass vials for numerous years. The staff concluded that glass ampoules, flame sealed to prevent leakage or escape of its contents, can be considered "sealed sources" as long as the radionuclide content is small and the impact on decommissioning of the facility, if one or a few were to fail, is minor. While the NIST event is still under review, the NRC's preliminary finding is that the plutonium sources in question were unsealed material. This preliminary finding is made based on the following: (1) the plutonium material was in a screw top micro-bottle specifically designed to allow the material to be readily accessible (e.g., poured out of the bottle); and (2) the material content was in a configuration such that breakage of the micro-bottle could reasonably be assumed to cause more than minor impact on decommissioning of a facility. Consistent with our practices in reviewing the circumstances surrounding an event or incident, the NRC plans to conduct a review of agency guidance relative to this incident to determine whether enhancements or clarifications are needed.

Q2. The NRC learned of the release at NIST–Boulder on Tuesday, June 10th, and sent inspectors to Boulder on Thursday, June 12th.

Q2a. What guidelines and requirements does the NRC follow to determine when to dispatch inspectors?

A2a. NRC has guidance documents that address the course of action to be taken in response to radioactive material incidents. The pertinent documents for the plutonium contamination event at NIST–Boulder are Management Directive 8.3, "NRC Incident Investigation Program," and NRC Inspection Manual Chapter 1301, "Response to Radioactive Material Incidents That Do Not Require Activation of the NRC Incident Response Plan." Section 06.03 of Manual Chapter 1301 directs regional management to evaluate the need to dispatch one or more regional inspectors to conduct a special inspection of an incident site. Section 06.03.c.1. further defines "immediate dispatch" to be typically within two days of a reported event. In this case, the NIST–Boulder licensee discussed the circumstances with Region IV personnel and, at the urging of the NRC staff, reported the event to NRC Headquarters Operations Center late Tuesday afternoon, June 10, 2008. No on-going, immediate safety issues were described on this call with the Operations Center. Specifically, the licensee reported that the laboratory was isolated, contaminated and potentially contaminated personnel had been decontaminated, bioassay on these individuals was initiated, and there was no indication that contamination had spread beyond the laboratory building. Region IV management reviewed the event information and decided to dispatch an inspector to gain first hand knowledge of the event and to observe the licensee's response activities.

Regional management briefed the inspector on Wednesday, June 11. He arrived on-site at NIST–Boulder the morning of Thursday, June 12. A second inspector was dispatched the following week on June 19. After reviewing the preliminary observations stemming from these two inspection follow-up activities, in combination with additional information obtained from NIST through telephonic briefings, the NRC expanded its inspection follow-up to a five-person team, which was dispatched to the site on June 29. This is consistent with Management Directive 8.3 for operational events of this level of significance.

Q2b. When NIST first informed the NRC, did they appreciate the magnitude of the incident? Was the description of the event presented to the NRC accurate?

A2b. NIST first notified a Region IV materials license reviewer of the event, which was immediately referred to regional management. NIST described the event details that were known at the time, and indicated that they were not certain whether the event was reportable. Regional management advised NIST to immediately report the event to NRC Headquarters Operations Center, which NIST did at 3:11 p.m. EDT on June 10, 2008.

The information provided in the initial notification to Region IV management and the NRC Headquarters Operations Center was limited. However, that information was generally consistent with our preliminary observations during the initial on-site inspection. NIST provided additional details of the event (e.g., that the associate researcher washed his hands in the laboratory sink prior to notifying the principal investigator that the source bottle was cracked) to Region IV staff as information evolved during the progression of the licensee's investigation.

Although their findings are preliminary, the NRC's special inspection team has identified a number of elements required by the NIST's license for the possession and use of special nuclear material of less than a critical mass that were, in some cases, never developed or implemented, or were not adequately implemented. Examples include: insufficient training of occupational workers and laboratory frequenters; procedures that were never developed or fully implemented; security measures that were not implemented; safety modifications that were not made to the laboratory where the plutonium sources were stored and used; required audits of the radiation safety program that were not conducted; not assigning a radiation monitoring device to personnel who should have had one; personnel not wearing an assigned radiation monitoring device; and inadequate emergency procedures. Additionally, the scope of the licensee's efforts to bound the number of people that were potentially contaminated and the extent of the spread of contamination was insufficient. While the NRC agrees with the findings and conclusions of the licensee's Ionizing Radiation Safety Committee Initial Report of Plutonium Contamination at NIST–Boulder, other causes and contributors of these apparent performance deficiencies are the subject of NRC's ongoing special inspection.

Questions submitted by Representative Phil Gingrey

Q1. Your testimony describes a range of enforcement actions that are available to the NRC that apply to a federal laboratory like NIST–Boulder, including civil penalties.

Q1a. Can you elaborate on what enforcement tools the NRC has at its disposal?

A1a. The NRC's enforcement authority is contained in the *Atomic Energy Act of 1954,* as amended, and the *Energy Reorganization Act of 1974,* as amended. These statutes provide the NRC with broad authority. The Agency implements its enforcement authority through Subpart B of 10 CFR Part 2 and as reflected in the NRC Enforcement Policy. The NRC Enforcement Policy sets out the general principles governing NRC's enforcement program and provides a process for implementing the agency's enforcement authority in response to violations of NRC requirements. The Enforcement Policy applies to all NRC licensees, to various categories of non-licensees, and to individual employees of licensed and non-licensed firms involved in NRC-regulated activities.

Because violations occur in a variety of activities and have varying levels of significance, the NRC Enforcement Policy contains graduated sanctions. Enforcement authority includes the use of Notices of Violation (NOVs), civil penalties (current statutory maximum of $130,000 per violation per day), Demands for Information (DFIs), and Orders to modify, suspend, or revoke a license, Enforcement actions against individuals include NOVs and Orders prohibiting the individual from participating in NRC licensed activities. The NRC typically does not issue civil penalties to individuals. Discretion may be exercised in determining the appropriate final enforcement sanction to be taken.

Based on their safety and regulatory significance, violations are categorized into one of four severity levels, with Severity Level I being the most significant and Severity Level IV being the least significant. Severity Level IV violations are considered very low significance in nature and are not considered for escalated enforcement. Severity Level I, II, and III violations are considered for escalated enforcement and a civil penalty will be considered as part of the final sanction. For violations at academic or research facilities similar to NIST, a base civil penalty, currently $6500, is considered when escalated enforcement action is taken. If a violation is considered particularly egregious, an Order modifying, suspending, or revoking a license may be issued. In determining the proper sanction and severity level, the NRC will consider factors such as (1) was the violation a result of a willful act by the licensee or an employee/contractor of the licensee, (2) was the violation committed by an official of the licensee, and (3) is it necessary to increase any civil penalty to deter further recurrence of a serious violation.

Q1b. Can you fine a federal agency or individuals involved in a mishap?

A1b. The NRC typically does not issue civil penalties to individuals. However, discretion may be exercised in determining the appropriate final enforcement sanction to be taken. The NRC has taken escalated enforcement actions that included civil penalties against federal facilities and research laboratories in the past.

Q1c. In the past, what type of actions has the NRC taken to respond to research mishaps involving small amounts of regulated material?

A1c. Three examples of escalated enforcement taken against licensees involving events similar to the event which occurred at NIST are summarized below:

- In 1996, the Department of Health and Human Services, National Institute of Health (NIH) was issued a Severity Level III NOV and a $2,500 Civil Penalty for failure to secure from unauthorized removal or limit access to licensed materials that were stored in unrestricted areas. In this case, an increase to the base civil penalty for a Severity Level III violation was not warranted because the licensee took effective corrective action to prevent recurrence of the violation.
- In 2000, Oklahoma State University was issued a Severity Level III NOV without a civil penalty because the licensee willfully used radioactive material in an unauthorized location within the facility and the person using the material was neither properly trained nor authorized to use the material. Although the violation resulted in contamination of areas not authorized for use of the licensed material, no individual exposures greater than regulatory limits occurred. Due to the low safety significance of the incident, this violation would normally have been categorized as Severity Level IV. However, since there was willfulness associated with the violation, in accordance with the enforce-

ment policy, it was categorized as Severity Level III. Although the application of the civil penalty assessment process would have typically resulted in a civil penalty being proposed, the NRC decided to exercise discretion and not assess a civil penalty based on the licensee's effective corrective actions and the fact that the violation involved the use of small amounts of tritium representing a low risk to the health and safety of workers.

- In 2001, a Severity Level I Notice of Violation and an $11,000 civil penalty was issued to Southeast Missouri State University for an event which resulted in a radiation dose to the bone of a contract employee greater than the regulatory limit of 50 rem. In accordance with the Enforcement Policy, this overexposure was categorized as a Severity Level I violation and discretion was used to increase the base civil penalty for a Severity Level I violation by 100 percent because of the particularly poor performance by the licensee.

Q2. How would you characterize the NRC's role and responsibility in oversight of small laboratory research, as compared with facilities with nuclear reactors? Does the NRC provide guidance for structuring safety regimes in research environments? How do you foster a safe operating regime in a complex and dynamic setting where prescriptive rules may be insufficient or counterproductive to the underlying research?

A2. The NRC regulates all facilities within its jurisdiction based on the requirements within Title 10 of the Code of Federal Regulations (CFR). Small laboratory research facilities are very different from nuclear reactors and are licensed under a different part of these regulations. Small laboratory research facilities use small quantities of radioactive materials and the magnitude of risk is significantly lower than for nuclear reactors. All NRC licensees are required to have adequate equipment and facilities to protect the public health and safety, and the environment. Additionally, licensees must be qualified by training and experience to use the material for the purpose requested.

It is the responsibility of the licensee to foster a safe working environment. NRC regulations establish minimum radiation safety requirements that are generally performance-based. Licensees have flexibility in how to meet these regulations in developing their programs and accomplishing their own specific activities. However, NRC does provide guidance for applicants and licensees to use in developing their radiation safety programs. This guidance is found in the multi-volume technical guidance document series entitled, "NUREG–1556: Consolidated Guidance About Materials Licenses." Each volume in this series is tailored to the radiation safety requirements for that type of program and use of radioactive material. The guidance provides information on all aspects necessary for the safe use of radioactive material. For example, NRC's guidance includes information on topics such as training, facilities and equipment, radiation safety program, safe use of radioactive material, and emergency response. NRC radioactive materials licensees are inspected by the agency on a routine basis. The frequency of inspections is commensurate with the risk to public health and safety posed by radioactive material that licensees possess. NRC inspectors review a licensee's program against its license, requirements in the regulations, and sound radiation safety practices.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Kenneth C. Rogers, Former Commissioner, U.S. Nuclear Regulatory Commission

Questions submitted by Representative Phil Gingrey

Q1. On pages 9 and 10 of Dr. Turner's testimony, he lists five different safety principles that he expects NIST personnel to embrace. These include the need for effective safety oversight, requirements that safety staff immediately stop questionable work, and, that individuals are responsible for their own safe behavior. Dr. Rogers, would you describe these principles as a sufficient starting point for designing an effective safety program? In your opinion, what are the strengths and weaknesses of these policies?

A1. The safety principles that Dr. Turner has listed are all good starting points. He particularly emphasized training and specific steps that the Safety Staff and Management must follow to build a safety culture. He committed to a review of the training requirements that will be imposed on new or transferred appointees. He stated that NIST is reviewing the time period during which they could work before having undergoing laboratory specific safety training, and also the development by each laboratory/shop of a safety checklist. The current thirty-day period that new employees can work without appropriate training is too long in my opinion. These training requirements must also apply to visiting researchers who are not NIST employees but are afforded freedom to take scientific initiatives at the laboratories.

One important step that Dr. Turner has taken immediately is to move the NIST Safety, Health, and Environment Division so that it now reports directly to the NIST Deputy Director. This should elevate the status of that Division and give it more authority. I hope that it will be a permanent change.

The organizational structure, which treats NIST–Boulder as if it were an integral part of NIST–Gaithersburg with the Boulder Laboratory Director having no overall line management authority, may have some useful features, but I failed to appreciate what they might be. The Director title appears to be largely a ceremonial one. This arrangement creates an unnecessary degree of uncertainty particularly in an emergency situation. I would recommend that serious consideration be given to reviewing and possibly revising the role of the Boulder Laboratory Director.

In short, I believe that Dr. Turner has put in place an action program that has the potential for creating a strong safety culture at all of NIST, and I see no significant weaknesses. However, its success will take time and continuity of leadership committed to emphasizing safety in all of NIST's activities will be very important. I understand that in the past changes in the NIST Director's office have sometimes resulted in a loss of momentum in strengthening the Institute's safety commitments. That should not happen again.

Q2. How would you characterize the effectiveness and applicability of NRC's license requirements for small, research-oriented licensees?

A2. In general, NRC's extensive radioactive source material license requirements are applicable and have been effective in protecting the health and safety of the public and the users of the materials. However, there are very many types of uses (approximately two million devices use NRC licensed radioactive sources in the U.S.). The licensing and oversight of these devices is carried out through NRC Regional Offices not the Washington Headquarters. The Regional staff required to perform the necessary oversight would be hard pressed to inspect and follow up inspections at every single licensee unless a strict priority system for these activities is established and maintained, and unless licensees conscientiously obey the requirements of their licenses. NRC has established such a priority system that takes account of the potential as well as actual hazards posed by the application of the radioactive material covered by the license. However, judgment decisions have to be made in applying the priority system and unless the NRC staff involved are well informed as to the licensees intentions and capabilities, NRC may not be aware of the need to reschedule an on site inspection or to explore more deeply the written or verbal information submitted to them relative to the license. I believe that lack of timely and complete information at NRC was one of the problems that led to the Boulder incident.

Q2a. Do the requirements and guidelines provided by the NRC realistically apply to a dynamic and innovative research setting?

A2a. I believe that they do and can be met without seriously hindering the quality of the work and the enthusiasm of the researchers, provided a culture of the importance of safety is established and valued throughout the organization. However, NRC should take the Boulder incident as an indicator that its guidelines should be reviewed for precision and clarity. For example, there is too much imprecision in the definition of *encapsulated sources.* Some individuals regarded *encapsulated* as identical to *sealed.* This led to a false sense of safety and was a contributor to the incident.

Q2b. How would you characterize the NRC's role and responsibility in oversight of small laboratory research, as compared with facilities with nuclear reactors?

A2b. In my opinion there are really three not two situations that should be identified as different: [1.] Small Scale Research, Medical and Commercial applications; [2.] Research and Test reactors and [3.] Power reactors. The first and the third categories are the most difficult regulatory challenges for NRC. The first because of the huge number and diversity of licensees and the third because of the large amount of nuclear material on site and the vital importance of excellent well maintained and highly competent licensee staffs. Close (essentially daily) regulatory attention must be maintained. I believe that NRC has performed well in discharging its responsibilities in situations [1.] and [3.] but needs to continue processes of self-examination to ensure that its performance is sustained in both of these. Situation [2.], Research and Test Reactors, poses a different set of challenges to NRC for it is there that an overly heavy regulatory hand can be seriously counter productive and stifling. NIST has laboratories falling into Situation [1.] at Boulder, and Situations [1.] and [2.] at Gaithersburg Center for Neutron Research. While imposing licensing requirements appropriate to Situation [1.] across the board on Gaithersburg poses no problem, simply carrying over without modification, requirements appropriate to Situation [3.] could negatively impact the research conducted at the Gaithersburg Center for Neutron Research without any appreciable improvement in public health and safety.

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