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NEON WARNING SIGNS: EXAMINING THE MANAGEMENT OF THE NATIONAL ECOLOGICAL OBSERVATORY NETWORK

JOINT HEARING

BEFORE THE

SUBCOMMITTEE ON RESEARCH AND TECHNOLOGY

&

SUBCOMMITTEE ON OVERSIGHT

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

HOUSE OF REPRESENTATIVES

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NEON WARNING SIGNS: EXAMINING THE MANAGEMENT OF THE NATIONAL ECOLOGICAL OBSERVATORY NETWORK

FRIDAY, SEPTEMBER 18, 2015

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON RESEARCH AND TECHNOLOGY &
SUBCOMMITTEE ON OVERSIGHT,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
Washington, D.C.

The Subcommittees met, pursuant to call, at 9:04 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Barbara Comstock [Chairwoman of the Subcommittee on Research and Technology] presiding.

LAMAR S. SMITH, Texas
CHAIRMAN

EDDIE BERNICE JOHNSON, Texas
RANKING MEMBER

Congress of the United States
House of Representatives
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
2321 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515–6301
(202) 225–6371
www.science.house.gov

Subcommittees on Research and Technology and Oversight

NEON Warning Signs: Examining the Management of the National Ecological Observatory Network

Friday, September 18, 2015
9:00 a.m. to 11:00 a.m.
2318 Rayburn House Office Building

Witnesses

Dr. James L. Olds, *Assistant Director, Directorate for Biological Sciences, National Science Foundation*

Dr. James P. Collins, *Chairman of the Board, National Ecological Observatory Network, Inc*

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

HEARING CHARTER

NEON Warning Signs: Examining the Management of the National Ecological Observatory Network.

Friday, September 18, 2015
9:00 a.m. –11:00 a.m.
2318 Rayburn House Office Building

Purpose

On Friday, September 18, 2015, the Research & Technology and Oversight Subcommittees will hold a joint hearing on the National Science Foundation's (NSF) recent report that the National Ecological Observatory Network (NEON) project would be $80 million over budget and 18 months behind its construction schedule.[1] The hearing will review NSF's proposed plans for de-scoping the project and other corrective actions to keep it on budget, examine NSF's oversight and internal project management controls, and look at the capability of NEON Inc.'s leadership to continue managing the project.

Witnesses

- **Dr. James L. Olds**, Assistant Director, Directorate for Biological Sciences, National Science Foundation
- **Dr. James P. Collins**, Chairman of the Board, National Ecological Observatory Network, Inc.

Background

Funded by the NSF, NEON is a continental-scale ecological observation facility with 62 planned sites across the United States to gather and synthesize data on the impacts of climate change, land use change and invasive species on natural resources and biodiversity over 30 years.[2] NEON is the largest NSF Major Research Equipment and Facilities Construction (MREFC) project in its FY2016 budget request of $80.64 million, the last year of funding in the six-year construction schedule that totals an estimated $433.72 million.[3]

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[1] http://news.sciencemag.org/environment/2015/08/nsf-shrinks-neon-major-blow-high-profile-u-s-ecological-science-project
[2] http://www.neoninc.org/about
[3] http://www.nsf.gov/about/budget/fy2016/pdf/01_fy2016.pdf

On July 30, 2015, NSF notified the Committee that the Foundation had received a June 2015 update from NEON Inc. of costs expended to date and the remaining costs needed to complete the project as originally designed. The report revealed the project would be approximately $80 million over the $433.72 million budget and 18 months behind schedule on its current trajectory. The original project budget had already included over $60 million for contingency costs.

National Ecological Observatory Network Inc. (NEON) is the independent 501(c) (3) corporation created to build, operate, and manage the network. On August 2, 2015, NEON Inc. announced that NSF had convened a panel of experts that included the NSF, NEON Inc. staff, members of the NEON Inc. Board of Directors, and science community experts involved in the original NEON design to determine the best way to move forward with the project within the existing budget.[4] The panel came up with a plan to reduce corporate and project management costs for NEON Inc., and reduce the scope of the project by eliminating several elements, including some urban sites and the Stream Ecology Observatory Network (STREON) portion of the project.[5]

On September 8, 2015, NEON Inc. announced that the Board would initiate a search for a new CEO and named an interim CEO. Dr. Russ Lea, had led NEON Inc. since early 2012.[6]

NEON Audits

On December 3, 2014, the Committee held a hearing on the findings of two financial audits of the NEON project conducted by the NSF Office of Inspector General (OIG) and the Defense Contract Audit Agency (DCAA).[7] Two audits have been completed on the NEON project. The NSF OIG initiated these audits due to concerns identified with NSF's lack of monitoring of several high-risk projects prior to entering into cooperative agreements and its failure to review the awardee's costs submitted on a regular basis.

In June 2011, the OIG contracted with DCAA to audit NEON Inc.'s construction cost proposal. After several weeks of work, DCAA advised the OIG that it was cancelling the audit because information supplied by NEON Inc. was inadequate to complete the necessary financial analyses. NSF and the OIG then intervened, enabling DCAA to complete its audit. However, before the audit was completed, NSF accepted NEON Inc.'s cost proposal and authorized the award of $433.72 million. In September 2012, the audit was finalized. DCAA concluded that NEON Inc.'s proposal was not acceptable as a basis for negotiation of a fair and reasonable cooperative agreement price. Of the proposed $433.72 million project cost, DCAA described

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[4] http://www.neoninc.org/updates-events/update/neon-adjust-scope-construction-project
[5] http://www.neoninc.org/updates-events/update/special-report-recommendations-response-nsf-scope-management-directives
[6] http://www.neoninc.org/updates-events/update/leadership-transition-announced-neon-inc
[7] https://science.house.gov/legislation/hearings/full-committee-hearing-review-results-two-audits-national-ecological

approximately $102 million as "questionable" and described an additional $52 million of proposed costs as "unsupportable." This audit was transmitted to NSF, accompanied by an OIG written alert about excessive costs and accounting deficiencies for major research facilities. This alert included a series of recommendations to NSF. The OIG subsequently commissioned a second DCAA audit of NEON Inc.'s accounting systems. DCAA completed a draft of this audit in May 2013, but it was not forwarded to the OIG for review until October 2014, due to internal disagreements within DCAA about the scope of the audit.[8]

A second audit of NEON Inc.'s accounting system was then conducted by the NSF OIG and DCAA. This audit included NSF's approval of management fees for non-profit corporations like NEON Inc. DCAA auditors found that NEON Inc. used the management fee to pay for such items as $112,000 lobbying contracts, $25,000 for a holiday party, and $11,000 per year for coffee services. [9]

Cooperative Agreements

On February 3, 2015, the Committee held a hearing on NSF's oversight of the NEON project and other Major Research Facilities developed under cooperative agreements.[10] Under a cooperative agreement, NEON Inc. is responsible for managing the construction of the NEON observatory and its transition to operations, including the hiring of management and staff, procurements, contracts, permitting of sites, financial reporting, requesting and receiving approvals from NSF for actions, education and outreach, and communications with the community. NSF, as the sole funding agency, is responsible for award oversight, including monitoring of progress towards the goals of the cooperative agreement, provision of periodic reports, financial oversight and managerial oversight.[11]

No-Cost Overrun Policy

In order to keep MREFC project costs from escalating during construction, NSF instituted a no-cost overrun policy for MREFC-funded projects. "This policy requires that the total project cost estimate developed at the Preliminary Design stage have adequate contingency to cover all foreseeable risks, and that any cost increases not covered by contingency be accommodated by reductions in scope."[12] Program managers are required to maintain a contingency control log in order to notify NSF of all proposed uses of contingency funds.

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[8] http://www.nsf.gov/oig/_pdf/12-1-008-neon.pdf
[9] http://www.nsf.gov/oig/_pdf/15-6-001-neon.pdf
[10] https://science.house.gov/sites/republicans.science.house.gov/files/documents/HHRG-114-SY21-20150203-SD001.pdf
[11] https://science.house.gov/legislation/hearings/subcommittee-oversight-and-subcommittee-research-and-technology-joint-hearing
[12] National Science Foundation Large Facilities Manual, March 31, 2011, p. 18. Available at: http://www.nsf.gov/bfa/lfo/lfo_documents.jsp

According to a NSF OIG and DCAA audit, NEON Inc. included over $150 million of questionable or unsupportable contingency costs in their proposal.

Chairwoman COMSTOCK. The Subcommittees on Research and Technology and Oversight will come to order.

Without objection, the Chair is authorized to declare recesses of the Committee at any time.

Welcome to today's hearing titled "NEON Warning Signs: Examining the Management of the National Ecological Observatory Network." I now recognize myself for five minutes for an opening statement.

In August, the National Science Foundation informed the Committee that the National Ecological Observatory Network project, known as NEON, was on trajectory to be $80 million over budget and 18 months behind schedule. NSF also notified the Committee that it was taking immediate action to de-scope the project and institute other corrective actions to keep it on time and on budget, in accordance with the no-cost-overrun policy that the Foundation has had in place since 2009. To put this in perspective, the $80 million is about 20 percent of the project's $433 million construction budget, a project that is supposed to be in its final year of construction in the upcoming fiscal year 2016.

In today's hearing, we want to learn more about how NEON has gotten so far off track, why the overrun was not caught sooner, and look at what corrective actions both NSF and NEON intend to take to complete the project, or actions that they've already undertaken to correct this issue. I also want to review NSF's proposed plans for scaling back the project and understand what impact it will have on the scientific value of the network.

We have an obligation and responsibility to ensure every dollar intended for scientific research is spent as effectively and efficiently as possible. Any dollars that are wasted on mismanagement is a dollar that could have been spent on groundbreaking basic research or training future scientists.

This is not the first time the Committee has looked at the serious problems which seem to have plagued NEON. We need to better understand what went wrong so we can determine what steps, including new legislation or guidelines, must be taken to ensure these problems never happen again.

[The prepared statement of Chairwoman Comstock follows:]

PREPARED STATEMENT OF SUBCOMMITTEE ON RESEARCH & TECHNOLOGY
CHAIRWOMAN BARBARA COMSTOCK

In August, the National Science Foundation informed the Committee that the National Ecological Observatory Network project, known as NEON, was on trajectory to be $80 million over budget and 18 months behind schedule.

NSF also notified the Committee that it was taking immediate action to de-scope the project and institute other corrective actions to keep it on time and on budget, in accordance with the no-cost overrun policy that the Foundation has had in place since 2009.

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This is not the first time the Committee has looked at the serious problems, which seem to have plagued NEON. We need to better understand what went wrong so we can determine what steps, including new legislation or regulations, must be taken to ensure these problems never happen again.

Chairwoman COMSTOCK. I now recognize the Ranking Member, the gentleman from Illinois, Mr. Lipinski, for an opening statement.

Mr. LIPINSKI. Thank you, Chairwoman Comstock and Chairman Loudermilk, and thank you for holding this hearing, and I thank Dr. Olds and Dr. Collins for being here this morning.

About six weeks ago, NSF informed the Committee that NEON was on a projected path, if not corrected, to go $80 million over budget, clearly a significant problem. While I hope that all of my colleagues join me in supporting the scientific goals of the NEON project and are interested in seeing it put on a better path going forward, I know we share the goal of being good stewards of taxpayer money. And I also believe we agree that, in a situation like this, more information sharing with the Committee at an earlier date would have helped us do better by these goals.

On the other hand, it seems a crisis may have been averted by swift action on the part of NSF and the NEON governing board, and this hearing is an opportunity to learn some lessons for the future. Today we will examine what went wrong, including whether NSF could have taken more aggressive steps sooner, and whether NSF has since taken all necessary corrective actions.

As we all know, this is not the first time this Committee is holding hearings about the NEON project. Our most recent hearings addressed NEON Inc.'s use of management fees under their cooperative agreement. In those hearings, we also addressed larger risk management policies, including policies for cost estimates and contingency funds. In fact, those broader topics have come up at a number of hearings over the last few years.

As we take a close look at what went wrong with NEON, we should also be considering what broader reforms may still be necessary. The NSF Inspector General, Ms. Lerner, is not on today's panel, but she has weighed in for several years on her broader facility management and policy concerns, and earlier this week on NEON specifically with an Alert Memo on NEON's potential $80 million cost overrun. As we discuss what reforms NSF has implemented and what reforms may still be necessary, it will be valuable for us to have that discussion in the context of the Inspector General's recommendations.

Finally, I want to address what happens now to ensure that NEON remains a valuable scientific asset for the research community and for the nation. We do not have a representative from the ecological sciences research community on today's panel. However, a group of leaders from that research community did publish a statement supporting the NEON project, while also expressing concerns about the level of engagement between NSF and the user community in determining the scientific priorities for NEON. I ask unanimous consent to include that letter with my opening remarks.

Chairwoman COMSTOCK. Without objection.

[The information appears in Appendix II]

Chairwoman COMSTOCK. Thank you——

Mr. LIPINSKI. I'm not done yet.

Chairwoman COMSTOCK. Sorry.

Mr. LIPINSKI. I don't believe anyone is interested in delaying NEON construction by another year. However, we are in effect at a temporary pause in the project. Given how much the scientific opportunities, the technological options, and the environment itself have changed since the NEON scope and design were approved five years ago, it might be worth taking advantage of this unplanned pause to ensure that we truly are getting the best science out of this facility.

I look forward to today's discussion. I believe the Committee can work productively with NSF to ensure NEON's success going forward and avert similar challenges for future NSF projects.

With that, I yield back.

[The prepared statement of Mr. Lipinski follows:]

PREPARED STATEMENT OF SUBCOMMITTEE
MINORITY RANKING MEMBER DANIEL LIPINSKI

Thank you Chairwoman Comstock and Chairman Loudermilk for holding this hearing, and thank you Dr. Olds and Dr. Collins for being here this morning.

About six weeks ago, NSF informed the Committee that NEON was on a projected path, if not corrected, to go $80 million over budget. Clearly a significant problem. While I hope that all of my colleagues join me in supporting the scientific goals of the NEON project and are interested in seeing it put on a better path going forward, I know we share the goal of being good stewards of taxpayer money. And I also believe we agree that, in a situation like this, more information sharing with the Committee at an earlier date would have helped us do better by these goals.

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I don't believe anyone is interested in delaying NEON construction by another year. However, we are in effect at a temporary pause in the project. Given how much the scientific opportunities, the technological options, and the environment itself have changed since the NEON scope and design were approved five years ago, it might be worth taking advantage of this unplanned pause to ensure that we truly are getting the best science out of this facility.

I look forward to today's discussion. I believe the Committee can work productively with NSF to ensure NEON's success going forward and avert similar challenges for future NSF projects.

I yield back.

Chairwoman COMSTOCK. Thank you, Mr. Lipinski, and I now recognize the Chair of the Oversight Subcommittee, the gentleman from Georgia, Mr. Loudermilk, for his opening statement.

Mr. LOUDERMILK. Good morning. Thank you, Chairwoman Comstock. I would also like to thank our witnesses for being here today.

As indicated, we are here today to discuss the $80 million in projected cost overruns to the National Science Foundation's cooperative agreement regarding the NEON Project. The fact that we are also here to discuss how this project is 18 months behind schedule is frankly unbelievable and is unfortunately what the American taxpayer has come to think of as business as usual.

Well, I'm here to say that at some point this most stop. In fact, I think that's exactly what the NSF Inspector General has been saying for years about this project. Just this week the IG released an Alert Memo on the subject of today's hearing. Striking is the fact that the NSF did not become aware of the $80 million budget overrun until August of this year, despite first having concerns about the budget and timeline in January of 2013. Given the multiple warning signs we'll hear about this morning, was the NSF asleep at the wheel?

This hearing is as much a reflection of the lack of oversight conducted by NSF as it is for the complete incompetence of NEON Incorporated to adequately handle a cooperative agreement of this size. However, I'm not sure anyone should be surprised of this outcome given that the NSF awarded NEON the $432 million cooperative agreement before an ongoing audit of their proposal was even completed. Frankly, exposing this kind of mismanagement in the federal government is one of the reasons my constituents sent me to Congress.

According to the IG's memo, although NEON plans to address the $80 million overrun, that number is only their best estimate and the IG indicates that based on their investigation, there is no certainty that the overrun will not increase. I am very troubled that NSF can provide our subcommittee with only its best estimate of an $80 million overrun. NSF needs an independent, expert analysis of the financial damage, or we may be in this hearing room again in another month to talk about how to de-scope another $10 to $20 million from the NEON project to make up for an even worse overrun.

To illustrate how fluid the $80 million NSF estimate is, I understand NSF is still unable to determine whether it gave NEON approval to spend any of the $35 million in project contingency funds. There is no accounting going on at the NSF for this almost half-a-billion-dollar project?

As one looks further at the IG memo and reviews the IG's previous audits of the NEON project, it is clear there has been a complete lack of proper oversight for this project. The memo indicates that the IG's auditors issued three inadequacy memos and an adverse opinion since 2011 regarding NEON's accounting, and the NSF has still not required NEON to provide adequate support for their spending. It also appears that multiple external audits were attempted before and during construction but were delayed because of an inability or unwillingness to provide the needed information.

How do you get almost a half-a-billion-dollar federal cooperative agreement and not have to cooperate when the government demands an accounting?

As if it couldn't get worse, we then learn that NEON has spent over a quarter of a million dollars on lobbyists and the NSF still hasn't determined if those expenses were legal. Are these lobbyists being used to conceal the true cost of this project from the American people while ensuring that more and more money is spent on it? In addition to the lobbyists, the top executives at NEON are making more than $200,000 a year, and as we have already discovered from previous hearings, thousands of dollars are being spent on lavish Christmas parties, gourmet coffee, happy hours, and unnecessary travel.

As a small business owner and former director of a nonprofit, I wholeheartedly understand the importance of accountability. However, what is inexcusable is that NSF has received warnings about this kind of irresponsible spending over the past four years, and it has not taken adequate measures to resolve the matter.

At today's hearing, I am not only interested in learning about how the federal government can and needs to do a better job with transparency and accountability, but also how we can ensure that this kind of abuse is not occurring with other cooperative agreements. Taxpayer money should be spent in a responsible way with the help of efficient management and oversight. In the end, I hope that this hearing will inform us on how to provide better oversight and management of federally funded research projects to ensure that taxpayers can trust us with their money and know that it will be spent in the manner intended.

I have a copy of the September 15, 2015, IG Alert Memo that I would like to add to the record.

[The prepared statement of Mr. Loudermilk follows:]

PREPARED STATEMENT OF OVERSIGHT SUBCOMMITTEE
CHAIRMAN BARRY LOUDERMILK

Good morning. Thank you Chairwoman Comstock. I would also like to thank our witnesses for being here today.

As indicated, we are here today to discuss the $80 million in projected overrun to the National Science Foundation's (NSF) cooperative agreement regarding the NEON Project. The fact that we are also here to discuss how this project is 18 months behind schedule is frankly unbelievable and is unfortunately what the American taxpayer has come to think of as business as usual. Well, I'm here to say that at some point this most stop. In fact, I think that's exactly what the NSF Inspector General has been saying for years about this project.

Just this week the IG released an alert memo on the subject of today's hearing. Striking is the fact that the NSF did not become aware of the $80 million budget overrun until August of this year, despite first having concerns about the budget and timeline in January 2013. Given the multiple warning signs we'll hear about this morning, was NSF asleep at the wheel? This hearing is as much a reflection of the lack of oversight conducted by NSF as it is for the complete incompetence of NEON Inc. to adequately handle a cooperative agreement of this size. However, I'm not sure anyone should be surprised of this outcome given that the NSF awarded NEON the $432 million cooperative agreement before an ongoing audit of their proposal was even completed. Frankly, exposing this kind of mismanagement in the federal government is one of the reasons my constituents sent me to Congress.

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mate" of an $80 million overrun. NSF needs an independent, expert analysis of the financial damage, or we may be in this hearing room again in another month to talk about how to de- scope another $10-20 million from the NEON project to make up for an even worse overrun. To illustrate how fluid the $80 million NSF estimate is, I understand NSF is still unable to determine whether it gave NEON approval to spend any of the $35 million in project contingency funds. Is there no accounting going on at the NSF for this almost half a billion project?

As one looks further at the IG memo and reviews the IG's previous audits of the NEON project, it is clear there has been a complete lack of proper oversight for this project. The memo indicates that the IG's auditors issued three inadequacy memos and an "adverse opinion" since 2011 regarding NEON's accounting, and the NSF has still not required NEON to provide adequate support for their spending. It also appears that multiple external audits were attempted before and during construction but were delayed because of an inability or unwillingness to provide needed information. How do you get almost a half a billion federal cooperative agreement and not have to cooperate when the government demands an accounting?

As if it couldn't get worse, we then learn that NEON has spent over a quarter of a million dollars on lobbyists and the NSF still hasn't determined if those expenses were legal. Are these lobbyists being used to conceal the true cost of this project from the American people while ensuring that more and more money is spent on it? In addition to the lobbyists, the top executives at NEON are making more than $200,000 a year, and as we have already discovered from previous hearings, thousands of dollars are being spent on lavish Christmas parties, gourmet coffee, happy hours, and unnecessary travel.

As a small business owner and former director of a non-profit, I wholeheartedly understand the importance of accountability. However, what is inexcusable is that NSF has received warnings about this kind of irresponsible spending over the past four years, and it has not taken adequate measures to resolve the matter.

At today's hearing, I am not only interested in learning about how the federal government can—and needs to—do a better job with transparency and accountability, but also how we can ensure that this kind of abuse is not occurring with other cooperative agreements. Taxpayer money should be spent in a responsible way with the help of efficient management and oversight.

In the end, though, I hope that this hearing will inform us on how to provide better oversight and management of federally-funded research projects to ensure that taxpayers can trust us with their money and know that it will be spent in the manner intended.

I have a copy of the September 15, 2015 IG Alert Memo that I would like added to the record.

Chairwoman COMSTOCK. Thank you, Chairman Loudermilk.

I now recognize the Ranking Member of the Subcommittee on Oversight, the gentleman from Virginia, Mr. Beyer, for an opening statement.

Mr. BEYER. Thank you, Madam Chairman.

I believe—and thank you both, Dr. Olds and Dr. Collins for being with us.

I believe the National Ecological Observatory Network is a valuable and innovative scientific project. Its mission, to create a nationwide observatory to detect, study and forecast ecological change, is a major challenge with the potential for great scientific benefits. I am concerned, with my colleagues, about the management and budget challenges NEON has recently confronted, and possibly they may have been avoided.

It appears that the National Science Foundation (NSF) may not have been adequately informed by NEON project management of cost and schedule challenges when they originally emerged, and the potential cost overrun also raises legitimate questions about NSF's oversight of the NEON project. It troubles me that NEON was on a projected path that would have placed it $80 million over budget and potentially 18 months behind schedule, although I am thankful that you are moving forward with aggressive actions to put it back on track. Later in the questions, I am eager to explore,

Dr. Olds, whether we can apply the no-cost-overrun policy to the rest of government and maybe the rest of the private sector, because I think it's very important as we talk about abuse and irresponsibility and all that, that these are hardly—that this is the first project hardly to have a cost overrun. Let me point out that the NOAA satellites were billions of dollars overrun back during the Bush Administration. Let me point out that the Joint Strike Fighter, the F–35, is again billions and billions of dollars overrun. The wars in Afghanistan and Iraq cost a little more than we had projected. And I will also say, this is not limited to the public sector. I have had the opportunity to build a number of buildings in Virginia over the last couple years and have yet to have one that met the original budget or the original timeline. We are constantly adapting and adjusting based on what we're actually learning.

Now, that doesn't relieve you guys, our witnesses today, of trying to explain why the $80 million is over there, why the 18 months is behind, what we're going to lose as we adapt to it, and how we take steps to make sure that we move forward. But we can't let the mistakes of the past relieve us of our responsibility to make NEON come true in a good and meaningful way in the short run.

This is—we can overcome the budget challenges to look to the incredible technological and environmental benefits that NEON will yield when we get past this. It is wise and important to understand the interaction among organisms in our environment and the impact the environment has on these organisms, specifically how land-use changes and climate change are driving ecological change, and how these changing systems in turn affect human health and wellbeing, and the economy, and this is NEON's fundamental purpose.

The environmental data that NEON collects will—and their analyses that will be conducted on the basis of this will help us understand the spread of invasive diseases, invasive species. It will help us gain potential insights into the biological and agricultural impact of increasing droughts across the country. It will help us explore responsible measures regarding land use, and aid scientists in deciphering the challenges we face from climate change.

So I'm looking forward to a good discussion on what happened and how we can prevent it in the future, but we also want to make sure that this doesn't get to be highly political because history would suggest that that would be pretty ugly.

Thank you. I yield back to the Chair.

[The prepared statement of Mr. Beyer follows:]

PREPARED STATEMENT OF SUBCOMMITTEE ON OVERSIGHT
MINORITY RANKING MEMBER DONALD S. BEYER, JR.

Thank you Chair Comstock and Loudermilk.

I believe the National Ecological Observatory Network or NEON is a valuable and innovative scientific project. Its mission, to create a nationwide observatory to detect, study and forecast ecological change, is a major challenge with the potential for great scientific benefits.

I am, however, concerned that some of the management and budget challenges NEON has recently confronted may have been avoided. It appears that the National Science Foundation (NSF) may not have been adequately informed by NEON project management of cost and schedule challenges when they originally emerged. The potential cost overrun also raises legitimate questions about NSF's oversight of the

NEON project. It troubles me that NEON was on a projected path that would have placed it $80 million over budget and potentially 18 months behind schedule, although I am thankful that NSF and NEON Inc. are now taking aggressive actions to put NEON on a better path forward.

I hope that our two witnesses, Dr. Olds from NSF and Dr. Collins from the NEON Inc. governing board, can help us better understand what led to this situation and what corrective actions they have put in place to prevent these issues from emerging in the future. I have other questions regarding how NEON Inc. and NSF are communicating with the ecological sciences community about their needs and what steps they are each taking to ensure that these needs are being appropriately examined and addressed.

We cannot step back to prevent past mistakes or missteps. But we can and should learn from these past events. We can implement corrective actions now to ensure greater oversight of NEON by NSF in the future. NEON is a unique and important scientific endeavor. I believe NEON Inc. and NSF can rise to the challenge and build a cutting edge scientific facility. There may be bumps on the road ahead and new scientific and management challenges. That is not uncommon to innovative technological projects. But I believe the benefits we will draw from NEON's future are indispensable and worthy of our continued investment and support.

I believe it is both wise and important to understand the interaction among organisms in our environment and the impact the environment has on these organisms, specifically how land use changes and climate change are driving ecological change, and how these changing systems in turn affect human health and wellbeing, and the economy. Fundamentally, this is NEON's purpose. Everyone benefits from this challenging scientific endeavor.

The environmental data NEON will help collect and the scientific analyses that will be conducted will help us all better understand the spread of infectious diseases and invasive species. It will help us gain potential insights into the biological and agricultural impact of increasing droughts across our country. It will help us explore responsible measures regarding land use, and aid scientists in deciphering the challenges we face from a changing climate.

I believe these are deeply important issues, regardless of political convictions. I believe there are legitimate management concerns about NEON that needs to be aggressively addressed and quickly corrected. But I hope those issues are not used as a political excuse to undermine the unique scientific benefits we can all gain from this project.

Thank you. I yield back.

Chairwoman COMSTOCK. Thank you, Beyer.

I now recognize the Chairman of the full Committee, Mr. Smith.

Chairman SMITH. Thank you, Madam Chair.

This morning's hearing will focus on one of the National Science Foundation's most ambitious major research facility projects, the National Ecological Observatory Network, or NEON. This hearing should help answer why the NSF and NEON Inc. failed to heed the warning signs that the $433 million project was seriously off track. We now have a better estimate of just how far off track—-$80 million over budget and 18 months behind schedule—and there is no guarantee that the figure is not even higher, as I understand NSF has increased this estimate several times since June.

For over a year, this Committee has raised concerns about the financial mismanagement of NEON. We have pushed the NSF to exert greater oversight controls of the construction project, which seemed to be plagued with problems. In the first NEON hearing the Committee held in December 2014, we learned that the Inspector General's independent audit of NEON's cost proposal identified more than $150 million in unsupported or questionable costs, yet NSF went ahead and made the award and did not resolve these issues.

A second audit of NEON's accounting system revealed a number of inappropriate NEON expenditures, which include lobbying, parties, and travel. All of these activities were financed by the man-

agement fee NSF agreed to pay NEON for ordinary and essential business expenses, and, of course, all these dollars came from taxpayers. The IG issued an Alert Memorandum this week that details further inappropriate expenditures by NEON discovered by the National Science Foundation. These include liability insurance for the CEO, excessive legal fees, and salaries for multiple executives in excess of $200,000. It also appears NEON wasted a half a million dollars when it broke a rental lease to move into a larger office space.

NSF discovered these inappropriate costs when they finally started to require NEON to provide more detail about its spending in May 2015. My understanding is that NEON still has not provided the NSF with adequate documentation to review all taxpayer-charged expenses.

In the Committee's second hearing in February, the chairman of NEON testified that NEON had made mistakes, but pledged to redouble their efforts to be "good stewards of the taxpayer funds we receive." It appears that the leadership of NEON Inc. has not fulfilled that promise. I understand that the Board of Directors is transitioning out the current CEO and is in the process of hiring a replacement. But I am frankly not sure that change is enough to regain the confidence of this Committee or the American people.

For its part, the NSF finally seems to be taking steps to more closely manage and take control over the costs of NEON. I am pleased that at the Committee's urging, the Foundation also has begun to evaluate how it can better manage major research facilities in the future. But the NSF must now scale back the scope of NEON to keep it under budget, which means less science for the same price tag. This week the IG recommended some additional steps that the NSF could take immediately to ensure it has the financial and project information it needs to oversee NEON. I hope the Foundation will take a close look at those recommendations.

The NSF, as well as its grantees and contractors, need to be held accountable for how they spend taxpayers' hard-earned dollars. I hope today's hearing will give the Committee a better understanding of the missteps that have lead NEON to this point, and I hope it will lead to a solution, which includes the possibility of legislative action, so that the mismanagement of taxpayer funds will not continue.

Madam Chair, also let me acknowledge that most of the problems with NEON occurred before the current Director of the National Science Foundation, Dr. Córdova, assumed her responsibilities, but there is still much that needs to be done, and I realize that Dr. Córdova is aware of that too.

I'll yield back.

[The prepared statement of Chairman Smith follows:]

PREPARED STATEMENT OF COMMITTEE CHAIRMAN LAMAR S. SMITH

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This hearing should help answer why the NSF and NEON Inc. failed to heed the warning signs that the $433 million project was seriously off track. We now have a better estimate of just how far off track—$80 million over budget and 18 months behind schedule.

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A second audit of NEON's accounting system revealed a number of inappropriate NEON expenditures, which include lobbying, parties, and travel. All of these activities were financed by the management fee NSF agreed to pay NEON for ordinary and essential business expenses. And, of course, all these dollars came from taxpayers.

The IG issued an alert memorandum this week that details further inappropriate expenditures by NEON discovered by the NSF. These include liability insurance for the CEO, excessive legal fees, and salaries for multiple executives in excess of $200,000. It also appears NEON wasted $500,000 when it broke a rental lease to move into a larger office space.

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I hope today's hearing will give the Committee a better understanding of the missteps that have lead NEON to this point. And I hope it will lead to a solution, which includes the possibility of legislative action, so that the mismanagement of taxpayer funds will not continue.

Chairwoman COMSTOCK. Thank you, Mr. Chairman.

At this time I would now like to introduce our witnesses. Our first witness is Dr. James Olds. He is the Assistant Director of the Directorate for Biological Sciences, or BIO, at the National Science Foundation. Before joining NSF, Dr. Olds was Director of the Krasnow Institute for Advanced Study at George Mason University in Virginia. Dr. Olds received his undergraduate degree in Chemistry from Amherst College and his doctorate from the University of Michigan in Neuroscience.

Our second and final witness today is Dr. James Collins, Chairman of the Board for NEON. Prior to his work with NEON, Dr. Collins was NSF's Assistant Director for Biological Sciences. Dr. Collins has a long history at NSF, having served in various positions there from 1985 to 2009. Dr. Collins is also the Virginia M. Ullman Professor of Natural History and Environment in the School of Life Sciences at Arizona State University. Dr. Collins earned his bachelor of science degree from Manhattan College and his Ph.D. from the University of Michigan.

I now recognize Dr. Olds for five minutes to present his testimony.

TESTIMONY OF DR. JAMES L. OLDS,
ASSISTANT DIRECTOR,
DIRECTORATE FOR BIOLOGICAL SCIENCES,
NATIONAL SCIENCE FOUNDATION

Dr. OLDS. Madam Chairwoman, Mr. Chairman, and Members of the Committee, thank you for this opportunity to testify about the National Science Foundation's oversight of the National Ecological Observatory Network project. I will confine my remarks to the steps NSF took to strengthen its oversight of NEON Inc. in light of recent schedule slippages and potential cost overruns. My written testimony provides a more complete explanation of the NEON project and its management history.

NEON is a one-of-a-kind continental-scale research observatory with a potential to transform environmental science. NEON construction and operation are funded through a cooperative agreement with NEON Inc., a private nonprofit corporation responsible for building and operating the NEON project. An integrated NSF project team currently tracks NEON Inc.'s progress and costs against deliverables in the cooperative agreement and the organization's expenditures. NEON's civil construction has been completed in 48 of 82 site locations with expenditures to date of approximately $285 million.

In spite of NSF oversight of NEON Inc., a cost sufficiency review and attempts at corrective guidance, it was clear to NSF in June of 2015 that NEON Inc. was at risk of a potential $80 million cost overrun and an 18-month schedule delay.

NSF takes its responsibility for stewardship of taxpayer resources extremely seriously and strong oversight of our large facilities is a top priority for NSF. That is why major research projects are subject to NSF's no-cost-overrun policy, which requires the project to maintain its cost and schedule profile within budget and timeline approved by the National Science Board and approved and appropriated by Congress.

When a project encounters potential cost overruns, NSF conducts a Scope Management Analysis to determine if the project should be de-scoped or canceled. A de-scoping can be achieved while still preserving the plan's transformational science and the project is allowed to continue within the bounds of the original budget.

Consistent with NSF policy, in July 2015, the NSF Biology Directorate convened a Scope Management Analysis of NEON by a panel of experts drawn from NSF, NEON Inc., the Neon Board of Directors, and scientific experts from the community involved in the original design. This panel developed a plan to reduce NEON Inc. corporate and project management costs, accelerate transition to operations, and selectively reduce non-essential capabilities. Importantly, this plan will still allow NEON Inc. to deliver a continental-scale observatory that accomplishes the planned science goals. NSF formally notified NEON Inc. of this de-scoping plan including a detailed series of benchmarks and deadlines that must be met for the project to stay on track. Key community and government stake-

holders were informed when the Scope Management Plan was finalized.

In response, I'm pleased that past and present presidents of the Ecological Society of America published a letter expressing their enthusiastic support of the NEON project in its new de-scoped form.

As described in my written testimony, NSF has carefully examined and strengthened its oversight of the project including implementing oversight recommendations by the NSF Inspector General. Organizing a review of the de-scoped project science by an independent subcommittee, the Biology Directorate Advisory Committee and establishing a National Science Board Task Force to monitor overall progress.

By December 1, 2015, NSF expects to have enough information to determine if NEON Inc. has improved sufficiently to complete construction of the NEON project within budget and on time. If NEON Inc. is not capable of completing construction, NSF will take action to pursue an alternative management process capable of completing construction.

Madam Chairwoman and Mr. Chairman, I hope I have reassured you that NSF has greatly increased its oversight of this important project and that we are following up with specific and appropriate actions. We remain ready to take additional actions if needed, but we are hopeful that the NEON Observatory will fulfill the goal of being a continental-scale research platform that supports transformative science.

Thank you again for the opportunity to testify. I would be pleased to answer your questions.

[The prepared statement of Dr. Olds follows:]

Testimony of

Dr. Jim Olds
Assistant Director
Directorate for Biological Sciences
National Science Foundation

Before the

U.S. House of Representatives
Committee on Science, Space and Technology

Subcommittee on Research and Technology, and the
Subcommittee on Oversight

on

NEON Warning Signs: Examining the Management of the
National Ecological Observatory Network

September 18, 2015

Madam Chairwoman, Mr. Chairman and Members of the Committee, thank you for this opportunity to discuss NSF's oversight of the National Ecological Observatory Network project.

The National Science Foundation (NSF) supports fundamental research at the frontiers of knowledge across all fields of science and engineering. NSF serves the national interest as stated by NSF's mission to promote the progress of science; to advance the national health, prosperity and welfare; to secure the national defense; and for other purposes; and we do so through our investment in a portfolio of more than 42,000 active awards. As part of our mission, NSF funds major research facilities such as the National Ecological Observatory Network (NEON).

NEON is a one-of-a-kind continental-scale research instrument consisting of a geographically-distributed complex cyber-enabled network of sensors and biological instruments that will, among other advances, use airborne remote sensing data to improve our fundamental understanding of biology, emerging disease, water use, invasive species, and agricultural,

forestry, and urban land-use. NEON was chosen as a major facility project based on its potential to transform environmental science.

Construction of NEON was funded through NSF's Major Research Equipment and Facilities Construction (MREFC) account at an amount of $433 million. NEON civil construction has been completed in 48 of 82 site locations and expenditures to date are approximately $285 million.

NEON Incorporated, which is responsible for the NEON project, is a private, non-profit corporation to whom NSF has provided federal financial assistance for the design, construction and early operations of the NEON network. Support for NEON began in 2007 with construction of the NEON project initiated in 2011, and early operations of the network began in 2014. NSF support for NEON construction and its operation is provided under a cooperative agreement, a federal financial assistance instrument. NEON is an ambitious, ground-breaking project that is challenging to construct because it is distributed, standardized across diverse locations, and includes multiple sensors and instrumentation. NSF recognizes these complexities and the challenges that NEON Inc. has had in staying on schedule and on budget throughout construction.

NSF began to have concerns with the project as early as January 2013. We noticed increased schedule slippages associated with production and procurement as well as the plan for the cyberinfrastructure, lack of data product development, delayed engineering designs for sensor assemblies, and lack of integration across teams. NSF followed up immediately with NEON Inc. to ask for corrective actions over the ensuing months and to provide clarity on requirements. We have had constant, close engagement with NEON Inc. throughout this process.

The project was re-planned in August 2014, and all information presented by NEON, Inc. at that time indicated that the scope could still be completed within the approved budget. However, at the start of this year schedule slippage began occurring at an even more rapid pace which prompted NSF to further increase its oversight of the project.

In late 2014, NSF also implemented a tightly coordinated oversight team for the NEON project using an agency-wide approach known as the Integrated Project Team (IPT). This team includes, among others, the Large Facilities Office (LFO), which tracks the progress of all MREFC projects through monthly reporting and ensures compliance with NSF-wide large facility processes and procedures; the Division of Acquisition and Cooperative Support (DACS), which authorizes the award of funds and ensures compliance with the terms of the cooperative agreement; and the NEON Program staff in the Biological Sciences Directorate, which is responsible for the scientific and technical oversight of the project and tracks progress against the deliverables in the Cooperative Agreement.

During a visit to NEON headquarters in Boulder during February 2015, I confirmed for myself firsthand some of the long-standing issues with management and project execution I mentioned earlier.

After that visit NSF continued to monitor schedule and costs and when the necessary improvements were not evident, called an emergency meeting in April 2015 to discuss corrective actions.

A warning letter was issued by DACS in May 2015 regarding the projects lack of compliance with NSF reporting and project management requirements and BIO issued a companion letter indicating that it would be working with NEON Inc. on the ground in partnership with LFO and DACS to assist NEON Inc. in rectifying the issues.

A series of site visits coupled with a DACS cost sufficiency review held in mid-June 2015 enabled NSF to finally obtain an estimate of the potential cost overruns and the extent of the projected schedule slip. These cost estimates finally revealed the full extent of the problem and the need for NSF to take immediate action. In short, the project was on a course to be approximately $80 million over budget and delayed by as much as 18 months.

NSF takes its responsibility for stewardship of taxpayer resources extremely seriously, and strong oversight of our large facilities is a top priority. That is why since FY 2009 projects funded through the MREFC account have been subject to NSF's "no cost overrun" policy. This policy requires any project funded through that account to maintain its cost and schedule profile with the budget approved by the National Science Board and appropriated by Congress. If it is found that a project is potentially headed for cost-overruns, the Foundation has two choices: de-scope the project or cancel it. In order for NSF to decide the proper course of action, an analysis of potential de-scoping options is required so that the project will be delivered within budget and schedule while still meeting the project's original scientific objectives. NSF requires this for all large facilities projects as the first line of defense in keeping the project within budget. In order for NSF to approve the project to move forward, the facility must still be capable of providing transformational science after the de-scoping has been implemented. Prior to 2015 the last initial de-scoping analysis for NEON was performed in October 2009.

BIO convened a meeting to perform an update of this de-scoping analysis for NEON at NSF headquarters July 14-17, 2015. A newly-formed panel of experts was assembled which included members of the NSF staff from the NEON Program, NEON Inc. project staff, members of the NEON Board of Directors and Science Technology Education Committee (STEAC), and domain scientific experts from the community involved in the original design. The panel came up with a plan to reduce NEON Inc. corporate and project management costs, accelerate transition to operations, and reduce the scope of the following items: construction and deployment of portable towers (also known as "relocatables") and urban sites; instrumentation sensor systems that could be replaced with new technologies during operations; some derived data products that could eventually be up-graded during operations; and the Stream Ecology Observatory Network (STREON) experiments.

The plan developed at this meeting focused on those scope changes that would still allow the NEON facility to deliver a continental-scale instrument and accomplish the major planned science goals.

Following that meeting, DACS issued a letter to NEON Inc. which provided formal notification of the steps to be taken to manage scope and a detailed series of benchmarks and deadlines that must be met for the project to move forward.

Further, NSF ensured that key stakeholders were informed as soon as the scope management plan was implemented:

- Hill notification and briefings
- OSTP and OMB notification
- Internal NSF briefings
- Presentations at major scientific conferences in August of this year

The scientific community has accepted the necessity of these scope changes and expressed continued enthusiasm and support for the project. Indeed, the Ecological Society of America past and present presidents recently published a letter expressing their enthusiastic support of the ongoing project.

The Foundation has carefully examined and strengthened its oversight of NEON in light of these events and has put in place changes to help ensure proper stewardship.

- Inside NSF, management of NEON has been transferred to the Division of Biological Infrastructure and additional project management oversight has been provided.
- In response to a letter from me requiring that action be taken to rectify deficiencies in the leadership of the project, the NEON Board of Directors has removed the CEO of NEON Inc. and has assured the NSF that the acting CEO has the experience and credibility to get the project back on track.
- Progress of NEON Inc. towards meeting the scope management deliverables is being monitored through rolling internal reviews coordinated by the Integrated Project Team with a deadline of December 1st for sufficiency based on NSF requirements.
- NSF Biological Directorate's Advisory Committee is forming an independent subcommittee of distinguished scientists, including members of the National Academy of Sciences, to conduct an external review of the science impacts of a de-scoped project.
- The National Science Board has set up a Task Force on NEON Performance and Plans for continuous monitoring of overall progress.

By December 1, NSF will have enough information to be able to make a determination as to whether or not NEON Inc. has made sufficient improvement to successfully complete construction of the NEON project. NSF is considering how it will undertake external review of the information received, including an independent review of the revised total project cost and schedule.

If it is determined that NEON Inc. is not capable of completing construction, NSF will take the necessary actions to pursue alternative management options.

The NSF Inspector General issued an Alert Memorandum on August 31, 2015 containing recommendations for increased oversight of NEON. Although we may differ on some of the

details and reasoning, NSF agrees with the intent and has accepted all of the recommendations. In fact, we have already implemented three well in advance of the Alert Memo:

- NSF is now conducting monthly expenditure review, and has strictly limited the amounts of funding made available to NEON Inc.
- NSF is working with NEON Inc. in an assistive mode, with coordination and tracking of the deliverables required to evaluate project sufficiency moving forward through NSF's Integrated Project Team
- The monthly Earned Value Management (EVM) reporting has been strengthened

The fourth recommendation (undertaking an independent cost assessment) is now planned, assuming NEON Inc. is able to meet the compliance benchmarks for sufficiency in December 2015. Performing an independent cost assessment is only prudent given NEON's past history and is an ideal way for NSF to further test its strengthened oversight mechanisms. If NSF does not deem the cost estimate sufficient by its own standards, there is no need to proceed with the independent assessment and other appropriate actions will be taken by the Agency.

Madam Chairwoman and Mr. Chairman, NSF's management of these large facilities is of critical importance to the Foundation. In the case of NEON, we have greatly increased our oversight of the project, and are following up on our findings with specific and appropriate actions. Although we remain poised to take additional actions as needed, we are hopeful that NEON will be able to fulfill its goal of providing the nation a continental-scale research platform that has the potential to support research that can transform environmental science.

It is only with the strong support of the Inspector General and Congress that complete oversight of taxpayer resources can be ultimately achieved, and we are appreciative of those efforts. The Foundation looks forward to continue working with the Committee and with our Office of Inspector General as we actively monitor this program in order to best serve science and technology in the national interest.

Thank you again for the opportunity to testify. I would be pleased to answer your questions.

Jim Olds

Assistant Director
Directorate for Biological Sciences
National Science Foundation

Jim Olds is currently Assistant Director for Biological Sciences at the National Science Foundation. Dr. Olds is concurrently the Shelley Krasnow University Professor of molecular neuroscience. He is also editor-in-chief of *The Biological Bulletin* published by the Marine Biological Laboratory in Woods Hole.

Prior to his appointment at NSF, Dr. Olds spent 16 years as Chief Academic Unit Officer and Director of George Mason's Krasnow Institute for Advanced Study. Dr. Olds has served on numerous private and public boards and has played a central role in scientific public policy development at all levels, ranging from the White House to advising heads of ministries internationally. He spent eight years as chair of Sandia National Laboratory's External Cognitive Science Board. In the non-profit world, Dr. Olds was treasurer of Americans for Medical Progress. He has also served as a Virginia State Commissioner, appointed by Virginia Governors of both political parties.

Prior to taking the leadership role at Krasnow, Dr. Olds led one of the oldest and most prestigious scientific societies, The American Association of Anatomists as CEO. Olds received his undergraduate degree in chemistry from Amherst College and his doctorate in neuroscience from the University of Michigan in Ann Arbor. His postdoctoral research at the National Institutes of Health led to fundamental advances in understanding the molecular basis of learning and memory, for which he was awarded the NIH Merit Award in 1993.

Chairwoman COMSTOCK. Thank you, Dr. Olds.

And I now recognize Dr. Collins for five minutes to present his testimony.

TESTIMONY OF DR. JAMES P. COLLINS,
CHAIRMAN OF THE BOARD,
NATIONAL ECOLOGICAL OBSERVATORY NETWORK, INC.

Dr. COLLINS. My name is Dr. James Collins, and I serve as chairman of the Board of Directors of NEON Inc., a 501(c)(3) corporation established to implement NEON, or the National Ecological Observatory Network.

At the outset, I want to thank you for your commitment to NEON. I can't say I relish the time I spend before you on this project—you ask hard questions but your diligent oversight is welcomed, and there is no doubt that it has made NEON a better project.

I also want to thank NSF for its vision and tireless support of NEON and for being a terrific partner in this path-breaking project.

Finally, let me say that I share your concerns about the construction budget gap and regret that the project required re-scoping. We're taking dramatic steps to place NEON back on the right path, and I commit to you that we will do what we can to keep it there.

NEON is an advanced research infrastructure for the study and analysis of the biosphere. Across the continent, we are creating a network of instruments and sensors so that we can better understand our changing environment at an unprecedented level of detail and successfully forecast and respond to these changes.

Despite recent changes to the project, NEON's high-level science requirements have not and will not be compromised. We are working aggressively to re-scope NEON based on the recommendations of NSF, NEON Inc., and community experts convened in July 2015. But the discussion did not start then. Five months earlier, in February 2015, NEON Inc. staff members initiated the discussions to explore strategies for cost savings through improved efficiencies and restructured processes. During these discussions, NEON Inc. staff proposed recommendations that ultimately formed the backbone of the current re-scoping. Under the re-scoped configuration, NEON will continue to build and then collect data at 81 of its original 96 sites. The essential core NEON terrestrial and aquatic sites all remain part of the national site constellation.

Your opening statements made clear your interest in discussing NEON's construction budget and specifically you cite $80 million gap between the construction budget approved in 2011 and NEON's current construction budget. To be clear, the gap is the result of costs that were underestimated, and NEON Inc. bears its share of blame.

While I go into greater detail in my written statement, let me list three categories of such underestimated costs. First, production costs and technology development. This accounts for about 50 percent of the gap. Challenges obtaining permits, this accounts for about 25 percent of the gap. And transitioning of observatory elements to operations, and that's about 25 percent of the gap.

The gap necessitated the re-scoping completed this past July. It's important to note that NEON has not requested nor received any additional construction funds. I would also note that at least five other NSF MREFC projects have undergone scope revisions, management adjustments, and/or instrument configuration changes during construction. So in this respect, NEON is not unique.

NEON Inc. is committed to ensuring that further re-scoping will not be necessary in the future. Together with NSF and independently, we are taking steps not only to develop and share better information in a more timely manner but also to fundamentally change the processes we undertake in order to ensure that NEON is on track and within budget. Let me briefly discuss some of these steps.

First, NEON has addressed the issues that led to the re-scoping by, among other things, reorganizing its complete supply chain to better facilitate the production process and imposing new control measures on permitting activities. Second, NEON is working closely with NSF as well as independent cost and schedule consultants to revise cost estimates and to ensure that adequate systems and estimating methodologies are implemented.

Third, NEON is now providing a comprehensive monthly financial report to the NSF that includes detailed expenditures, explanations of expenditures by budget line item, and functional areas with the sources of funding clearly identified. In addition, NEON is providing the NSF with complete general ledger detail of all transactions. Fourth, NEON Inc. is under the guidance of a new interim CEO. We will be searching for a new CEO. NEON is developing a comprehensive strategy for improving project management and identifying potential cost reductions.

NEON Inc. understands that in its pursuit of scientific goals, it must not sacrifice responsible stewardship of taxpayer dollars. That is a lesson to which we will strictly abide as we continue to monitor our construction schedule and budgeting work towards completing the observatory.

Thank you, and I welcome your questions.

[The prepared statement of Dr. Collins follows:]

House Committee on Science, Space, and Technology, Subcommittees on Research and Technology and Oversight Hearing

NEON Warning Signs: Examining the Management of the National Ecological Observatory Network

September 18, 2015

Introduction

Distinguished Chairwoman Comstock and Chairman Loudermilk, Ranking Members Lipinski and Johnson, and other members of the Research and Technology and Oversight subcommittees, my name is Dr. James Collins. Thank you for the opportunity to testify today.

I serve as Chairman of the Board of Directors of NEON, Inc., a 501(c)(3) corporation established to implement NEON, or the National Ecological Observatory Network, which I will also refer to as the "Observatory." The NSF supports this project. From 2005 to 2009, I served as Assistant Director for Biological Sciences at NSF. Since 2010, I have had no formal affiliation with the agency.

In this testimony, I will first provide an overview of the importance of the NEON project and explain how we are on a path to achieving the project's scientific goals. I will then detail the positive and transparent working relationship that NEON, Inc. has with the NSF. I will also provide a closer look at the circumstances related to the discovery of potential cost overruns and how NEON, Inc. is working with NSF to craft a strategy designed to ensure that additional rescopes will not be necessary.

Importance of the NEON Project and Its Commitment to High-Level Science Requirements

NEON is an advanced research infrastructure for the study and analysis of the biosphere on a regional to continental scale. Living systems are experiencing some of the greatest rates of alteration caused by multiple changes in the environment. Understanding how these changes affect our natural resources and ultimately humans requires a fully integrated, multi-scale research infrastructure to detect, understand, and forecast changes. The project was designed by the ecological research community to address this need. With its geographically diverse network of cyber-enabled instruments and sensors, NEON provides the scale, infrastructure, and data we need to better understand our changing environment at an unprecedented level of detail and successfully forecast and respond to these changes.

NEON is not only an essential investment for continued U.S. scientific leadership and long-term competitiveness; it is also a vital component to sustaining our Nation's commitment to fueling scientific innovation and advancing cutting-edge ecological research. This research will allow us to analyze, as never before, the impacts of large-scale environmental changes on our ability to sustainably meet society's food, fiber, energy, and water needs.

At its conception, NEON adopted an approach commonly used by science projects of similar complexity and scale. The approach demands a stringent set of science requirements to meet the project's needs and produce the data to enable transformational science. A six-member NSF review panel and the 17-member NEON Science, Technology and Education Advisory Committee reviewed these requirements. Among the reviewers were distinguished university professors, members of the US National Academy of Sciences, and technology experts from private industry. These requirements are encapsulated in a July

2009 document titled "The NEON Strategy: Enabling Continental Scale Ecological Forecasting" produced by NEON, Inc.

Recent Changes Will Not Alter NEON's Commitment to Science

Despite recent changes to the project, NEON's high-level science requirements have not and will not be compromised. As required by NSF's Division of Acquisition and Cooperative Support management letter to NEON, Inc., we are aggressively working on the details of executing against the recommended strategies for rescoping the Observatory. We hold paramount the preservation of high-level science that give NEON the power to enable transformational continental-scale science.

The recent changes to, or "rescope", of the Observatory was guided by a group of NSF, NEON Inc., and community experts convened in July 2015. But the discussion did not start then. Five months earlier, in February 2015, NEON, Inc. staff members initiated discussions to explore strategies for cost savings through improved efficiencies and restructured processes. During these discussions, the NEON, Inc. staff proposed recommendations that, ultimately, formed the backbone of the project rescoping. NEON, Inc.'s goal through these discussions was to scale back the project as necessary while preserving the geographical breadth and diversity of the Observatory's footprint.

For 100 years, the Ecological Society of America (ESA) has represented the voice of the ecological community. As a testament to NEON, Inc. and NSF's preservation of the project's scientific integrity and continued utility, current and past presidents of the ESA recently issued a joint statement supporting the goals and missions of NEON notwithstanding the proposed changes.

Under the rescoped configuration, NEON will continue to build and then collect data at 81 of its original 96 sites. The essential "core" NEON sites – twenty scientific anchor-points that span the continent – all remain part of the national site constellation. Already, 33 NEON sites are publishing freely accessible data collected by field personnel and *in-situ* sensors. The NEON airborne observation platform – consisting of a state-of-the-art spectrometer, an advanced LiDAR system, and a high-resolution visible-wavelength camera – has thus far acquired imagery data over eight sites. The scientific community has resoundingly expressed its enthusiasm for this type of high-resolution airborne data, which has never before been acquired at the scale and frequency planned by NEON. Our expectation is that the project will yield significantly more data in 2016, and a completed Observatory by 2017, in line with our mandate from NSF.

The community recognizes the potential for transformational science enabled by free and open ecological data. Accordingly, NEON, Inc. scientific staff have presented at approximately 50 different venues every year for the past three years. Many of these are invited talks, reflecting the broad array of topics and disciplines about which the research community has expressed a desire to learn. Workshops are useful in pushing the community to think about new opportunities and research directions, and NEON, Inc. responded by organizing an average of six workshops every year between 2012 and 2014. These types of engagement activities are discussed regularly with the Board of Director's Communications Committee, which, together with NSF observers, meets with NEON, Inc. staff members to assess emerging community needs.

NEON, Inc.'s Working Relationship with NSF

NEON, Inc. works hard to maintain a strong working and transparent relationship with the NSF staff. To manage a project as scientifically and technically challenging as NEON, NEON, Inc. staff members have

weekly calls with the NSF lead Program Director, often accompanied by other NSF staff members. In addition, monthly Major Research Equipment and Facilities Construction, or "MREFC", Cost Schedule and Technical Status reports are submitted to NSF. The information in these reports includes: a running, prioritized, summary risk register that lists project activities that may have an impact on the project's schedule and costs, project performance metrics related to major components of the Observatory, an explanation of departures from expected metrics, status of securing permits for sites, and other information. The main purpose of these reports and meetings is to ensure that NSF is kept informed of the status of the project as work moves ahead.

External experts convened by NSF also perform reviews of the project's progress at least annually. During these reviews, performance of the project is examined to ensure that resources are being used effectively, progress is on track, risks are being monitored, etc. It is important to note that these review committees operate independently of NSF and are composed of distinguished scientists, engineers, and managers of other MREFCs to ensure a thoughtful, insightful, and critical assessment of the project by some of the best minds in the scientific community. The major NSF reviews since the construction award in August 2011 are as follows:

- November 2011, business systems review;
- January 2012, operations review;
- October 2012, annual construction review #1;
- May 2013, baseline schedule and cost review;
- December 2013, annual construction review #2;
- August 2014, baseline schedule and cost review; and
- December 2014, annual construction review #3.

In short, NSF has been and remains a valuable partner of NEON, Inc. as we work to achieve the project's unique and exciting mission.

But we do not rely exclusively on NSF-organized peer reviews. NEON, Inc. also convenes its own reviews. Such reviews involve external members of the community, are observed by the NSF staff, and are convened in consultation with the NEON, Inc. Board of Directors and the Board's independent Science, Technology, and Education Advisory Committee, or "STEAC." A Science Capability Assessment was conducted in September 2014 to develop a framework for assessing the capabilities of NEON's infrastructure to help NEON, Inc. better understand how the infrastructure could be used by the research community. The report was developed by a panel of six scientists composed of two members of the NEON, Inc. Board of Directors, two STEAC members, and two distinguished members of the ecology community. In addition, a Cyberinfrastructure Architecture Assessment was conducted in March 2015 to provide independent critical assessment and guidance on the Database, Software, and System Architecture and its ability to meet the needs of NEON user communities.

A NEON Project Advisory Committee, or "NPAC", also has provided independent critical assessment and guidance during the construction of the Observatory. The NPAC draws on expertise from the following areas: project management, systems engineering, engineering design and execution, project controls (schedule and budget), manufacturing, cyberinfrastructure design and development, large project contract administration and agreement structuring, and distributed operations management and oversight.

Findings from NSF and NEON reviews are shared with the NEON, Inc. Board of Directors. In almost all cases, the Board and STEAC appoint observers from within their ranks to attend such reviews. The Board convenes a conference call every month with senior NEON, Inc. staff members. Major developments, including the outcomes of reviews and important communications from NSF, are shared with the Board during such calls. Three in-person Board meetings are held every year, which further facilitates in-depth deliberation regarding strategic issues. NSF representatives attend these in-person Board meetings and regularly participate in the proceedings.

Our Board of Directors is also structured to afford the NEON user community a key voice in overseeing and reviewing the project. In accordance with the NEON, Inc. bylaws, roughly half of the Board members are elected by the NEON, Inc. institutional membership. The remaining members are elected by the Board itself to discharge essential oversight and fiduciary responsibilities. Fiduciary oversight is entrusted to a standing Finance Committee of the Board. The standing Communications Committee of the Board provides guidance to the staff on community interaction. Where relevant, NSF staff members also participate in committee meetings.

NEON's Construction Budget

Your invitation letter indicates that the subcommittees would like to discuss NEON's construction budget and, specifically, a gap between the construction budget approved in 2011 and NEON's current construction budget. This gap, identified as $80M, is the result of underestimated costs in three categories and their impacts cascaded across the project execution. The categories, and their relative contribution to the gap, are as follows:

- Production costs and technology development (approximately 50% of gap);
- Permitting challenges (approximately 25% of gap); and
- Transitioning of Observatory elements to Operations (approximately 25% of gap).

I will discuss each category in turn.

Production & Technology

The establishment of a sustainable supply chain for procurement and production of sensor assemblies has presented challenges since the beginning of the project. For example, it was difficult to find the right suppliers who could adhere to a demanding project schedule while complying with the quality standards required of a thirty-year Observatory. In addition, actual costs for production materials during construction were higher than estimated. NEON, Inc. addressed these challenges during 2014 by re-organizing the complete supply chain to better facilitate the production process.

Standardized, quality-assured, and consistent data are integral to the design of NEON: the nature of the technology required to collect, process, and deliver data for a project of this scale is complex. In addition, delays in developing these technologies directly affect the project's ability to transition working field sites to Operations. To address computing and data delivery challenges, a Cyberinfrastructure Architecture Review was conducted during March 2015 by NEON, Inc.: resulting recommendations are currently being implemented and will lead to improvement of data generation and delivery efficiency, as well as the data product development process. Consequently, during the past year, NEON has published data from 30 additional sites to the NEON web portal for use by the scientific community.

Permitting

Securing site permits and negotiating land use agreements has proven more difficult than expected during construction and has created a cascade of unanticipated construction costs. For example, the difficulty in negotiating land use agreements with some site owners resulted in further delays in finalizing the construction of observation sites and implementing organismal sampling. Additionally, the number of permits required per site to build the NEON infrastructure was underestimated by a factor of 10, as well as the effort required to obtain these permits. To remediate these issues, the Deputy Project Manager has direct supervision of permitting activities as of August 2014. This control measure has helped better identify the problem and address the permitting efforts more efficiently.

Transition of Observatory Elements to Operations

Finally, delays in the transition of Observatory elements to operations contributed to the gap. Reaching a set of criteria for transitioning elements of the Observatory to operations continues to pose a challenge because the deliverables were originally defined with many interdependencies, making certification of completion difficult to accomplish. As a result, the transition to operations timeline has been delayed and the costs incurred stem from carrying these elements in construction. NEON, Inc. and NSF are currently collaborating to resolve this issue.

Rescoping of NEON

The budget revisions discussed above necessitated the rescoping completed this past July. It is important to note that NEON, Inc. has not requested nor received additional construction funds; the rescoping activities are intended to enable the project to complete construction on time and on budget without compromising its scientific integrity. The rescoping included:

- Constructing 41 relocatable sites instead of 55 while retaining all core sites;
- Removing the STReam Experimental Observatory Network (STREON) component from the construction project due to permitting challenges; and
- Eliminating the Biogenic Gas Measurement System due to immature technology.

NSF has a strong track record in building MREFC projects that have proven to be scientifically transformative and successful. However, building complex, large-scale scientific projects is always challenging. Adjustments in scope are often necessary along the way given that these projects extend the boundaries of science, engineering, and technology; this process is iterative in nature. At least five previous NSF MREFC projects underwent scope revisions, management adjustments, and instrument configuration changes during construction based on challenges with increased costs for production of instrumentation, delayed site permitting, and schedule delays. In the long run, all of these facilities will enable scientific discovery far beyond current understanding and provide enormous benefit to American citizens.

Overarching Financial and Management Modifications to Prevent Further Rescoping

NEON, Inc. is committed to ensuring that further rescoping will not be necessary in the future. Together with NSF and independently, we are taking steps not only to develop and share better information in a timelier manner, but also to fundamentally change the processes we undertake in order to ensure that NEON is on track, and within budget. Let me briefly discuss some of these steps.

First, and as noted, NEON, Inc. has addressed the issues that led to the rescoping by, among other things, reorganizing its supply chain to better facilitate the production process and imposing new control measures on permitting activities.

Second, NEON, Inc. is working closely with the NSF to revise cost estimates and to ensure that adequate systems and estimating methodologies are implemented. To assist in this process, NEON, Inc. has hired independent cost and schedule consultants who are working very closely with the project on detailed cost estimates. NEON, Inc. is also working with the NSF to evaluate the progress of the revised cost estimate, which is slated for completion by December 1st.

Third, NEON, Inc. is now providing a comprehensive monthly financial report to the NSF that includes detailed explanations of expenditures by budget line item and functional areas with the sources of funding clearly identified. In addition, NEON, Inc. is providing the NSF with complete general ledger detail of all transactions. This additional reporting and oversight will allow the NSF to review the expenditures in more detail on a monthly basis so that any areas of concern can be identified quickly and discussions and resolutions can take place immediately.

Fourth, NEON, Inc. is developing a comprehensive strategy for improving management efficiencies and identifying potential cost reductions in the construction project as well as the support functions. The strategies identified include reorganization of leadership of the company to improve effectiveness and to reduce overall costs of management of the company, a review of all staff positions to determine any duplications of effort and to identify potential consolidation of functions and possible reductions in force, an evaluation of outsourcing opportunities in various departments to ensure that staff is focused on its core functions and staff time is better utilized, a complete review of fringe benefits offered to all employees to identify potential cost reductions, and a complete review of all other cost categories to ensure that costs are maintained and kept to an appropriate level to support the project.

Closing

NEON, Inc. understands that, in its pursuit of scientific goals, it must not sacrifice responsible stewardship of taxpayer dollars. That is a lesson to which we will strictly abide as we continue to monitor our construction schedule and budget and work toward completing the Observatory and deliver a ground-breaking research infrastructure for our nation's long term understanding of our ecosystems.

Thank you, and I welcome your questions.

James Collins

Board of Directors, Chair
Institution: Arizona State University
Biography

Dr. James Collins received his B.S. from Manhattan College in 1969 and his Ph.D. from The University of Michigan in 1975. He then moved to Arizona State University where he is currently Virginia M. Ullman Professor of Natural History and the Environment in the School of Life Sciences. From 1989 to 2002 he was Chairman of the Zoology, then Biology Department. At the National Science Foundation (NSF) Dr. Collins was Director of the Population Biology and Physiological Ecology program from 1985 to 1986. He joined NSF's senior management in 2005 serving as Assistant Director for Biological Sciences from 2005 to 2009. NSF is the U.S. government's only agency dedicated to supporting basic research and education in all fields of science and engineering at all levels. Within the Biological Sciences Directorate Collins oversaw a research and education portfolio that spanned molecular and cellular biosciences to global change as well as biological infrastructure. He coordinated collaborations between NSF and other federal agencies through the President's National Science and Technology Council where he chaired the Biotechnology Subcommittee and co-chaired the Interagency Working Group on Plant Genomics. He was also NSF's liaison to NIH and served as coordinator across NSF of all environmental research and education. Dr. Collins' research has centered on the causes of intraspecific variation. Amphibians are model organisms for field and laboratory studies of the ecological and evolutionary forces shaping this variation and its affect on population dynamics. A recent research focus is host-pathogen biology as a driver of population dynamics and even species extinctions. The role of pathogens in the global decline of amphibians is the model system for this research.

The intellectual and institutional factors that have shaped Ecology's development as a science are also a focus of Dr. Collins's research, as is the emerging research area of ecological ethics. Federal, state, and private institutions have supported his research. - Dr. Collins teaches graduate and

undergraduate courses in ecology, evolutionary biology, statistics, introductory biology, evolutionary ecology, and professional values in science. He has directed 35 graduate students to completion of doctoral or Masters degrees. Collins was founding director of ASU's Undergraduate Biology Enrichment Program, and served as co-director of ASU's Undergraduate Mentoring in Environmental Biology and Minority Access to Research Careers programs. - Honors include the Pettingill Lecture in Natural History at The University of Michigan Biological Station; the Thomas Hall Lecture at Washington University, St. Louis; Distinguished Lecturer in Life Science, Penn State University; President's Science Symposium Address, Bowdoin College; and serving as Kaeser Visiting Scholar at the University of Wisconsin-Madison. ASU's College of Liberal Arts and Sciences awarded him its Distinguished Faculty Award. He is a Fellow of the American Association for the Advancement of Science, a Fellow of the Association for Women in Science, and Past President of the American Institute of Biological Sciences (AIBS). Professor Collins is a member of the Board of Directors for the American Association of Colleges and Universities, the National Ecological Observatory Network, and is on the Board of Delegates for Oxford University Press. Dr. Collins has served on the editorial board of Ecology and Ecological Monographs as well as Evolution. He is the author of numerous peer reviewed papers and book chapters, co-editor of three special journal issues, and co-author with Dr. Martha Crump of Extinction in Our Times. Global Amphibian Decline (Oxford University Press, 2009).

Chairwoman COMSTOCK. Thank you.

I thank the witnesses for their testimony, and the Chairman recognizes herself for five minutes of questioning.

Okay. Dr. Olds, we understand that NSF was originally informed by NEON that the cost overrun would be $27 million and then at that point NSF has further questions in light of that, and then the estimates went up to $40 million, then 60, then 80. How confident are you that we're at the right figure now, and that in looking back because the IG has looked at this and sort of a lot of this was predicted in this manner, what was ignored in the previous analysis and why the process of how we can prevent that, given we sort of had the warnings and they came true to a large extent? How do we and how can you going forward avoid this kind of situation?

Dr. OLDS. Madam Chairwoman, when the February hearing took place about NEON, I was deeply troubled, and it wasn't the scale of the dollars and the management fee, it was the fact that that issue had been raised at all, and so I sent in the early spring after that hearing a number of members of my team including folks who are expert in finances, and they basically sat in a rolling review of what was going on with NEON's dollars that lasted from the middle of spring through June 15. When it became clear to that NSF team in collaboration with NEON folks, that this problem was much larger that had been anticipated, that forensics was led by NSF folks. You know, I'm a molecular neuroscientist so my expertise is not in financial forensics, but we are determined to actually make sure that we are sure about the dollars. We accept the NSF Inspector General's recommendations, and we plan to in December when we finish up looking at the numbers, to get an independent cost estimate on those NEON numbers also just to make sure that there are other eyes looking at this. But I think this was a result of hard work on the part of NSF and NEON during the spring to actually elucidate the right number.

Chairwoman COMSTOCK. And Dr. Collins, could you kind of basically answer the same question on how you see—and I know you're in a position where you're still looking for somebody to run the project here, so we keep inviting you back. Thank you for being here. But can you offer us your thoughts on the same issue?

Dr. COLLINS. I can. So for purposes of perspective, it's useful if we start in August 2014 actually. So in August of 2014, as a result of a series of reviews, NEON was given a clear bill of health. It was scheduled to be on time and on budget as of August of 2014. In November, the period of November-December of 2014, as a result of regular financial reviews at NEON itself, it was recognized that in fact there was an expense of about $11–1/2 million that was not included as far as the August review is concerned. So at that point we were looking at about $11–1/2 million, and there was another expense of about $4.5 million to bring to a total of about $16 million at that point that should have been accounted for in that August 2016—I am sorry—August 2014 review.

In January of 2015, then, another internal review at NEON uncovers that there looks to be a gap developing as far as production costs are concerned in the project. So this is important to note, that it was a result of internal forensics, to use Dr. Olds's words, which is a good thing. The corporation itself is reviewing itself, and at

that point in January 2015 informs NSF that it looks like there's this gap that's developing within the corporation.

In February of 2015, then, the board gets notified that this gap is developing in terms of something that needs to be corrected, and this was at a regularly scheduled board meeting that we were informed. The board then took upon itself to call a special meeting in March of 2015 to get a better handle on what was going on as far as the finances are concerned and to make it clear to the corporation that they had to take this absolutely seriously and we had to understand what was happening. So that was a special board meeting in March. In April, then, there's a much better handle on the production expense, and that's about $20 million. Put that together with the $16 million and now we have about $36 million that's developing as a gap, and that's in April of '15.

NSF then comes in and asks for a directive assistance review, which is a good thing to do because at that point now you have a whole other set of eyes to begin to look at the project and say all right, where are we at on this in order to get a better handle on it. In order to do that review, NSF asked the project to not go back to August 2014 but to rather go back to 2011, February of 2011, and re-baseline the project from February of 2011, and it was in the course of re-baselining the project from February 2011 that you sweep up a bunch of additional expenses because you're essentially taking costs from 2015 and you're projecting them back over multiple years and then you're bringing them forward to project what the cost is going to be. So at that point you run it up to $80 million.

Chairwoman COMSTOCK. Okay. And those kind of situations, are there areas you're able to identify that those costs don't have to be? There are, things like you said, with permitting. That's a problem there that you just didn't know what the permits were going to be and now those are fixed costs that you can't adjust in any way?

Dr. COLLINS. That's right, and they fall into this category of areas where you start out, you expect some difficulties when it comes to permitting. Just as when you go into remodel a home, you expect some difficulties, but yet there are things that still pop up, and in the case of permitting in particular, there are things like endangered species that show up on a review and you have to deal with that, for example, and with permitting when you're doing something across the entire country and you have 20 sites, it's prudent and it makes a lot of sense to take the easiest sites first so that you can keep the construction moving along. But then as you take care of the easier sites, it becomes harder to take care of those at the end, and especially those where you begin to run into "not in my backyard."

Chairwoman COMSTOCK. You know, I'm sorry, I know we're over time, but will you continue to highlight for us some of those things because I know we often deal with all those things. It might be informative for us to know where there are these local regulations where they're causing particular problems that we might want to know about because we are often doing things in other areas to alleviate those problems. So thank you.

And I now recognize Mr. Lipinski for five minutes.

Mr. LIPINSKI. Thank you.

I want to focus on not only NEON but also more general lessons learned. I want to start out with Dr. Olds and the IG recommendations. The NSF IG made a series of recommendations since 2011 for strengthening cost controls and general management oversight of MREFC projects, not just limited to NEON. The IG and NSF senior officials have testified on these issues in earlier hearings. The NSF had implemented a number of the IG's recommendations but continues to disagree with others. The IG's Alert Memo issued earlier this week restated all of these earlier recommendations and faulted NSF for continuing to resist some of them.

So Dr. Olds, can you please update us as to which IG recommendations you have fully complied with and which you continue to have some disagreements over, and why—what's the nature of the disagreements?

Dr. OLDS. Congressman, the NSF accepts all of the recommendations of the IG in the Alert Memo that you just received, and the only one that we're delaying is the independent cost estimate because we need to get the data to have such an independent cost estimate, which we will have in December.

Mr. LIPINSKI. Okay. So—but you are saying that you agree with all of them, and is there anything more that you want to tell us about what NSF has done in terms of complying with the recommendations?

Dr. OLDS. Sure. Over the past 15 years, NSF has spent tremendous effort developing and implementing and detailing requirements related to its oversight of large facilities projects. These requirements are published in the NSF's Large Facilities Manual, which was just recently revised and published in June of this year. It's a much tougher document. And it must be noted that NSF's primary role is oversight while our recipients like NEON Inc. are responsible for the day-to-day management of construction, operation facilities. So NEON is an excellent example of how NSF is implementing its latest policy and process improvements in accordance with the IG's advice.

Mr. LIPINSKI. Okay. Let me use the rest of my time. I want to go over to Dr. Collins in regard to lessons learned.

You started going into some of those, I think, in your testimony and then in the—some of your answers to the Chairwoman's questions. Is there anything else that you could tell us that you think—mistakes that were made by NEON Inc. or mistakes by NSF in the whole process of what kind of lessons we might be able to learn from these going forward with other projects.

Dr. COLLINS. Sure. One of the lessons—and to echo something that Dr. Olds said, is to bring more outside expertise in, and in particular, outside expertise on the accounting side as far as these projects are concerned as opposed to the performance side. So the reviews often emphasize performance as far as the science is concerned relative to outcomes, relative to the goals that you're looking for, and is the project proceeding towards those goals. What we could use is a deeper analysis of the accounting side, the expense side, individuals who are really familiar with the ins and outs of the accounting on these large projects. That would be one point in terms of something that would be very, very helpful.

The other thing is to—just to expand on that in terms of estimates where you really get to the ground truth of what those estimates are. So the estimates are made early on using the best information that's available, inflation indicators, for example. But you have to be willing to go in and reach into the project and keep adjusting those on really an adaptive management basis in order to keep constant track of what those expenses are on an ongoing basis. That's really the biggest lesson it seems to come out of this as far as I'm concerned as I watch all these reviews that are taking place, and yet in some ways there are details that are slipping through the fingers of the referees in these cases, and we need to do a better job and understand probably on the accounting side what's going on.

Mr. LIPINSKI. Thank you. My time's up, so I yield back.

Chairwoman COMSTOCK. Thank you, and the Chair now recognizes Mr. Loudermilk.

Mr. LOUDERMILK. Thank you, Madam Chair.

Before I get into my questions, I'd like to make a statement and have something entered into the record.

According to a September 2015 Cato Institute report on federal government cost overrun, the statement is: "Cost overruns on large government projects are pervasive. The problem appears to stem from a mixture of deception and mismanagement. It has not diminished over time. One of the many consequences is that taxpayers are likely footing the bill for many projects that cost more than the benefits delivered." And I ask that a copy of the Cato report be entered into the record.

Chairwoman COMSTOCK. No objection.

[The information appears in Appendix II]

Mr. LOUDERMILK. Dr. Olds, thank you for being here today. I've got a couple of questions, and I appreciate your commitment that you and I have met about and you have stated here today to make sure that this project comes in within the budget level or we move on, and I think that's what the taxpayers are expecting.

First question. Before this cooperative agreement was signed, there was an ongoing audit of NEON's initial cost proposal. However, the NSF didn't wait for the audit to be completed before awarding the contract. The first question is, why did we not wait, and if we would have waited, would that audit of the initial cost proposal uncovered some of the potential cost overruns?

Dr. OLDS. Congressman, NSF has worked to resolve the OIG recommendations. Based on our review of the audits conducted, only approximately five percent, or $19.8 million, of the costs questioned in the audits were ultimately determined by NSF to not be properly documented and justified. It is important to note that this amount is associated with differences in the estimated costs necessary to complete the project and not actual expenditures. NSF has required that NEON provide additional justification for these costs. The bottom line is, we need to pay really careful attention to the cost estimates that are the basis for these large projects. It's something that's essential so that we deliver to the taxpayer what they deserve, and I think that's really where our eyes need to be on the ball in the future.

Mr. LOUDERMILK. But in the initial cost estimate of the project, you know, the audit of the project estimate, if we would've waited for that audit to be done, would that have uncovered some of the overruns we have now?

Dr. OLDS. Congressman, I think that the key aspect is, these audits as a result as a rule are really important lest we go off course. I think it's always possible to look back in time and say could we have done something different or better. What I am prepared to say is, we have to redouble our efforts, redouble our efforts to actually take numbers, get them looked at not only by us but independent auditors so that the basis for these cost estimates is as solid as possible for the American people. That's the goal going forward. And what I can promise you is that in the months leading up to the December decision point, we're going to be doing just that. We're going to be putting as many eyes as possible on these cost estimates so that those dollar figures are not fuzzy.

Mr. LOUDERMILK. Dr. Collins, can you answer the question? Would an audit of the cost proposal have uncovered some of these cost overruns?

Dr. COLLINS. I'll go back to the example that you used yourself in terms of when you put up a building, you do wind up with these costs that are just unexpected. So part of the answer is, sure, we could have, and indeed, the project, as I suggested earlier in response to Mr. Lipinski, by having additional external eyes, especially when it comes to folks really skilled in accounting. Yes, you probably could have taken care of some of the variance there. There's going to be some of the variance, though, that's going to be left over that it's the nature of doing larger construction projects that you still have to be able to pick up and be able to deal with.

Mr. LOUDERMILK. But isn't that what the $60 million in contingency was for, those unintended, unexpected——

Dr. COLLINS. Those $60 million in contingency, that is what it's for as far as unexpected is concerned, and that takes care of that level of unexpected costs that in a way you expect to have, you expect to be showing up. But in a project like this where you're developing new technology, you're of necessity going to have new costs added on top.

Mr. LOUDERMILK. So the $60 million is for expected unexpected costs is what you're saying?

Dr. COLLINS. You can put it that way.

Mr. LOUDERMILK. Okay. Okay. I'm running out of time, but one other question. Is this standard operating procedure for NSF to award these agreements without first completing an audit of the cost proposal?

Dr. OLDS. I think NSF has to strive for all projects going forward to audit the cost estimates multiple times so that we are really sure of those numbers. That's our obligation to the American people.

Mr. LOUDERMILK. I yield back the balance of my time.

Chairwoman COMSTOCK. Thank you, and I now recognize Mr. Beyer.

Mr. BEYER. Thank you, Madam Chair.

I want to begin, Dr. Olds, by thanking you for at least four things. First, for the many, many steps taken both in your oral tes-

timony and your written to get the project back on track, both in time and in costs, and you're very committed to that and you've done lots of things to do that.

Second, I want to congratulate you on the accountability. We had a very painful hearing yesterday with EPA Administrator Gina McCarthy in Natural Resources and the Oversight and Government Reform Committees in which mirroring an earlier hearing that we had here on accountability on the same spill on August 5 out in Colorado, three million gallons of acid mine wastewater, and they kept coming back to say who was fired, who was fired, who was fired. Well, I can tell them the head of NEON was fired for these cost overruns.

The third thing I'd like to thank you for is for adopting all of the IG recommendations, even those that you weren't exactly excited about, and three of them implemented already.

And finally, to match up with Chairman Loudermilk's comments on Cato, I wonder if we could send a no-cost-overrun policy to Cato and they could figure out how we could apply this to the rest of the federal government, and also I'm thinking about our own household budget, and how we could apply that.

And Dr. Collins, in your written testimony also, you talked about the $80 million broken and $40 million of it was the establishment of sustainable supply chain for procurement production. It seems that that was largely you didn't realize the contractors there to build the sensors, the quality needed at the time just weren't there.

Dr. COLLINS. That's right.

Mr. BEYER. And the second $20 million was permits. I was fascinated by the fact that you needed ten times as many permits as you'd anticipated originally, and even the Inspector General pointed out that the permitting was something that was factors outside your control.

Dr. COLLINS. Exactly.

Mr. BEYER. The third $20 million, the last 25 percent, was transition of observatory elements to operations. Could you explain that to us? That's the one thing I don't understand.

Dr. COLLINS. Sure. So the observatory, the NEON observatory, basically has two pieces to it in the sense that first you have to build it. You're going to put up the towers, you're going to build the sensors and so on, put them on the towers, and you're going to develop the sampling regimes, and that's largely what's going on now and has been going on for the past 18 months, two years. And now the observatory is in a position of transitioning away from the construction part so the towers will be up, the sensors will be hung, and you're moving into individuals that will be now operating the system, will be collecting data. Now, there are already individuals in place to do that, and it's in the bringing the transition through that gets hard because you have to switch personnel. The same individuals who are doing the construction—engineers, technicians and so on—are not necessarily the same individuals who are going to be doing the operating part of the observatory. So there are whole new hirings that have to be done. Some individuals may transition but others will not.

Mr. BEYER. Were the operating costs ever intended to be in the original $430 million budget, though?

Dr. COLLINS. No, the operating costs are handled separately from the original construction budget.

Mr. BEYER. Thank you, Dr. Collins, very much.

Dr. Olds, much has been made of the $257,000 in lobbying costs, the Christmas party, the entertainment, visas and meals. How much of the—when you put all that together, how much of the $80 million is represented by these controversial costs?

Dr. OLDS. The controversial costs are not represented at all in the dollars that were uncovered looking at the trajectory to a cost overrun. Those are, as Dr. Collins said, related to these really substantive scientific and engineering issues, permitting and the like.

Mr. BEYER. Thank you.

Dr. Olds, one of the things in the IG's letter, she talked about the NSF hadn't required the incurred cost submissions from NEON nor has it conducted an incurred-cost audit of NEON, and if NSF had taken either action, NSF could have been able to identify unallowable or poor spending mby on NEON, and yet I think what we've just heard is, the $80 million wasn't unallowable or poor spending, that it was permitting, it was the shift to operations, and it was the absence of a secure supply chain. Am I reading that correctly, and does that make this particular IG recommendation less meaningful?

Dr. OLDS. Congressman Beyer, so I want to make sure that I give you a very full and accurate answer to that question so I'm going to ask to get back to you on that one for the record.

Mr. BEYER. You're a thoughtful, careful person.

One last thought. None of the proposed cost elements for labor, overhead, equipment and other costs reconciled to the supporting data in the proposed budget. Again, a direct quote from the IG's report. I'm just about out of time, but it concerns me greatly that the budget didn't match up with the underlying data.

Dr. OLDS. I think it's always a challenge to get these things right on really complicated projects where you're building a distributed instrument that extends from Barrow, Alaska, to Puerto Rico, and you're using bleeding-edge state-of-the-art technology and trying to network it all together. So that's always a challenge, and it's very—it's qualitatively very different from building something like a ship or an airplane that we've had a lot of experience with, so I think that relates to those challenges.

Mr. BEYER. Thank you.

Thank you, Madam Chair.

Chairwoman COMSTOCK. Thank you, and the Chair now recognizes Mr. Johnson.

Mr. JOHNSON. Thank you, Madam Chairman.

Dr. Olds, you testified that NSF started having concerns with the NEON project's budget and timeline management as early as January 2013. The NSF Inspector General first noted concerns about NEON's cost proposal in 2011 and recommended that NSF require annual incurred cost submissions and conduct annual incurred cost audits. NSF did not follow this recommendation. So in hindsight, could annual audits have caught NEON's cost issues earlier and helped preserve more of the budget as designed?

Dr. OLDS. Congressman, I'll freely admit that we could have done a better job, and what I'm determined to do is make sure that

going forward we are as rigorous as we can possibly be in terms of auditing, getting cost estimates and getting independent eyes on on those so that we don't have these issues in the future.

Mr. JOHNSON. Hindsight's always 20/20, isn't it?

Dr. OLDS. Yes, sir.

Mr. JOHNSON. Again, Dr. Olds, the NSF Inspector General has previously recommended that NSF should retain contingency funds for projects like NEON and pay the contractor as those expenses are approved as appropriate contingency costs. The NSF has not agreed with this recommendation. Would retaining contingency funds for NEON have helped NSF notice the cost overrun at NEON sooner?

Dr. OLDS. Congressman, once again, that's an issue which is outside my area of molecular neuroscience, so I want to make sure I get you an accurate and full answer to that, so I'd like to get back to you on that one.

Mr. JOHNSON. Take that one for the record. Okay.

Let's see. Dr. Olds, in dealing with management and oversight, what alternative options does NSF have with respect to the existing NEON cooperative agreement? If you determine that you're not capable of delivering the project on budget and on time, is relieving NEON as the managing entity one of those options that would be considered?

Dr. OLDS. Congressman, I don't want to presuppose what the answer is going to be to the answer that we will receive in——

Mr. JOHNSON. I'm not asking you for the answer. I'm asking you what options you might consider.

Dr. OLDS. I think that there are a variety of options that would quite substantive in terms of getting this project through to completion in a way that deals with the management issues that you put forward. I don't want to lock on to any one in particular at this time.

Mr. JOHNSON. I'm not asking you to do that. I'm asking you——

Dr. OLDS. But I——

Mr. JOHNSON. —is relieving NEON is the managing entity one of the options that would be considered?

Dr. OLDS. That's certainly an option.

Mr. JOHNSON. Okay. All right. That's fair enough.

Dr. Olds, it appears that NEON has moved $35 million of contingency funds into the base construction budget. The cooperative agreement requires approval by NSF for NEON to use contingency funds. Did NSF approve the transfer of contingency funds?

Dr. OLDS. That issue has been previously identified and addressed with NEON Inc. with regard to the process.

Mr. JOHNSON. So did NSF approve?

Dr. OLDS. The organization had incorrectly concluded that a prior initial approval of their contingency estimate had provided authorization of contingency expenditures. That situation has been corrected. We do plan to do a full accounting of the documentation to ensure contingency allocations were not actually spent in advance of approvals.

Mr. JOHNSON. Okay. So let me make sure I understood. You're telling me that NSF, the finding is that NSF did approve the transfer of contingency funds?

Dr. OLDS. I want to make sure that I get that exactly accurate so I'm going to have to get back to you on that answer.

Mr. JOHNSON. I'm very interested in the answer to that because obviously there would be a violation of the cooperative agreement if that approval is not there.

Dr. OLDS. Understood.

Mr. JOHNSON. Okay. Mr. Chairman, I yield—Madam Chairman, I yield back.

Chairwoman COMSTOCK. Thank you, and the Chair now recognizes Mr. Tonko.

Mr. TONKO. Thank you, Madam Chair.

While I have concerns regarding NEON's budget and management challenges, I also want to take this time to express my gratitude to the many people who had the vision for this type and scale of research and coordination. I recognize that NEON will have real implications for our understanding of climate science, of agriculture and infectious diseases, water use, and so many other areas that affect all of our lives. Improving our understanding of our world and how it's changing and how we effect that change will allow us to better evaluate our actions and priorities. For instance, the scale of this project will allow us to have a baseline of data that will inform us long before catastrophic events occur so that we can better prevent and prepare for these occurrences. So can you further describe why it is significant that this research is happening on such a large scale? Dr. Collins?

Dr. COLLINS. Well, you said it very well in terms of the implications of the sort of research that's being done. It has the expectation to affect our understanding of the dispersal of infectious disease, emerging infectious diseases, exotic species. It has—it's designed to help understand the way in which various sorts of gases will move across the continent. So, as you've said, it really has these much larger implications in terms of grand challenge questions in the ecological sciences.

Mr. TONKO. Now, we know that with the will and necessary resources, America will lead the way in continued exploration in research and development. When our Nation leads by investing and innovating, we also inspire our next generation of scientists and engineers. We must retain the will to learn about our world as well as the human infrastructure needed to make the proposed research a reality.

I recently learned that Rensselaer Polytechnic Institute, which is in New York's 20th Congressional District, was one of 19 academic institutions selected to receive a grant to do research that will leverage data from NEON. Can you further describe how these awards and NEON's efforts will ensure that our Nation's research pipeline, so to speak, will remain vibrant for the decades to come?

Dr. COLLINS. Sure, sure. So NEON employs some 320 individuals at the Boulder site, but then there are another 120 individuals dispersed throughout the system in the United States in terms of gathering data and sampling various sorts of biological material across the country.

Relative to your pipeline point, though, it's especially notable that in the summer, NEON brings on as many as 100 and even more summer interns, students, who work in the system and are

learning the basic biological sciences, and therefore can go on to careers in the sciences themselves or basically are STEM-capable students. They know what science is about. They're dealing with leading-edge questions and they're dealing with leading-edge technology. Your example from RPI is really a good one in that one of my colleagues at RPI, who just moved there recently, is working with IBM to monitor a lake system in that area, and they're using comparable leading-edge technology to begin to understand what these ecological processes are looking like on a 24/7 basis and involving young people in doing this sort of work right from the very beginning.

Mr. TONKO. What other types of data or research capabilities is NEON already providing to the larger scientific community, and who can access these resources?

Dr. COLLINS. NEON is providing data from the airborne observing platform. This is a series of sophisticated instruments that are flown on airplanes over the NEON system. They'll eventually be flown over the entire NEON system. The planes are flying over eight domains, and those data are freely available to the entire community.

Likewise, as far as the NEON system is concerned, when those data come online, and they're already coming online—they will be freely available on a 24/7 basis to the entire research community to use as they see fit.

Mr. TONKO. Okay. I thank you very much, and with that, yield back, Madam Chair.

Chairwoman COMSTOCK. The Chair now recognizes Mr. Posey for five minutes.

Mr. POSEY. Thank you, Madam Chairman.

Dr. Collins, since we last met, has NEON Inc. paid back the federal government any of the thousands of dollars spent on liquor and parties for the unintended benefit of the employees who enjoyed the endeavors?

Dr. COLLINS. NEON has not used any management fee dollars since the last time I was here.

Mr. POSEY. Okay, but they haven't paid the government back? They haven't reimbursed the government for the unintended squandering of the tax dollars on parties and liquor?

Dr. COLLINS. Well, as we discussed last time, there is this issue in terms of how management fees can be used, and we could not use management fees to pay back the federal government at this point. That's my understanding. I'm not an accountant when it comes to these details.

Mr. POSEY. Have there been any fears of repercussions from the IRS for the misuse of that money?

Dr. COLLINS. Not that I'm aware of.

Mr. POSEY. You're a 501(c)(3) nonprofit corporation?

Dr. COLLINS. That's correct.

Mr. POSEY. Who are the principals of the corporation, just out of curiosity?

Dr. COLLINS. Well, the principals of the corporation would be—well, the board of directors has fiduciary responsibility, if that's what you mean.

Mr. POSEY. Yeah. Whose name is—who's the president of the company?

Dr. COLLINS. Well, there's a chief executive officer of the company——

Mr. POSEY. Who's that?

Dr. COLLINS. —who at the moment, the interim, is Gene Kelly, Dr. Eugene Kelly from Colorado State University.

Mr. POSEY. What state is it incorporated in?

Dr. COLLINS. Colorado.

Mr. POSEY. Colorado? Given the total mismanagement by NEON Inc. of this project to date, why should it continue to manage the project? You know, wouldn't taxpayers and the research community be better served by another qualified organization taking over the management of the project?

Dr. COLLINS. So we've—I've explained to you some of the details in terms of where the discrepancies occurred, and it's important, I believe, at a moment like this to appreciate the degree to which there is learning going on within the corporation and learning by the individuals. So we admit mistakes were made. We admit we could do a better job. I admitted that the last time. And therefore I believe the key is to look forward, and as Dr. Olds has suggested, put in place those kinds of things——

Mr. POSEY. Well, you know, when you were here in February, you testified "We pledge going forward to redouble our efforts to be good stewards of the taxpayers' funds we receive." Yet, according to the National Science Foundation Inspector General, since that time they continue to discover inappropriate charges by NEON and its leadership.

Dr. COLLINS. Well, inappropriate charges in——

Mr. POSEY. I think those they referred to as legal fees and lobbyist expenses.

Dr. COLLINS. I'll have to get back to you on that because, as I said, there are no management fees that have been used since the last time I was here.

Mr. POSEY. Not a dime spent for lobbyists or legal fees, not one penny?

Dr. COLLINS. Again, I would have to get back to you, but in terms of my understanding, that's true.

Mr. POSEY. Okay. Mr. Olds, do you care to comment?

Dr. OLDS. Well, I think it's extremely important that any federal monies that were misspent needs to be made right to the American people.

Mr. POSEY. You know, I think we can't spend the management fees to reimburse the federal government for wasting their money. Maybe you could just divide it among the participants that enjoyed the liquor and the parties and have them ante up and just repay the government for a party that wasn't intended, was authorized, certainly wasn't ethical, useful or in any way positive for the taxpayers who funded it. Does it sound like a good idea to you?

Dr. COLLINS. And so your question is whether there should be some retroactive effort to gather in the individuals who were at the party and have them contribute?

Mr. POSEY. I know it's a foreign concept to some, but it's called justice. You know, you take something that doesn't belong to you,

and as a minimum, you pay it back. Like the lawyers behind you today—are they lawyers for you? Are they your lawyers?

Dr. COLLINS. There is one—I have one counsel representing me, yes.

Mr. POSEY. Okay. Do they get paid?

Dr. COLLINS. Yes.

Mr. POSEY. Okay. Who pays them?

Dr. COLLINS. NEON.

Mr. POSEY. And from what funds does NEON pay them?

Dr. COLLINS. We have fees within the corporation to be used in order to ensure that the corporation is acting in ways that are consistent with the laws of the United States, and so we do have legal counsel.

Mr. POSEY. But you haven't used any since you told me since the last time we met here on lobbyists or legal fees, correct?

Dr. COLLINS. I said that I—that we have not used any management fee money for lobbyists since the last time I was here.

Mr. POSEY. Okay.

Dr. COLLINS. And we haven't spent any management fees at all.

Mr. POSEY. Okay. And the lawyers behind you, they prepared your testimony for today?

Dr. COLLINS. I had help as far as the testimony and preparation from a variety of individuals, not just legal counsel, but individuals at NEON as well. It was a real team effort.

Mr. POSEY. Just to come in and tell us what's going on?

Dr. COLLINS. Well, I guess I wouldn't say just to come in. I believe that the issues that you're raising are indeed important and serious issues, and so we put in a good deal of preparation in order to be ready to help you out——

Mr. POSEY. Tell me that you don't know the answer?

Dr. COLLINS. —to help you understand.

Mr. POSEY. I understand. All right. Sorry I went over, Madam Chair.

Chairwoman COMSTOCK. Okay. Thank you, and the Chair now recognizes Ms. Bonamici.

Ms. BONAMICI. Thank you very much, Chair Comstock.

Dr. Olds, large construction projects often run into some unanticipated challenges. The NEON project in particular is unprecedented in size and scope for the ecological sciences community, and it required, of course, significant technology development. I share the concerns raised today about the troubles with NEON but also that they were allowed to progress to the point that we find ourselves today. So in your testimony, you described for us the series of increasingly aggressive oversight steps that NSF took in an effort to keep NEON on track. I know there's been some talk about hindsight and retrospect, but could you talk a little bit about what might you have done even sooner or more aggressively to avert such a significant re-scope of the project? And I also want to hear about what the lessons are that have been learned for future projects.

Dr. OLDS. Well, I think you raise a really good question, Congresswoman, and I would say what we've learned really comes down to this. If you think about the large projects scientifically that NSF does, they're over a spectrum. Oceanographic research

vessels, we've done those before. Things like NEON, that's at the other end of the spectrum. We've never built anything like NEON before. So I would say in terms of lessons learned going forward, projects like NEON that involve technologies and instrumentation and distribution that we have not done before deserve a much greater level of scrutiny from the very beginning going forward so that we have a better handle on how the project's doing and when it starts to get off the rails.

When we're looking at something that we've done before, that's a different story, but NEON and projects in the future that may be like NEON I think deserve a much higher level of scrutiny.

Ms. BONAMICI. Thank you. I was among the group of Committee Members who went to the South Pole this last year and saw the IceCube Neutrino project. That one went pretty well, didn't it?

Dr. OLDS. It certainly did. That's a terrific example of a large project that is delivering to the American people as we hoped it would.

Ms. BONAMICI. So, Dr. Olds, a group of former Ecological Society of America presidents published an open letter strongly supporting the NEON project. I believe Mr. Lipinski already has entered that into the record. They support the project even as re-scoped but they express some concern that NSF has not sufficiently engaged the community in decision-making for NEON since construction began. So I fully appreciate the tension between keeping a large construction project on time and on budget and wanting to be responsive to the evolving scientific and technological opportunities that come from that.

I don't think anyone wants to delay the project for a length of time or increase its budget but we're at a sort of unplanned pause here as NEON develops a new cost proposal. So the scientific and technological opportunities have changed since 2010 when the project design was approved. So is there an opportunity here to more directly engage the community in the final re-scoping decisions so that the science meets the needs of the user community? And I'll get Dr. Collins in on this as well and ask him about that.

Dr. OLDS. Congresswoman, that's a terrific idea. Just weeks ago, I personally went to the Ecological Society meeting in Baltimore. A little bit after that, I went out to Estes Park, Colorado, to meet with a long-term ecological network of scientists community so I believe that actually that engagement needs to start from the very top of the Biological Sciences Directorate and permeate everything that we do. Really, the community needs to be fully engaged scientifically in this project so that the data that is delivered back is as valuable to them as possible.

Ms. BONAMICI. And Dr. Collins, what role are you playing or is NEON playing in making sure that the community is engaged in the re-scoping?

Dr. COLLINS. I agree entirely with Dr. Olds. I was also there in Baltimore with him. It is a moment to bring along even greater engagement by the scientific community. You put your finger on exactly the issue early on. You're balancing this tension between getting the facility built and therefore controlling a scope creep as far as the construction is concerned. But now at this moment, and it is just right as you transition from construction to operations, that

you want to bring the community in even more deeply and take advantage in the course of doing the re-scope to look at new instrumentation that's available, new potential that you have in order to make it an even better facility than you thought it could be at the beginning.

Ms. BONAMICI. Thank you.

My time is expired. I yield back. Thank you, Madam Chair.

Chairwoman COMSTOCK. Thank you, and I now recognize Dr. Abraham for five minutes.

Mr. ABRAHAM. Thank you, Madam Chairman.

Dr. Collins, I'll certainly agree with your suggestion that we bring more private accountants in to monitor these projects. I'm looking at some notes I have, and it's my understanding that since 2011, the NSF has had at least seven expert—I'll use that tongue in cheek with the word "expert"—reviews of these projects, and in August 2014, they're telling us that you guys are on target, on time, on budget, and then 3 months later we're $16 million in the hole and it has just escalated since then. So I think it's an excellent idea.

Dr. Collins, on NEON Inc., I understand it's a private enterprise. Is that a correct statement?

Dr. COLLINS. Well, it's a 501(c)(3).

Mr. ABRAHAM. Okay. How many employees does Neon Inc. have?

Dr. COLLINS. There are approximately 320 individuals in Boulder and about another 120 individuals throughout the United States.

Mr. ABRAHAM. And to your knowledge, were there any employment bonuses given in 2014 and 2015?

Dr. COLLINS. That's a detail that would be left to the financial individuals in the corporation, and I can get you that information.

Mr. ABRAHAM. I would appreciate that.

Dr. Olds, hearing the testimony that you and Dr. Collins both gave, and we appreciate your presence here, at least I do, I hear this term over and over, we're learning, we're learning. But we're learning on the taxpayers' dollars here, guys, and you need to learn somewhere else, not on the taxpayers' dollars. I mean, you guys should be past the learning into the doing stage.

Of these projects that have been—or this entire project that has been de-scoped—I'll use that term—we use a different term, a more direct term in private business. We're down to 60 or 80 sites. How many of those sites are projected to be in the United States?

Dr. OLDS. All of them are in the United States, Congressman.

Mr. ABRAHAM. And with—Dr. Olds, I'll go to you. The CEO, it's my understanding, of NEON Inc. was just relieved of duty, and that's a pretty big strike when you take out a CEO of a 300- to 450-employee company. That shows that there some basic large mismanagement. Do you have confidence that NEON Inc. can do the job?

Dr. OLDS. Well, we are going to be sitting on NEON Inc. over the next three months and putting them through some pretty difficult hoops, and we will know very quickly whether this organization is going to be successful under new leadership in changing its course, and if they aren't, we'll act.

Mr. ABRAHAM. Have you guys got a timeline that says hey, you've got to be at this point at this time or——

Dr. OLDS. Yes, sir.

Mr. ABRAHAM. —game over? Okay.

Dr. OLDS. Yes, sir.

Mr. ABRAHAM. Fair enough.

Dr. Collins, the CEO that was just relieved of his duties, how much—and I know it's an opinion but I'm asking it—in your opinion, how much of the mismanagement was attributed directly to him?

Dr. COLLINS. Well, the issue is a personnel issue, of course, so I'm only going to go into certain kinds of details, but let's put it this way. We have a corporation that is changing. It is dynamic. And it was the judgment of the board that at this time we needed to bring on, to go back to some points that we made earlier—an individual who could deal with this transition from construction to operations.

Mr. ABRAHAM. But come on, Doc. I mean, you know, this guy should have already been vetted to—he should have been—if he's a CEO of a company of this size, he should have known from A to Z how this project was going. I mean, he is the CEO.

Dr. COLLINS. Yes.

Mr. ABRAHAM. And I guess that's my frustration is that maybe he didn't know all the particulars, but the board should've done a better job of vetting this guy before he was hired. I think that's just basic business acumen there.

Dr. COLLINS. So it was a previous board that hired the CEO, but the important thing is that I'm confident that they did the best job that they could at the time. Then you work with the individual in order to bring the individual along. Now we're at a point where we're going to look for a new individual.

Mr. ABRAHAM. I would probably respectfully disagree that they did the best job at that time in hiring this guy.

Madam Chairman, I yield back.

Chairwoman COMSTOCK. Thank you.

I thank the witnesses for their testimony today and the Members for their questions. We very much appreciate your diligence in looking at this and responding to us and appreciating the concerns here.

And the record will remain open for two weeks for additional written comments and written questions from Members.

So the hearing is now adjourned.

[Whereupon, at 10:26 a.m., the Subcommittees were adjourned.]

Appendix I

Answers to Post-Hearing Questions

ANSWERS TO POST-HEARING QUESTIONS

Responses by Dr. James Old

HOUSE COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
SUBCOMMITTEE ON RESEARCH AND TECHNOLOGY
SUBCOMMITTEE ON OVERSIGHT

"NEON Warning Signs: Examining the Management of the National Ecological Observatory Network"

Dr. James L. Olds, Assistant Director for Biological Sciences, National Science Foundation

Questions submitted by Rep. Barbara Comstock, Chairwoman, Subcommittee on Research and Technology and Rep. Barry Loudermilk, Chairman, Subcommittee on Oversight

1. What formal and informal communications did NSF and NEON, Inc. have between January 1, 2013 – September 18, 2015 regarding construction schedule and budget issues at NEON? As part of your response, please provide copies of every relevant e-mail, letter, memorandum, record, note, and text message as well as any internal NSF staff correspondence or notes regarding NEON's schedule or budget.

   NSF Response: Since the beginning of the project, NSF has received monthly reports from NEON, Inc. that document the cost and schedule status. NSF conducts weekly phone calls with Project leadership to assess detailed progress on cost and schedule issues, such as permitting, production and procurement, data products, transition to operations, and cyberinfrastructure. With the current ongoing assistive visits, frequent dialog between NSF and NEON, Inc. is being conducted to discuss, review and evaluate deliverables related to cost and schedule.

   At table summarizing these (and additional) communications since January 2013 is attached (Attachment 1).

2. According to the NSF Inspector General Alert Memo issued on September 15, 2015, it appears that NEON, Inc. moved $35 million of contingency funds into the base construction budget.

   a. Has NSF determined the amount of funds that NEON, Inc. has moved from contingency into the base construction budget? If yes, what is the amount?

      NSF Response: Yes; movement (allocation) of contingency to the base construction budget was $35,142,305. However, it should be noted that NSF has not yet obligated all of the funds necessary to actually spend this allocation of contingency and most of the re- budgeted work will take place in the future. Even though NEON, Inc. (like all Recipients) has re-budgeting authority for work activities, NSF is in the process of determining if NEON

actually spent (and drew down) funds associated with some portion of this contingency allocation in advance of NSF approval. This will require a detailed look by individual work activities. NSF is working closely with the OIG on this issue.

b. Did NSF approve the transfer of contingency funds? If yes, please provide documentation of that approval. If no, what actions does NSF plan to take to correct the improper transfer?

NSF Response: Yes; NSF approved the allocation of contingency on July 28, 2015 after being satisfied with the sufficiency of the documentation. The approval documentation is attached (Attachment 2).

3. The NSF Inspector General has previously recommended the NSF should retain contingency funds for projects like NEON, and pay the contractor as those expenses are approved as appropriate contingency costs. NSF has not agreed with this recommendation.

   a. Why hasn't NSF adopted this recommendation?

   NSF Response: NSF's normal practice of awarding contingency as part of the budget is in conformance with 2 CFR, part 200.433 – Contingency provisions (Uniform Guidance). That said, NSF always maintains the option of retaining (holding) contingency if there is a perceived risk with the Recipient's management practices and as an additional lever to enhance oversight. It should be noted that the full budget (including the contingency budget) is never obligated at once, but rather in annual increments that align with the appropriations from Congress. NSF currently has the mechanisms in place to hold contingency back and obligate only as needed to meet project objectives. Going forward, NSF will likely withhold more of the contingency on NEON given past performance.

   b. Would retaining contingency funds for NEON have helped alert NSF to the possibility of a cost overrun sooner?

   NSF Response: No; the retention of contingency funds has no relation to the projected cost overruns on any project. Under Earned Value Management (EVM), projected cost overruns are the difference between the approved Total Project Cost (TPC) and what the project currently estimates the actual, final total project cost to be (i.e., Estimate At Complete; EAC). EAC is the sum of actual expenses to-date plus the estimated cost of the remaining work.

4. According to Dr. James Collins' testimony, at least "five previous NSF MREFC projects underwent scope revisions, management adjustments, and instruments configuration changes during construct based on the challenges with increased costs for production of instrumentation, delayed site permitting, and schedule delays." Is this statement correct? If so, please provide a brief description of each project that underwent a significant scope revision, including the estimated total dollar amount of the potential cost overrun that necessitated this revision.

NSF Response: All MREFC projects go through significant cost, scope and schedule refinement during the Design Stage. However, once construction begins, very few are forced to go through significant scope reductions to keep actual costs below the approved Total Project Cost (TPC). NSF implemented a "No Cost Overrun" policy in FY2009. If contingency is not able to cover all known and realized risks, de-scoping is the first line of defense to meet this policy as published in NSF's Large Facilities Manual.

The following table summarizes the MREFC projects completed (or nearly completed) in the last 10 years as well as those currently in construction. The table indicates those that had to be de- scoped during the Construction Stage (i.e. once the construction award was made) to maintain costs below the approved TPC, the items removed from scope, and the approximate value of the scope removed to maintain budget.

Project	Year Complete	TPC ($M)	Required De-Scoping During Construction
Daniel K. Inouye Solar Telescope (DKIST); formerly ATST	-	$344	In construction. None to-date.
Large Synoptic Survey Telescope (LSST)	-	$473	In construction. None to-date.
Alaska Region Research Vessel (ARRV)	2015/16	$200	None.
Ocean Observatories Initiative (OOI)	2015	$386	None. Minor scope modifications were conducted for technical maturity reasons; not cost.
Atacama Large Millimeter Array (ALMA)	**2015**	**$499**	**Antenna reduction ($56M), Site Infrastructure ($2M)**
Advanced Laser Interferometer Gravitational-wave Observatory (AdvLIGO)	2015	$205	None.
Ice Cube	2012	$202	None.
Scientific Ocean Drilling Vessel (SODV)	**2008**	**$115**	**Drill String ($1M)**
South Pole Station Modernization	2010	$149	None.
EarthScope	**2008**	**$197**	**Borehole reduction ($55M)**

In short, implementation of de-scoping as has been required of NEON is not a common occurrence for NSF projects. NSF has only been able to identify two facilities in the past 10 years that meet the same criteria and approach a similar de-scope level as NEON.

Attachment 1

Timeline of Identification of Issues and Actions Taken

2013

Date	Activity	Involvement	Outcomes
January 28-29	NEON CEO and PM/COO visit to NSF	NSF Program and BIO OAD Staff	Discussion Schedule slippage, strategic planning, CCB/CRE, procurement/production, senior Staffing
February 7-8	NEON Inc. Board Meeting	NSF Program Staff, NEON project Staff, NEON Board	
February 11-15	NSF visit to NEON facilities, Boulder CO Site visit and program analysis of the new schedule and review material	NEON Program and BIO OAD Staff	Raised significant concerns about production/procurement; cyberinfrastructure and data products
May 13-17	Baseline Review, Boulder, CO	NSF Program Staff, External Review Team, DACS representatives	Areas requiring improvement: issues identified in February site visits with schedule, manufacturing, logistics, data products development, aligning budget and schedule.
May 30-31	NEON Inc. Board Meeting	NSF Program and BIO OAD Staff	Reiterated concerns about the lack of schedule float
August 19-29	In-depth site visits on construction issues causing delays	NSF Program Staff	Beginning of extensive site visits to understand construction schedule delays
September 16-20	In-depth site visits on construction issues causing delays	NSF Program Staff	
October 2	Letter to NEON Inc. Board for their Meeting	NSF Program Staff	Significant concerns raised about the status of site deployments and lack of deployments of sensors. Root cause is the leadership of the construction project and of NEON, Inc.
December 2-5	Annual Construction Review	NSF Program Staff, External Review Team, DACS and LFO representatives	Areas requiring improvement: Schedule performance and tool effectiveness, cost basis, production/procurement, cyberinfrastructure and data product deliver, transition to operations

2014

Date	Activity	Involvement	Outcomes
January 27-31	In-depth site visits on construction issues causing delays	NSF Program Staff	Focus on Data Products and CYI issues relating to delay in delivery issue identification and plan to resolve, NEON project controls, budget, and schedule

February 4-7	NEON Inc. Board Meeting	NSF Program Staff, NEON project Staff, NEON Board	Discussions included CI and data products delivery
February 24-27	In-depth site visits on construction issues causing delays	NSF Program Staff	Topics included strategic management, EVM, performance baseline, production/procurement, data product log jam.
April 16-18	In-depth site visits on construction issues causing delays	NSF Program Staff	Discussions to develop transitions to operations criteria
May 13	NEON, Inc. Staff visit NSF	NSF Program Staff, BIO OAD Staff, NEON, Inc. Staff	Discussions about the status of the cost to complete and schedule updates, milestones, transition to operations and Observatory capability delivery
May 14-16	NEON Inc. Board Meeting, Airlie House, VA	NSF Program Staff, NEON project Staff, NEON Board	
May 19-20	NSF visit to NEON facilities, Boulder CO	NSF Program Staff	Topics included strategic management, EVM, performance baseline, production/procurement, data product log jam.
August 12	BIO Letter	BIO AD	NEON Board requested for its plans to address management concerns
August 25-29	Baseline Review, Boulder, CO	NSF Program Staff, External Review Team, LFO & DACS representatives	Positive report. NSF representatives noted concerns about the depth of analysis of the cost book and remaining contingency following the proposed re-plan.
September 20-21	Science Capability Review, Boulder, CO	STEAC, NSF Program Staff (observers)	
September 22-24	NEON Inc. Board Meeting, Boulder, CO	NSF Program Staff, NEON project Staff, NEON Board	NSF excluded from several important discussions.
October 1	New Observatory Director appointed		C. J. Loria appointed and named as PI of operations award.
November 6	IPT Kick-Off Meeting, NSF	NSF Program Staff, LFO, DACS, OGC, OLPA	Largely informational meeting about the status of NEON construction and transition to operations
November 10	LFO September Monthly Report	NSF Program Staff, LFO	NEON cost performance index green. NEON schedule performance index red.
November 18	Call with NEON Board Chair, Jim Collins	NSF Program Staff	NSF informed Board Chair that NSF would participate in all Board meeting sessions and phone calls from now on.
November 26	BIO Science Engagement Working Group (SEWG) Charged	BIO and CISE Program Directors, NSF Program Staff	Development of messaging on NEON transition to operations and early science. Development of a DCL for use of NEON data.
December 1-5	Annual Work Plan Review	NSF Program Staff, External Review Team	Positive review based on outcomes of the August 2014 Baseline Review

December 3	House Science Committee Hearing	Alison Lerner (NSF IG), Anita Bales (DCAA)	IG audit of NEON management fee usage
December 8	NSF Program Meeting with AIBS	NSF Program Staff, AIBS leadership	Update on NEON construction and transition to operations

2015

Date	Activity	Involvement	Outcomes
January 26-28	Operations Kick-Off Review, Boulder, CO	NSF Program Staff, External Review Team,	Concern about loss of contingency, lack of a clear plan for T2O
January 29	NEON Science Day, NSF	NSF Program Staff, NEON project Staff, NEON Inc. CEO	Opportunity for Program directors across BIO to meet the NEON Staff and understand what NEON is funded to deliver and when.
January 29	NEON Leadership Meeting	NSF Program Staff, NEON Inc. CEO, Project Manager, Observatory Director	Presentation indicating rapid decrease in contingency, delays in planned T2O activities, evidence of financial errors.
February 3	House Science Committee Hearing	Richard Buckius (NSF COO), Jim Collins (NEON Board Chair)	NEON management fee usage
February 5-6	NEON Board Meeting, Boulder, CO	NSF Program Staff, NEON project Staff, NEON Board	NSF Program expressed serious concerns about the T2O plan and containment of costs and schedule escalation. NEON Board instituted additional oversight of finances, operations, and communications. Notification of planned Operations Review in June 2015 after which NSF would make a decision to recomplete NEON operations after Observatory construction is completed.
February 19-20	France Cordova visit to NEON	NSF Director, BIO leadership and NSF Program Staff	Opportunity for the NSF Director to see the NEON Headquarters and meet the NEON leadership.
March 4	IPT Meeting	NSF Program Staff, LFO, DACS, OGC, OLPA	Schedule and contingency concerns discussed. Suggested due dates for a revised scope management plan were given. Updates on audit resolution activities provided (associated with cost estimates).
March 19-20	NEON Board Meeting, Boulder, CO	NSF Program Staff, NEON project Staff, NEON Board	NEON Board follow-up on outcomes of additional oversight
March 26	ESA and AIBS Visit, NSF	NSF Program Staff, society leadership	Update on NEON construction and transition to operations
First week of April	"NEON DCL: Stimulating Research Using NEON Data" posted on the NSF web site	NEON SEWG	Pitches for EAGERS and workshops requested by May 8 for funding in FY 2015
April 16	IPT Meeting	NSF Program Staff, LFO, DACS, OGC, OLPA	Emergency meeting to discuss schedule slippage and potential cost overruns. Recommendation to convey concerns to NEON via a warning letter and postpone the Operations Review scheduled in June until after the project is in compliance.
April 16	LFO January/February Monthly Report	NSF Program Staff, LFO	NEON cost performance index and schedule performance index green.

April 20	NEON Staffing reorganization	NSF Program Staff, NEON CEO	C.J. Loria terminated after submission of a request for reorganization submitted
April 21	Phone call with NEON Board Chair	BIO OAD Staff and NEON Program Staff	Conveyed outcomes of the IPT meeting
May 14	Delivery of warning letters to NEON, Inc. from DACS and BIO	DACS leadership, BIO OAD and Program Staff	DACS letter listed non-compliant items and appendix lists required materials and deadlines for delivery. BIO letter referenced DACS letter and indicated that assistive visits will begin to correct non-compliance. Planned Operations Review replaced with an assistive visit.
May 14	Phone call with NEON Board Chair	BIO OAD and Program Staff	Reviewed the warning letters
May 14	Phone call with NEON Inc. CEO and Project Manager	BIO OAD Staff and NSF Program Staff	Reviewed the warning letters
May 21-22	NEON Board Meeting, Boulder CO	NSF Program Staff, NEON project Staff, NEON Board	Discussion of the warning letters and NSF follow-up actions
May 25-29	NSF Assistive Visit, Boulder, CO	NSF Staff (BIO, LFO, DACS)	Improvements to financial reporting and EAC/ETC reporting
June 1-5	NSF Assistive Visit, Boulder, CO	NSF Program Staff	CI discussions
June 8-12	NSF Assistive Visit, Boulder, CO	NSF Program Staff, (BIO,DACS, LFO), NEON Inc. CEO, NEON Staff	NSF Program, LFO and DACS discussion of issues. Sufficiency review.
	BIO briefing document for NSF Director	Prepared by NSF Program Staff	Identified issues with the NSF review process that missed critical issues with NEON management
June 26	Briefing for NSF COO	BIO and LFO Staff	Provided a summary timeline showing integrated activities of Program, LFO, and DACS to bring NEON into compliance
June 29	LFO March/April Monthly Report	BIO Program Staff, LFO	NEON cost performance index green and schedule performance index yellow.
July 10	NSF Program Meeting with OGC	BIO and OGC Staff	Discussion of options for replacement of NEON Inc. as the managing organization
July 14 -17	NEON Scope Management Meeting, Arlington, VA	BIO Program Staff, community scientific experts, NEON Inc. CEO, Project Manager and Visiting Observatory Director, NEON Board representatives, STEAC Chair	Agreement on scope of the funded construction project, identification of scope management options, development of a communications plan.
July 20	NEON Scope Management Meeting debrief	DACS, LFO, OGC representatives	Provided summary outcomes of the meeting and discussed next steps, including development of a directive letter to come from DACS
July 27-31	NSF Assistive Visit, Boulder, CO	BIO, DACS, and LFO Staff	Follow-up on sufficiency review outcomes, business processes, financial reporting, supply chain issues, CI
July 29	NSB call	NSF Director and COO, NSF Program Staff, NSB Staff, LFO Staff	Briefing on the current issues with NEON and the outcomes of the scope management meeting

July 30	NSB letter	NSF Director and NSB Chair	Written summary of the Board Call discussion for the NSB Executive Committee
July 31	DACS letter	DACS Officer	Scope Management Directive letter that outlines the revised project documentation required descope NEON and provide a revised cost and schedule to complete the remaining scope.
September 3	NEON IPT	NSF Program Staff, LFO, DACS, OGC, OLPA	Award/Procurement Management Issues with respect to the NSF BIO, DACS, and LFO efforts underway with NEON, Inc. and the coordination necessary to ensure effective outcomes.
September 15	Efficiency Management Plan Review	BIO Program Staff, DACS, and LFO Staff	Plan to reduce NEON, Inc. corporate costs and improve efficiencies on the Project to reduce the overall construction project descope costs.
September 21-25	NSF Assistive Visit	BIO, DACS, and LFO Staff	Follow up on Shared Supply, Financial Expenditures, Transition to Operations, Data Products, Cost Estimating, PMCS Plan, Summary Schedule, Key Milestones and CP Analysis, Contingency Management Plan, Risk Management Plan and Risk Register, Configuration Control and PCCB & CRE
September 25	Management Fee Determination	DACS Officer	Letter to NEON, Inc. on the amount and allocation of management fee that would be allowable based on June 1, 2015 request by NEON, Inc.

NEON Change Request

Date Submitted	6/5/2015	**Award**	1029808
CRE Title	Cost & Schedule Baseline Replan Application for Cost	**CRE #**	2.04.0085
WBS Title	Total Program	**WBS**	2-04

Scope: This CRE (with the attached memo) addresses the revised EaC/EtC costs as presented during the August, 2014 Cost & Schedule Baseline Review

Justification: Motivation

The NEON Construction schedule and budget were subject to a series of reviews since the start of the program. Three consecutive reviews in 2012 and 2013 concluded that the materials presented by NEON did not provide a sound justification for both the schedule and cost. After the May 2013 review, the project initiated a schedule management change from a functionally oriented schedule to a product delivery oriented one. At the December 2013 review, the cost was not properly integrated with the schedule which in addition did not contain sufficient float for the stage of the program. With the change in Project Management in March 2014, NEON undertook a complete revision of the schedule and the estimate to complete using a bottoms-up approach, followed by an joint confidence analysis that integrated cost, schedule and risk. The NEON project prepared a re-plan of all activities and a new estimate to complete using an incremental development plan (see Figure on the right).

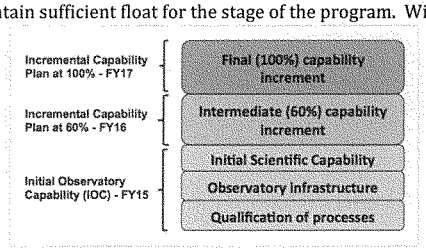


Figure 1. Incremental capabilities approach

The motivation for the replan was fourfold:

- the project was still using the 2009 cost estimate and no revision had been made since then;
- the need to move from a functionally driven schedule to a product oriented schedule to focus on an incremental delivery of the Observatory infrastructure and Science capabilities that provides a better management of the program development;
- the need to incorporate key project milestones to the development plan that provide a sense of progress and enable an accurate tracking; and
- the recognition from past reviews that the project progress was slipping and there was a need to get the schedule and cost back on track and under control.

The review held in August 2014 applauded the re-plan and the joint confidence level analysis that integrated risks, schedule and cost. The latter provided 80% level of confidence as follows:

- End of project: March 2018
- EtC $270M if risks cannot be mitigated
- Etc $ 263 if risks are mitigated

The NSF recommended the implementation of the replan following submission and approval of a CRE that captured the required contingency calls on both cost and schedule following the replan.

The calculated risk exposure was in the order of $9M, which provided an estimate of the minimum contingency level desired for the remainder of the construction project. The new contingency cost level was derived from the difference between the new Budget at Complete (BAC, Estimate to Complete plus Actuals to date, $411,442,787) and the Total Project Cost (TPC, $433,789,931) as indicated below:

Contingency level after replan = TPC – BAC = TPC – (EtC + ACWP) = $22,347,144

Since the risk exposure was less than half of the newly calculated contingency level, the latter was considered in August 2014 adequate to complete the remainder of the construction project as it provided a contingency profile of about $7M/yr. In fact, the actual calls on contingency in FY15 to end of May 2015 is $3,217,835, which is well within the linear profile of $7M.

The replan addressed all scoped NEON capabilities and a new schedule was established in accordance with an incremental approach to the delivery of the Observatory. The initial development plan as reflected in the old IMS had several main deficiencies: 1) it did not include all scoped activities; 2) it did not include the logical linkages to determine critical paths; 3) it contained a high number of critical milestones concentrated at the end of construction, which posed a high risk of schedule slippage; and 4) it was a functional schedule rather than a product oriented one. The new IMS addressed these deficiencies by including all scoped activities, eliminating duplicate activities, rearranging activities using a product oriented delivery, correcting linkages and anticipating key milestones.

In addition to the above and related to the functional approach, the project had executed inefficiently and translated in a significant lack of traction in terms of deliveries. The subsequent impact is that more deliverables were concentrated in the remainder of the schedule that caused further slippage of the date of end of construction.

The strategy NEON used to replan the sequence of activities took into account a number of factors, namely:

- Permitting – the timeframe on which NEON believes they can acquire the necessary permits for a specific activity (site characterization, construction, deployment, etc.)
- Seasonality – the optimal season in which to conduct an activity (building in winter in Alaska, sampling during green season, etc.)
- Resources – the number of resources available for a particular activity (# of construction supervisors, # of field deployment teams)
- Synergistic Opportunities – the ability for one resource/set of resources to cover off multiple areas concurrently (i.e. one construction supervisor managing construction at two nearby sites)
- Supply Chain – the availability of equipment, materials, power, etc. to build out a site

- Science needs – whether or not construction/deployment during a particular window will negatively impact necessary science activities (i.e. aquatics deployment concurrent with sampling activities)

Based on the above factors, the PTLs generate their optimal schedule execution for incorporation into the schedule. Once the activities have been incorporated, a collaborative meeting was held to discuss the linkages and to perform further optimization of the schedule.

Furthermore, the addition of Observatory delivery incremental milestones provided the means to group logically the multiple parallel deliveries of the NEON project allowing thus the determination of critical paths to those milestones and a better management and control of the construction development. Finally, the incremental delivery of the Observatory allows capturing lessons learned at an earlier stage of the development (as soon as FY15/16) while still having time to implement eventual corrective actions.

The new sequencing of deployments and activities is summarized at high level in the schedule overview shown in Figure 2. As a consequence of all corrections and adjustments made to the IMS and development plan, the overall schedule necessitated to use all schedule contingency that was available (88 days) and further introduced a slippage of 3 months beyond the end of construction (marked by the Final Observatory Operational Capabilities Review, FOOCR) that was originally planned by end of Q4 FY17 and is now planned by the end of Q1 FY18. This change of the end date of the NEON Construction project does not impact the TPC. NEON will work with the NSF on re-establishing adequate schedule float in a follow-on CRE and after further re-planning.

The table below compares the major milestone dates from August 2014 Schedule and Cost review with the dates from before the review.

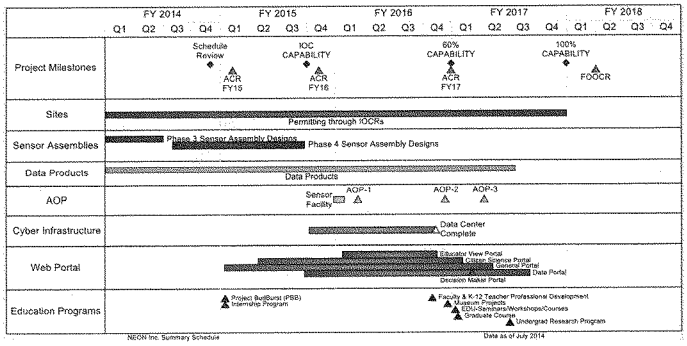


Figure 2. NEON high level schedule overview

DWBS	Activity ID	T20 (Pre-Aug14 review)	T20 (Aug14 review)	Variance (months)
SITES	Domain: 01 NORTHEAST	17-Jul-14	31-Dec-14	6
SITES	Domain: 02 MID-ATLANTIC	27-May-14	31-Jan-15	8
SITES	Domain: 03 SOUTHEAST	11-Sep-13	30-Nov-14	15
SITES	Domain: 04 ATLANTIC NEOTROPICAL	10-Mar-15	18-May-15	2
SITES	Domain: 05 GREAT LAKES	5-Dec-14	31-Dec-14	1
SITES	Domain: 06 PRAIRIE PENINSULA	31-Mar-16	6-Jul-15	-9
SITES	Domain: 07 APPALACHIAN/CUMBERLAND PLATEAUS	18-Nov-14	18-Mar-15	4
SITES	Domain: 08 OZARKS COMPLEX	24-Nov-14	5-Dec-14	0
SITES	Domain: 09 NORTHERN PLAINS	1-Oct-14	29-May-15	8
SITES	Domain: 10 CENTRAL PLAINS	28-Oct-13	30-Nov-14	13
SITES	Domain: 11 SOUTHERN PLAINS	11-Mar-15	9-Jun-15	3
SITES	Domain: 12 NORTHERN ROCKIES	12-Jul-16	5-Dec-16	5
SITES	Domain: 13 SOUTHERN ROCKIES	1-May-15	30-Jun-15	2
SITES	Domain: 14 DESERT SOUTHWEST	11-Mar-15	26-May-15	3
SITES	Domain: 15 GREAT BASIN	11-May-15	21-May-15	0
SITES	Domain: 16 PACIFIC NORTHWEST	2-May-16	6-Jul-16	2
SITES	Domain: 17 PACIFIC SOUTHWEST	12-Jul-16	25-May-16	-2
SITES	Domain: 18 TUNDRA	13-Sep-16	25-Aug-16	-1
SITES	Domain: 19 TAIGA	8-Sep-15	30-Aug-16	12
SITES	Domain: 20 PACIFIC TROPICAL	10-May-16	12-Sep-17	16
Portals	General Web Portal	2-Dec-14	14-Oct-14	-2
Portals	CSA Web Portal	2-Dec-14	28-Jan-15	2
Portals	Citizen Science Web Portal	28-Oct-16	4-Nov-16	0
Portals	Educator Portal Landcover, Landuse, Land Processes	(1)	23-Oct-15	-
Portals	Educator Portal Atmosphere	(1)	27-Apr-16	-
Portals	Educator Portal Ecosystem Health and Diversity	(1)	16-Aug-16	-
Portals	Decision Maker Portal	(1)	5-Dec-16	-
EDU	Project Bud Burst Program	17-Mar-14	16-Oct-14	7
EDU	Museum Projects	2-May-16	20-Sep-16	5
EDU	Professional Development program	18-May-16	2-Aug-16	3
EDU	Undergrad Programs	1-Mar-17	4-Apr-17	1
EDU	Internship programs	31-Dec-13	14-Oct-14	10
EDU	Graduate programs	19-Oct-16	21-Oct-16	0
EDU	Workshops, Seminars & Courses	17-Sep-16	27-Oct-16	1
AOP	AOP Lab IOCR	5-Oct-15	5-Oct-15	0
AOP	AOP Payload 1 IOCR	31-Aug-15	10-Dec-15	3
AOP	AOP Payload 2 IOCR	12-May-16	9-Sep-16	4
AOP	AOP Payload 3 IOCR	19-Sep-16	11-Jan-17	4

N.B. milestones related to aggregated data products is still being worked
(1) activity in scope, but milestone was not in IMS

Following the NSF guidance to implement this replan, this change request addresses the following:

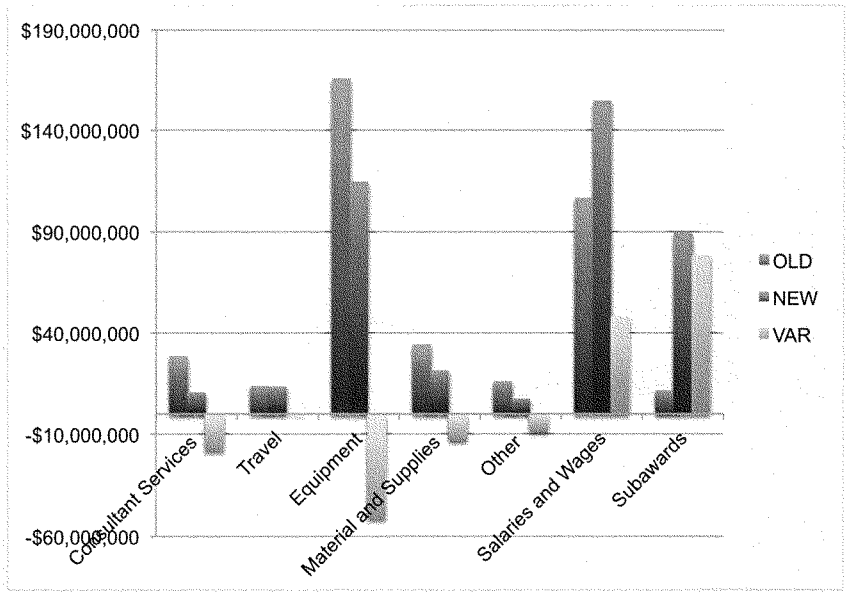
- Cost contingency: use $35,142,305 from cost contingency, which changes the cost contingency from $57,489,451 (before replan) to $22,347,144 (after replan).
- Schedule contingency: use 88 working days of schedule contingency (May 25th 2017 to September 30th 2017) and additional 3 months to change end date of Construction to end of Q1 FY18 (December 31st 2017), which changes the schedule contingency from 88 (before replan) to -60 (after replan).
- Performance: no changes to NEON scope or performance are requested with this CRE.

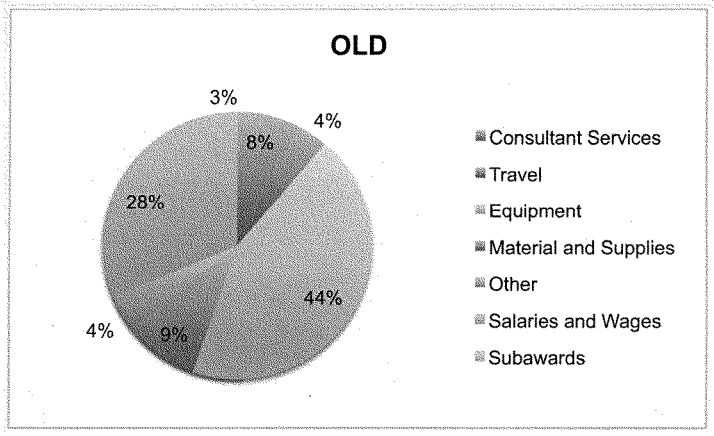
With the implementation of this CRE, NEON establishes a new cost baseline and a realistic construction schedule.

Analysis of BAC – per fastlane categories

As a consequence of the review of the EtC, the BAC changed. The following table provides an overview of the old and new BAC as well as the variance between the two. The graphs below provide the comparison between the EAC right before the replan and after. The following sections describe the reasons for the changes in each category.

	OLD	NEW	VAR	%
Salaries and Wages	$106,472,777	$154,336,584	$47,863,807	45%
Travel	$13,781,629	$13,430,219	$351,410	-3%
Consultant Services	$28,490,024	$10,542,714	$17,947,310	-63%
Equipment	$165,811,376	$114,522,769	$51,288,607	-31%
Material and Supplies	$34,326,067	$21,433,940	$12,892,126	-38%
Subawards	$11,411,318	$89,774,508	$78,363,190	687%
Other Direct Costs	$16,007,293	$7,402,053	$8,605,240	-54%
TOTAL	$376,300,482	$411,442,787	$35,142,305	9%


$190,000,000
$140,000,000
$90,000,000
$40,000,000
-$10,000,000
-$60,000,000
Consultant Services
Travel
Equipment
Material and Supplies
Other
Salaries and Wages
Subawards
OLD
NEW
VAR


OLD
3%
4%
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Consultant Services
Travel
Equipment
Material and Supplies
Other
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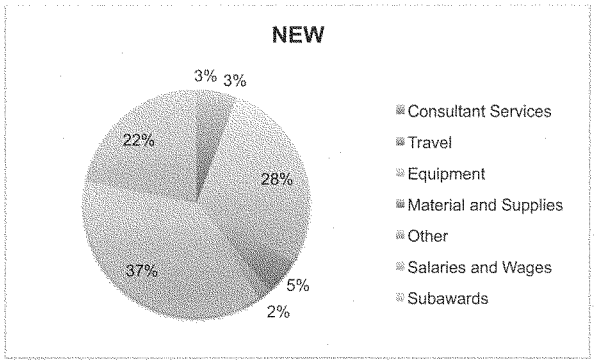

Salaries and wages

The updated labor costs were calculated using the resource loaded Integrated Master Schedule (IMS). The main reasons for the increase of $47,863,807 (45% increase) in this category is due to the following:

- Extension of the program duration: The increased duration of the program from five (5) to seven (7) years resulted in an extension of labor to cover the additional constructions years. The labor cost for 2 years based on the average of labor actuals from project inception to date is on the order of $52M.
- Delay in Transitioning to Operations: The requirements for the start of transitioning to Operations the completed Observatory capabilities were not met until end of 2014. As a primary consequence, Field Operations labor and the costs of the facilities were carried over for a longer period than anticipated in the original plans. The labor cost for this is $3.4M. Labor cost because of delay in transitioning EDU programs is $352K.
- Underestimated level of effort: the scope of CYI was underestimated for resulting in an increase of labor cost.

Synergies were also explored and implemented across the team in order to contain the increase, e.g. Systems Integration and Validation, Integrated Product Teams for sensor assembly designs and development of data products. The

	Old BAC	New BAC	Variance
FCC - 2.01	$6,123,311	$9,372,324	$3,249,013
ENG - 2.02	$2,815,332	$11,482,405	$8,667,074
CYI - 2.03	$16,349,702	$24,699,028	$8,349,326
PMO - 2.04.10	$4,465,359	$9,681,253	$5,215,894
PSE - 2.04.20	$630,305	$1,877,427	$1,247,123
PER - 2.04.30	$5,431,827	$3,362,987	$(2,068,840)
SCI - 2.04.70	$2,079,089	$3,549,430	$1,470,340
CLA - 2.04.75	$572,629	$321,629	$(251,000)

PMCS - 2.04.80	$3,848,195	$5,975,052	$2,126,857
FOPS - 2.04.95	$7,721,116	$11,895,390	$4,174,274
CVAL - 2.05	$1,376,335	$2,974,692	$1,598,357
EDU - 2.06	$7,746,710	$6,840,399	$(906,311)
SIV - 2.07	$20,102,472	$23,690,842	$3,588,370
PROD - 2.08	$3,024,108	$5,744,317	$2,720,209
DPS - 2.10	$4,305,289	$5,102,067	$796,778
FIU - 2.11	$3,914,580	$5,864,327	$1,949,747
FSU - 2.14	$5,256,165	$7,661,147	$2,404,982
AOP - 2.15	$5,611,733	$9,264,037	$3,652,303
AQU - 2.16	$5,098,520	$4,977,831	$(120,688)
TOTAL	**$106,472,777**	**$154,336,584**	**$47,863,807**

Travel

The travel plans for all WBS was re-evaluated using actuals leading to an overall decrease of the cost of this category by $351,410 (3% reduction). The reasons are:

- Use of a more refined basis of estimate. Prior to the replan, a parametric value was used to calculate the number and cost of trips. For the replan, the number of trips was reassessed with an emphasis on reducing the traveling requirements (duration, number of travels) and taking into account the travel destinations (use of GSA rates). As a result, the use of more accurate estimates led to a reduction of cost in this category.

In addition, a transfer of costs was performed between WBSs following a project reorganization performed in 2013, e.g. from 2.02 ENG to 2.07 SIV where also a refined estimate was used with subsequent reduction of cost.

	Old BAC	New BAC	Variance
FCC - 2.01	$2,212,395	$2,037,187	$(175,208)
ENG - 2.02	$5,472,087	$410,849	$(5,061,238)
CYI - 2.03	$352,246	$339,474	$(12,771)
PMO - 2.04.10	$503,385	$575,118	$71,733
PSE - 2.04.20	$ -	$2,976	$2,976
PER - 2.04.30	$615,258	$364,637	$(250,621)
SCI - 2.04.70	$272,687	$231,547	$(41,140)
CLA - 2.04.75	$50,484	$470	$(50,014)
PMCS - 2.04.80	$143,381	$39,214	$(104,167)
FOPS - 2.04.95	$389,418	$511,755	$122,337
CVAL - 2.05	$3,825	$18,057	$14,232
EDU - 2.06	$613,676	$571,642	$(42,034)
SIV - 2.07	$335,883	$4,816,027	$4,480,144
PROD - 2.08	$41	$45,440	$45,399
DPS - 2.10	$292,529	$139,191	$(153,337)
FIU - 2.11	$679,872	$845,032	$165,160
FSU - 2.14	$630,083	$1,466,802	$836,719

AOP - 2.15	$488,280	$445,272	$(43,008)
AQU - 2.16	$726,098	$569,526	$(156,571)
TOTAL	**$13,781,629**	**$13,430,219**	**$(351,410)**

Equipment

The Equipment category was reduced by $51,288,607 (31% reduction) mainly due to the following:

- A re-categorization of $46.4M from 2.01 FCC equipment related costs to Subawards. Same applies to $7.8M from 2.04.95 FOPS. This re-categorization was performed in order to follow the correct NSF cost categorization.
- The equipment costs for 2.03 CYI were reduced by $5M due to a more accurate basis of estimate using actuals and recent quotes instead of engineering estimates.
- ENG experienced $3.6M increase based on actuals.
- Other WBS resulted in an overall net increase of about $4.3M by using more accurate basis of estimate for both quantities and costs, e.g. use of actuals or average of relevant actuals.

In addition, three main transfers were performed to 2.08 PROD in order to centralize sensor procurements in this WBS:

- $33.3M from 2.11 FIU
- $6.8M from 2.16 AQU

	Old BAC	New BAC	Variance
FCC - 2.01	$73,006,977	$26,563,793	$(46,443,184)
ENG - 2.02	$70,232	$3,880,396	$3,810,164
CYI - 2.03	$18,948,054	$13,892,290	$(5,055,764)
PMO - 2.04.10	$761,720	$1,056,040	$294,319
PER - 2.04.30	$ -	$14,589	$14,589
PMCS - 2.04.80	$ -	$9,500	$9,500
FOPS - 2.04.95	$9,281,355	$1,489,445	$(7,791,911)
CVAL - 2.05	$676,010	$1,539,768	$863,758
EDU - 2.06	$785,123	$120,367	$(664,756)
SIV - 2.07	$ -	$561,132	$561,132
PROD - 2.08	$ -	$43,879,955	$43,879,955
DPS - 2.10	$32,219	$16,333	$(15,886)
FIU - 2.11	$33,912,440	$562,315	$(33,350,125)
MDP - 2.12	$2,343,743	$1,926,509	$(417,234)
FSU - 2.14	$38,366	$7,622	$(30,744)
AOP - 2.15	$16,164,974	$16,039,518	$(125,455)
AQU - 2.16	$9,790,163	$2,963,198	$(6,826,965)
TOTAL	**$165,811,376**	**$114,522,769**	**$(51,288,607)**

Materials

The Materials category was decreased by $12,892,126 (38% reduction) due to the following:

- $20.6M were moved from ENG to contingency (N.B. At the time of writing this CRE, it is evident that this amount should have been repurposed to PROD, but it was repurposed by increases seen in other categories).
- Increase of $4.9M in FOPS following recategorization of equipment into materials to follow the correct NSF cost categorization.
- Increase of $5.9M in SIV following the shift of Field Deployment scope from ENG to SIV and to take into account.

	Old BAC	New BAC	Variance
FCC - 2.01	$ -	$142,874	$142,874
ENG - 2.02	$28,815,934	$2,213,739	$(26,602,195)
CYI - 2.03	$356,084	$1,850,681	$1,494,597
PMO - 2.04.10	$13,493	$130,283	$116,790
PSE - 2.04.20	$153	$459	$306
PER - 2.04.30	$545,442	$283,692	$(261,750)
SCI - 2.04.70	$ -	$3,140	$3,140
CLA - 2.04.75	$1	$15,244	$15,242
PMCS - 2.04.80	$91,733	$64,034	$(27,699)
FOPS - 2.04.95	$896,770	$5,812,030	$4,915,260
CVAL - 2.05	$996,085	$1,202,410	$206,325
EDU - 2.06	$222,035	$372,428	$150,393
SIV - 2.07	$308,713	$6,287,436	$5,978,724
PROD - 2.08	$50,304	$109,621	$59,317
DPS - 2.10	$364,107	$55,213	$(308,894)
FIU - 2.11	$494,676	$752,139	$257,463
FSU - 2.14	$424,520	$228,377	$(196,143)
AOP - 2.15	$183,199	$812,908	$629,710
AQU - 2.16	$562,818	$1,097,230	$534,412
TOTAL	**$34,326,067**	**$21,433,940**	**$(12,892,126)**

Subawards

This category was significantly increased by $78,363,190 (about 690% increase) mainly due to:

- An increase of $69M in FCC following the re-categorization of the FCC equipment and other direct costs ($57.4M) to follow correct NSF cost categorization. The additional increase is due to new cost estimates that have used of a more accurate basis of estimate[1] which rely on actuals costs (or relevant averages) incurred to date.
- The reduction of non-committed $2.2M subawards in SCI
- An increase of $1.4M in laboratory analyses of field collected samples, following a more accurate basis of estimate using actuals;

[1] See Facilities and Civil Construction Basis of Estimate, NEON.DOC. 002270

- An increase of $3.7M in FOPS is due to transferring the consulting costs along with equipment costs(vendor supply) to subawards.
- An increase of $1.0M in FSU following a more accurate basis of estimate using actuals;
- An increase of $2M in AQU to outsource the construction of water wells and building/testing/integrating and delivery of Buoys; and
- An increase of $1.6M in EDU following the re-categorization of consultant services for web development and faculty/teacher summer salaries.

	Old BAC	New BAC	Variance
FCC - 2.01	$ -	$69,039,326	$69,039,326
PER - 2.04.30	$ -	$692,807	$692,807
SCI - 2.04.70	$2,207,758	$ -	$(2,207,758)
CLA - 2.04.75	$1,332,799	$2,746,298	$1,413,499
FOPS - 2.04.95	$ -	$3,747,118	$3,747,118
EDU - 2.06	$ -	$1,666,434	$1,666,434
FIU - 2.11	$ -	$348,364	$348,364
FSU - 2.14	$5,612,816	$6,629,034	$1,016,218
AOP - 2.15	$2,257,944	$2,908,596	$650,652
AQU - 2.16	$ -	$1,996,531	$1,996,531
TOTAL	**$11,411,318**	**$89,774,508**	**$78,363,190**

Other Direct Costs

Overall the ODC were reduced by $8,605,240 (54% reduction) primarily due to:

- A recategorization of $11M in FCC to subawards in order to reflect the actual procurement approach.
- An increase of $1.1M in FOPS to reflect actual costs of the domain support facilities.

	Old BAC	New BAC	Variance
FCC - 2.01	$11,502,924	$466,749	$(11,036,175)
ENG - 2.02	$196,411	$159,202	$(37,209)
CYI - 2.03	$ -	$278,580	$278,580
PMO - 2.04.10	$631,742	$1,172,714	$540,972
PER - 2.04.30	$1,257,135	$455,449	$(801,687)
SCI - 2.04.70	$ -	$45,813	$45,813
PMCS - 2.04.80	$80,616	$68,072	$(12,544)
FOPS - 2.04.95	$958,826	$2,086,061	$1,127,235
CVAL - 2.05	$9,000	$100,911	$91,911
EDU - 2.06	$134,889	$16,260	$(118,629)
SIV - 2.07	$116,536	$125,908	$9,372
PROD - 2.08	$148,428	$784,392	$635,964
DPS - 2.10	$-	$879	$879
FIU - 2.11	$43,961	$20,104	$(23,857)
FSU - 2.14	$901,768	$35,186	$(866,582)
AOP - 2.15	$25,013	$1,516,769	$1,491,756

AQU - 2.16	$43	$69,005	$68,962
TOTAL	**$16,007,293**	**$7,402,053**	**$(8,605,240)**

Consultant Services

This category was reduced by $17,947,310 (63% reduction) as a result of removing uncommitted funds from almost all WBSs. This category was overestimated in the original NEON baseline. The only areas that required additional funds were 2.01 FCC, 2.04.80 PMCS, 2.05 CVAL and 2.08 Production for consultant support activities and temp labor for manufacturing (i.e. temp assembly work).

	Old BAC	New BAC	Variance
FCC - 2.01	$27,500	$248,499	$220,999
ENG - 2.02	$1,456,878	$1,082,593	$(374,285)
CYI - 2.03	$11,848,137	$3,437,747	$(8,410,390)
PMO - 2.04.10	$512,769	$18,940	$(493,829)
PSE - 2.04.20	$59,541	$24,137	$(35,404)
PER - 2.04.30	$673,511	$486,448	$(187,062)
SCI - 2.04.70	$ -	$ -	$ -
PMCS - 2.04.80	$169,556	$386,748	$217,192
FOPS - 2.04.95	$1,364,949	$37,501	$(1,327,448)
CVAL - 2.05	$52,777	$96,433	$43,656
EDU - 2.06	$1,091,341	$335,759	$(755,583)
SIV - 2.07	$123,794	$68,565	$(55,229)
PROD - 2.08	$7,273	$2,017,586	$2,010,312
DPS - 2.10	$986,903	$13,007	$(973,896)
FIU - 2.11	$434,866	$420,423	$(14,443)
FSU - 2.14	$2,598,760	$1,011,867	$(1,586,893)
AOP - 2.15	$2,597,327	$620,384	$(1,976,943)
AQU - 2.16	$4,484,140	$236,077	$(4,248,063)
TOTAL	**$28,490,024**	**$10,542,714**	**$(17,947,310)**

Associated Risk or Opportunity (include # and description): not associated to a risk ID in the risk register. However the implementation of this CRE mitigates the programmatic risk of working on incorrect estimates to complete the construction project.

Schedule Impact: Absorb 88 days of schedule contingency and extend the project completion date through 3/31/2018. The project has therefore no schedule contingency and with this CRE is also requesting an extension of the end date of construction to 3/31/2018.

Cost Impact: $35,142,305

Contingency Impact: $35,142,305 will be drawn from contingency

NEON CCB Approval:

Kathy Kirby – Deputy Project Manager	6/5/15 Date
Larry Davidson – Project Engineer	6/5/15 Date
Hanne Buur – Project Systems Engineer	6/5/2015 Date
Andrea Thorpe – Project Scientist	6/5/2015 Date
Jill Ryan – Director of PMCS	6/5/15 Date

NEON CCB Chair Final Approval:

Javier Marti, NEON Project Manager	6/5/15 Date

NEON Change Request - NSF Approval Request

Date Submitted	6/5/2015	**Award**	1029808
CRE Title	Cost and Schedule Baseline Re-plan Application for Cost	**CRE #**	2.04.0085
WBS Title	Total Program	**WBS**	2-04

Reason for required NSF Approval:	☒ Contingency request above $150,000 threshold	☐ Schedule delay beyond 45 days	☐ Other

NSF Approval:

Elizabeth Blood, NEON Program Officer — Date 7/28/15

Comments:

Appendix II

Additional Material for the Record

DOCUMENT SUBMITTED BY REPRESENTATIVE LOUDERMILK

CATO INSTITUTE
Tax & Budget BULLETIN
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Federal Government Cost Overruns

Chris Edwards and Nicole Kaeding, Cato Institute

The federal government has hundreds of agencies and thousands of programs, and it now spends almost $4 trillion a year. The government has grown too large to manage efficiently. Agencies have little incentive to control costs or improve quality, and Congress does a poor job of overseeing the executive branch to ensure good performance. As a result, many federal agencies suffer from wasteful spending practices.[1]

One aspect of federal waste is frequent cost overruns on major projects, such as weapon systems and infrastructure. If a government project is initially estimated to cost $1 billion, it may end up costing $2 billion by the time it is finished. This essay looks at the causes of cost overruns, and examines some of the budget areas that have the most serious problems, including defense, energy, and transportation.

Scope of the Problem

The federal government proceeds with large projects on the basis of estimated costs, but once projects get underway officials often revise the costs upward. Cost overruns have plagued the federal government since the beginning. Way back in 1836, for example, a Ways and Means Committee report criticized infrastructure spending by the Army Corps of Engineers. All 25 projects reviewed by the committee that year were overbudget, and "many" had cost overruns of 50 percent or more.[2]

Economists Stanley Engerman and Kenneth Sokoloff studied a sample of major government infrastructure projects in U.S. history and found that most had substantial cost overruns.[3] The construction of the Erie Canal between 1817 and 1825, for example, went 46 percent overbudget, while the canal's later expansion went 142 percent overbudget.

In recent years, many federal projects have had large cost overruns. The cost to create the Healthcare.gov website launched in 2013 grew from $464 million to $824 million.[4] The International Space Station more than quadrupled in cost from $17 billion to $74 billion.[5] The Capitol Visitor Center in Washington soared in cost from an initial $265 million to $621 million by the time it was completed in 2008.[6]

Cost overruns have plagued hospital construction by the Department of Veterans Affairs.[7] A hospital currently being built in Orlando has more than doubled in cost from $254 million to $616 million. And a hospital being built near Denver has quintupled in cost from $328 million to $1.7 billion.

Cost overruns on government projects are a global phenomenon.[8] For example, construction costs for Olympic Games often escalate, with the 2012 London Olympics doubling in cost, and the 1992 Barcelona Olympics quadrupling in cost.[9] Describing government infrastructure, the World Bank concluded, "studies show a history of extensive cost and time overruns in construction projects across the sectors and in countries around the world. . . . The rising expense can be crippling for governments, particularly in developing countries as they try to improve basic services."[10]

A leading expert on cost overruns is Bent Flyvbjerg, a Danish professor of planning. His co-authored 2003 book, *Megaprojects and Risk*, concluded that "cost overruns of 50 percent to 100 percent in real terms are common in megaprojects."[11] In one of his studies, Flyvbjerg looked at 258 large transportation projects across 20 countries.[12] He found that 90 percent went overbudget.

Another study by a team at Oxford University looked at 245 dam projects across 65 countries.[13] The study found that average construction costs were 96 percent higher than originally budgeted, in constant dollars. Thus, real dam costs have typically doubled from the original estimates.

This issue is important because the true costs of projects determine whether or not they make economic sense. On the Oxford study, for example, the average projected benefits of the dams was just 40 percent higher than the originally estimated costs. Since the costs, on average, rose 96 percent, the study concluded that large dams are not economically viable in most cases.

Unfortunately, government policymakers and planners do not seem to learn from past mistakes. Flyvbjerg finds that the magnitude of cost overruns on major projects has not declined over time.[14] Engerman and Sokoloff come to similar conclusions.[15] So there appear to be systematic factors that induce governments to either consistently mismanage projects, low-ball initial cost estimates, or both.

Causes of Cost Overruns

There are technical reasons why cost overruns may occur on major projects. The costs of materials, labor, or other inputs may change in unexpected ways. Projects may face delays for reasons not envisioned. Project planners may have "optimism bias," meaning that they are eager for a positive result and overlook possible problems.

However, expert planners and engineers should consider contingencies and include leeway in their initial cost estimates. They should study prior projects, consider risk factors, and construct conservative estimates. Optimism should be tempered by experience in dealing with problems on previous projects. If planners did make realistic projections based on experience, one would expect that, in a sample of projects, the errors in cost estimating would go both ways—some projects would be underbudget and some would be overbudget.

However, that is not what happens with large government projects. In studying hundreds of projects, Flyvbjerg and his colleagues conclude that the differences in initial and final cost figures "are too consistent and too one-sided for this."[16] Projects generally run overbudget, not underbudget.

The cost overrun problem has not diminished over time. Yet, as Flyvbjerg notes, "it seems unlikely that a whole profession of forecasting experts would continue to make the same mistakes decade after decade instead of learning from their actions."[17] So he concludes that project promoters purposely low-ball initial cost estimates to increase the likelihood of project approval. Flyvbjerg calls this "strategic misrepresentation."

With the federal government, there are structural incentives that encourage both low-balled estimates and a lack of cost control on projects once they are underway. Unlike businesses, federal agencies do not have to earn profits, so they have little reason to restrain costs. A 2014 Government Accountability Office (GAO) report on Department of Defense (DoD) contracting noted:

> In DoD, there can be few consequences if funds are not used efficiently. For example, as has often been the case in the past, agency budgets generally do not fluctuate much year to year and, programs that experience problems tend to eventually receive more funding to get well.[18]

Another problem in the government is that disciplining managers is difficult because of strong civil service and union protections. Just 0.5 percent of federal workers get fired each year, which is just one-sixth the private-sector firing rate.[19] Also, federal pay is generally tied to longevity, not performance. As a result, federal managers do not have strong incentives to ensure that projects are executed on time and on budget.

Now consider the incentives in Congress. Members are inclined to support expensive federal projects that benefit voters in their districts and states, even when projects make no sense for the overall nation. Cost overruns may generate some negative publicity, but they also create benefits for politicians because they mean more spending in affected congressional districts.

Alan Stern, a former associate administrator of the National Aeronautics and Space Administration (NASA), pointed to numerous bureaucratic and political reasons for chronic cost overruns:

> Endemic project cost increases at NASA begin when scientists and engineers (and sometimes Congress) burden missions with features beyond what is affordable in the stated budget. The problem continues with managers and contractors who accept or encourage such assignments, expecting to eventually be bailed out. It is worsened by managers who disguise the size of cost increases that missions incur. Finally, it culminates with scientists who won't cut their costs and members of Congress who accept steep increases to protect local jobs.[20]

Flyvbjerg and his colleagues conclude that "project promoters routinely ignore, hide, or otherwise leave out important project costs and risks in order to make total costs appear low."[21] Put another way, politicians, officials, and contractors use "salami tactics." They present artificially low costs up front to gain initial funding, and then higher costs are revealed later on one slice at a time when projects are too far along to be canceled.

Martin Wachs, an infrastructure expert at RAND Corporation, has come to similar conclusions about the causes of cost overruns:

> I have interviewed public officials, consultants, and planners who have been involved [in transit projects and ridership forecasting] and I am absolutely convinced that the cost overruns and patronage overestimates were not the result of technical errors, honest mistakes, or inadequate methods. In case after case, planners, engineers, and economists have told me that they had to 'revise' their forecasts many times because they

> failed to satisfy their superiors. The forecasts had to be 'cooked' in order to produce numbers that were dramatic enough to gain federal support for projects whether or not they could be fully justified on technical grounds.[22]

William Ibbs, a professor of construction management at the University of California, Berkeley, concurs that governments often lowball initial cost estimates to help get projects underway: "I'm not saying they're committing fraud, but let's say they're overly optimistic. . . . They'll get the work going and then the public will be reluctant to cancel a project because they've spent all this money so far."[23]

Former San Francisco mayor Willie Brown has been even more blunt than Ibbs or Wachs. In a 2013 opinion piece, he described the sources of cost overruns on projects in his city:

> News that the Transbay Terminal is something like $300 million over budget should not come as a shock to anyone. We always knew the initial estimate was way under the real cost. Just like we never had a real cost for the Central Subway or the Bay Bridge or any other massive construction project. So get off it. In the world of civic projects, the first budget is really just a down payment. If people knew the real cost from the start, nothing would ever be approved. The idea is to get going. Start digging a hole and make it so big, there's no alternative to coming up with the money to fill it in.[24]

Brown was in the California assembly for 30 years and mayor of San Francisco for 8 years, so he knows how the government works. He is saying that officials provide the public with fake initial estimates to get projects approved, and then projects are moved ahead before the truth is known so that there is no turning back. Note that major shares of funding for San Francisco's Transbay Transit Terminal and Central Subway came from the federal government.[25]

Defense Projects

The Department of Defense has long struggled with cost overruns. As one of the first major procurements under the Constitution, the government bought six Navy frigates in 1794. The ships were projected to cost $688,889, but a myriad of problems pushed the ultimate cost up 70 percent to $1,176,721.[26]

Over the decades, that pattern has been repeated many times. The Pentagon building itself, constructed in Virginia in the 1940s, "was built upon a foundation of lies, secrecy, and cost overruns."[27] The Pentagon building ending up costing $75 million to build, more than double the original estimate of $35 million.

In 2006 Comptroller General David Walker said that the Pentagon has "a long-standing track record of over-promising and under-delivering with virtual impunity."[28] In 2008 the GAO found, "DoD's major weapon system programs continue to take longer, cost more, and deliver fewer quantities and capabilities than originally planned."[29] And in 2014 the GAO noted, "Weapon systems acquisition has been on GAO's high risk list since 1990. . . . While some progress has been made on this front, too often we report on the same kinds of problems today that we did over 20 years ago."[30]

Congress has made some reforms to help reduce defense cost overruns, but the problem does not seem to have diminished. For 91 major programs the GAO examined in 2005, R&D costs were 33 percent overbudget, on average, and procurement costs were 18 percent overbudget.[31] For 78 major programs examined in 2014, R&D costs were 53 percent overbudget, and procurement costs were 46 percent overbudget.[32] These overruns are measured in constant dollars.

Policymakers often blame the Pentagon's use of cost-plus or cost-reimbursement contracts—rather than fixed-price contracts—as a key problem. Cost-plus contracts seem to give a "blank check" to contractors because they allow costs to rise over time. And, indeed, studies find that cost-plus contracts typically have more cost growth than do fixed-price contracts.[33]

However, some experts argue that a greater use of fixed-price contracts would not necessarily reduce overall procurement costs.[34] Producing advanced weapons is a complex activity, which makes it difficult to set tight up-front parameters. As a result, fixed-price contracts are often modified to add new capabilities, which tends to push up overall costs.[35] So finding the best solution for Pentagon contracting is not easy, and different types of contracts are likely appropriate for different types of procurement.

Nonetheless, there is wide agreement that current DoD procurement suffers from a bloated bureaucracy and excess paperwork, and it moves far too slowly.[36] The system produces results biased strongly toward cost overruns. Consider the Joint Strike Fighter, or F-35, which is the Pentagon's largest acquisition program at almost $400 billion. Real, per-unit costs of the fighters have soared 75 percent since 2001, as shown in Table 1.[37]

Another high-profile cost overrun was the purchase of new Marine One helicopters for the president. The VH-71 project began in 2002, and then estimated costs began to rise, eventually doubling from $6.5 billion to $13 billion.[38] The GAO pinned the blame on DoD mismanagement.[39] Fortunately, the DoD scrapped the VH-71 program in 2009, but after $3.2 billion had already been spent.[40]

In sum, the Pentagon and Congress share the blame for ongoing problems in defense procurement. The GAO says that the military branches "overpromise capabilities and underestimate costs to capture the funding needed to start and sustain development programs."[41]

As for Congress, many members fight attempts to restrain spending in their districts, including spending on weapons that the Pentagon does not want. As defense analyst Winslow Wheeler noted in his book about the dysfunction in military budgeting, gaining parochial advantage "has become a full-time preoccupation that permeates Congress's activities and members' decisionmaking processes."[42]

Table 1. Sampling of Defense Cost Overruns

Defense Projects[43]	Cost Estimate and Date of Estimate	
	Original	Recent or Final
Littoral Combat Ship	$360m (2004)	$667m (2014)
Evolved Expendable Launch Vehicle	$102m (1998)	$376m (2013)
Joint Strike Fighter	$79m (2001)	$138m (2013)
JPALS Landing System	$29m (2008)	$77m (2014)
G/ATOR Radar	$24m (2005)	$61m (2014)

Notes: Costs in this table are per-unit in constant 2015 dollars. By contrast, Tables 2 and 3 show total costs in nominal dollars. m=million.

Energy Projects

Mismanagement is pervasive in the Department of Energy (DOE). The largest part of DOE's budget is spending on the National Nuclear Security Administration (NNSA), which handles the safety of America's nuclear weapons stockpile. NNSA activities are plagued with cost overruns.[44] For example, "costs have skyrocketed for the Mixed Oxide Fuel Fabrication Facility at the Savannah River plant in South Carolina."[45] When the NNSA began this program in 2002, it was expected to cost $1 billion, but by 2014 costs had soared more than seven-fold to $7.8 billion. The project has already consumed $5 billion in taxpayer funding, and a group of outside experts is now calling for it to be cancelled.[46]

The second largest part of DOE's budget is spending to clean up federal nuclear weapon sites. This activity has cost a remarkable $150 billion or more since 1990.[47] Unfortunately, "efforts to treat and dispose of high-level waste have been plagued with false starts and failures, resulting in steadily growing estimates of the program's total cost," noted GAO.[48]

In 2008 GAO found that "nine of 10 cleanup projects we reviewed have experienced cost increases and schedule delays in their life cycle baseline, ranging from $139 million for one project to more than $9 billion for another, and schedule delays ranging from 2 years to 15 years."[49] The largest nuclear site cleanup is at Hanford in Washington State. A key waste treatment plant at Hanford ballooned in cost from $4.3 billion in 2000 to $13.4 billion by 2012, as shown in Table 2.[50]

Federal energy research has been another black hole for taxpayer dollars. One boondoggle was the Illinois-based FutureGen. It was launched in 2003 to build a low-emission coal power plant and demonstrate carbon capture technologies. It was originally estimated to cost $950 million, but by 2008 the cost had ballooned to $1.8 billion.[51] The George W. Bush administration wisely cancelled it. But in 2010, the Obama administration revived the project, which it dubbed FutureGen 2.0. This version of the project also went overbudget, and was eventually cancelled in 2015.[52] The project made no economic sense, but was sustained for years by the dogged efforts of Illinois members of Congress.

Table 2. Sampling of Energy Cost Overruns

Energy Projects	Cost Estimate and Date of Estimate	
	Original	Recent or Final
Hanford waste site[53]	$4.3b (2000)	$13.4b (2012)
Superconducting Supercollider[54]	$4.4b (1987)	$11.8b (1993)
NNSA-Savannah River[55]	$1.0b (2002)	$7.8b (2014)
National Ignition Facility[56]	$2.1b (1995)	$5.3b (2014)
Clinch River Reactor[57]	$400m (1971)	$4.0b (1983)
FutureGen clean coal[58]	$950m (2003)	$1.8b (2008)

Note: m=million, b=billion.

Transportation Projects

Cost overruns on transportation projects have plagued American governments since at least the 19th century. The Erie Canal, which opened in 1825, suffered a large cost overrun, as noted, but in the end it turned out to be an economic success. The problem was what happened next: the Erie's success prompted politicians in Michigan, Pennsylvania, Ohio, Indiana, Maryland, and Illinois to spend lavishly on their own, often dubious, canal schemes.[59] The states overestimated the demand for canals and underestimated the construction costs. Routes were

often chosen for political reasons, not to maximize economic benefits. It turned out that the Erie Canal was a uniquely high-return route, while nearly all the rest of the state-sponsored canals in the 19th century were boondoggles that created large taxpayer losses.

Today's equivalent of boondoggle canals is urban rail systems, which cost federal taxpayers $13 billion a year.[60] Federally funded rail projects have long been prone to cost overruns and inflated ridership projections. A 1990 Department of Transportation (DOT) report examined the costs of 10 large rail projects.[61] Nine of the projects had cost overruns, and the average overrun was 50 percent.

Little has changed since that study. Martin Wachs, the RAND infrastructure expert, says, "of 35 public transit projects I have studied in the U.S., 33 overestimated patronage [ridership] and 28 underestimated costs."[62] A recent study by Randal O'Toole and Michelangelo Landgrave looked at the costs of 45 urban rail projects across the nation since the 1980s.[63] They found that, on average, rail projects doubled in cost between when they were approved and when they were completed.

Looking internationally at a sample of 58 rail projects, Flyvbjerg and colleagues found that the average cost overrun, in constant dollars, was 45 percent.[64] On the benefits of rail projects, they found that ridership was 51 percent less, on average, than originally estimated. O'Toole and Landgrave find a similar overestimate of ridership.

Both studies found that cost overruns on rail projects have not diminished over time. Looking at transportation projects overall, Flyvbjerg and colleagues concluded, "The use of deception and lying as tactics aimed at getting projects started appears to best explain why costs are highly and systematically underestimated and benefits overestimated in transport infrastructure projects."[65]

One current project with a large cost overrun is the East Side Access train tunnel in New York City between Queens and Manhattan. The original proposal in 1999 put the cost at $4.3 billion and completion by 2009. But now the project is expected to cost $10.8 billion and be completed by 2023, as shown in Table 3.[66] Federal taxpayers will pay $2.7 billion of the project's bill.

Another troubled project is the World Trade Center rail station in New York. When completed this year, the station will have cost about $4 billion, double the original estimate of $2 billion.[67] The *Wall Street Journal* found that political infighting and the conflicting demands of numerous government agencies pushed up the costs. It concluded that the station is "a project sunk in a morass of politics and government."[68]

The morass of transportation bureaucracy is made worse by federal involvement in state and local projects. GAO points to the "fragmented approach as five DOT agencies with 6,000 employees administer over 100 separate programs with separate funding streams for highways, transit, rail, and safety functions. This fragmented approach impedes effective decision making and limits the ability of decisionmakers to devise comprehensive solutions to complex challenges."[69] By adding more officials and more paperwork, federal involvement in state projects reduces accountability and encourages cost overruns.

Table 3. Sampling of Transportation Cost Overruns

Transportation Projects	Cost Estimate and Date of Estimate	
	Original	Recent or Final
Boston Big Dig[70]	$2.6b (1985)	$14.6b (2005)
NYC East Side Access[71]	$4.3b (1999)	$10.8b (2014)
San Francisco Bay Bridge[72]	$1.4b (1996)	$6.3b (2013)
Denver International Airport[73]	$2.1b (1990)	$4.8b (1995)
NYC WTC Rail Station[74]	$2.0b (2004)	$4.0b (2015)
Denver West Light Rail[75]	$250m (1997)	$707m (2013)
VA-Springfield Interchange[76]	$241m (1994)	$676m (2003)

Note: m=million, b=billion.

Conclusions

Cost overruns on large government projects are pervasive. The problem appears to stem from a mixture of deception and mismanagement, and it has not diminished over time. One of the consequences is that taxpayers are likely footing the bill for many projects that cost more than the benefits delivered. Flyvbjerg argues that cost overruns result in the "survival of the unfittest," meaning that projects with the most exaggerated benefits and low-balled costs get approved, rather than the most worthy ones.[77]

To help cure the cost overrun disease, the federal government should increase transparency in major contracting. Agencies should release details about proposed projects early in the process, and they should actively solicit critiques of projects from independent engineers and economists.

Federal agencies should also benchmark the costs and schedules of proposed projects against similar past projects to inject more realism into planning.[78] And agencies should perform detailed evaluations of projects after they are completed, so that policymakers and contractors can learn from them and avoid mistakes in the future.

The gains from such improved efficiencies would be large. A McKinsey Global Institute study looked at hundreds of infrastructure projects worldwide, and found that productivity could be improved by up to 60 percent by better project selection, more efficient permitting and construction, and better use of existing assets.[79]

In the United States, productivity would be improved by decentralizing funding and decisionmaking for projects out of Washington whenever possible. Energy research should be left to the private sector. Urban transit should be left to local governments and the private sector. Highway funding should be left to state governments and the private sector.

It is true that cost overruns and other inefficiencies are a risk on all types of large projects, whoever undertakes them. But the federal government's track record on major project management is particularly poor, and many federal agencies do not learn from past mistakes. By using their own funding, state and local governments and the private sector would have stronger incentives to minimize costs and reduce delays on major investment projects.

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[1] These issues are discussed in Chris Edwards, "Why the Federal Government Fails," Cato Institute Policy Analysis no. 777, July 27, 2015.

[2] The report is excerpted in Chester Collins Maxey, "Log-Rolling," Thesis for Master of Arts, University of Wisconsin, 1914, p. 38. And see Todd Shallat, "Success through Failure," *Water Resources Impact,* American Water Resources Association, January 2003.

[3] Stanley L. Engerman and Kenneth L. Sokoloff, "Digging the Dirt at Public Expense: Governance in the Building of the Erie Canal and Other Public Works," National Bureau of Economic Research, Working Paper 10965, December 2004, Table 1.

[4] Department of Health and Human Services, Office of the Inspector General, "Federal Marketplace: Inadequacies in Contract Planning and Procurement," January 2015, p. 18.

[5] A NASA report found, "The final configuration of the ISS cost more, took longer to complete, and is less capable than NASA and its partners envisioned. NASA originally estimated assembly of the station would be complete by 2002 at a total cost to the agency of $17.4 billion. However, construction was not completed until 2011, and through fiscal year (FY) 2013 the agency has spent approximately $74.4 billion." National Aeronautics and Space Administration, Office of Inspector General, "Extending the Operational Life of the International Space Station Until 2024," September 18, 2014.

[6] Ashley Halsey III, "6 Years Later, Capitol Visitor Center Puts Out Long-Awaited Welcome Mat," *Washington Post*, December 1, 2008.

[7] Government Accountability Office, "VA Construction: Actions to Address Cost Increases and Schedule Delays at Denver and Other VA Major Medical-Facility Projects," GAO-15-564T, April 24, 2015, p. 4.

[8] In Britain, a think tank examined 240 large U.K. government projects and found an average cost overrun of 38 percent. See Taxpayers' Alliance, "Out of Control: How the Government Overspends on Capital Projects," November 20, 2009.

[9] Bent Flyvbjerg and Allison Stewart, "Olympic Proportions: Cost and Cost Overrun at the Olympics 1960–2012," Saïd Business School Working Papers, University of Oxford, June 2012.

[10] The World Bank, News, "Construction Sector Transparency Program Goes Global," November 8, 2012.

[11] Bent Flyvbjerg, Nils Bruzelius, and Werner Rothengatter, *Megaprojects and Risk: An Anatomy of Ambition* (Cambridge, UK: Cambridge University Press, 2003), p. 136. The authors discuss some private projects, but their main focus is government projects.

[12] Bent Flyvbjerg, Mette Skamris Holm, and Soren Buhl, "Underestimating Costs in Public Works Projects: Error or Lie?" *Journal of the American Planning Association* 68, no. 3 (2002).

[13] Atif Ansar et al., "Should We Build More Large Dams? The Actual Costs of Hydropower Megaproject Development," *Energy Policy* 69 (2014).

[14] Bent Flyvbjerg, Nils Bruzelius, and Werner Rothengatter, *Megaprojects and Risk: An Anatomy of Ambition* (Cambridge, UK: Cambridge University Press, 2003), p. 16.

[15] Stanley L. Engerman and Kenneth L Sokoloff, "Digging the Dirt at Public Expense: Governance in the Building of the Erie Canal and Other Public Works," National Bureau of Economic Research, Working Paper 10965, December 2004, p. 31.

[16] Bent Flyvbjerg, Nils Bruzelius, and Werner Rothengatter, *Megaprojects and Risk: An Anatomy of Ambition* (Cambridge, UK: Cambridge University Press, 2003), p. 45.

[17] Bent Flyvbjerg, "Survival of the Unfittest: Why the Worst Infrastructure Gets Built, and What We Can Do about It," *Oxford Review of Economic Policy* 25, no. 3 (2009), p. 351.

[18] Government Accountability Office, "Defense Acquisitions: Addressing Incentives Is Key to Further Reform Efforts," GAO-14-563T, April 30, 2014, p. 8.

[19] Andy Medici, "Federal Employee Firings Hit Record Low in 2014," www.federaltimes.com, February 24, 2015. And see Chris Edwards, "Federal Firing Rate by Department," Cato@Liberty, Cato Institute, June 6, 2014.

[20] Alan Stern, "NASA's Black Hole Budgets," *New York Times*, November 23, 2008.

[21] Bent Flyvbjerg, Mette Skamris Holm, and Soren Buhl, "Underestimating Costs in Public Works Projects: Error or Lie?" *Journal of the American Planning Association* 68, no. 3 (2002).
[22] Quoted in Stanley L. Engerman and Kenneth L. Sokoloff, "Digging the Dirt at Public Expense: Governance in the Building of the Erie Canal and Other Public Works," National Bureau of Economic Research, Working Paper 10965, December 2004, p. 29.
[23] Antonio Olivo and Katherine Shaver, "Why Costs Often Creep on Public-Works Projects," *Washington Post*, May 14, 2014.
[24] Willie L. Brown, Jr, "When Warriors Travel to China, Ed Lee Will Follow," *San Francisco Chronicle*, July 27, 2013.
[25] Transbay Transit Center, "FAQs," http://transbaycenter.org/project/faqs. And see Central Subway, "Project Funding/Budget," www.centralsubwaysf.com/content/project-fundingbudget.
[26] Joseph Fordham, U.S. Naval Institute, "#PlatformsMatter—The Rebirth of the U.S. Navy: A Fleet of Frigates to Equal None," Naval History Blog, March 27, 2014.
[27] James Mann, "The House That War Built," *Washington Post*, June 17, 2007.
[28] R. Jeffrey Smith, "Tanker Inquiry Finds Rumsfeld's Attention Was Elsewhere," *Washington Post*, June 20, 2006.
[29] Government Accountability Office, "Defense Acquisitions: Better Weapon Program Outcomes Require Discipline, Accountability, and Fundamental Changes in the Acquisition Environment," GAO-08-782T, June 3, 2008, p. 1.
[30] Government Accountability Office, "Defense Acquisitions: Addressing Incentives Is Key to Further Reform Efforts," GAO-14-563T, April 2014, p. 1.
[31] Government Accountability Office, "Defense Acquisitions: Better Weapon Program Outcomes Require Discipline, Accountability, and Fundamental Changes in the Acquisition Environment," GAO-08-782T, June 3, 2008, p. 5.
[32] Government Accountability Office, "Defense Acquisitions: Assessments of Selected Weapon Programs," GAO-15-342SP, March 2015, p. 170.
[33] Joachim Hofbauer, Gregory Sanders, Jesse Ellman, and David Morrow, "Cost and Time Overruns for Major Defense Acquisition Programs," Center for Strategic and International Studies, April 2011.
[34] Chong Wang and Joseph San Miguel, "Unintended Consequences of Advocating Use of Fixed-Price Contracts in Defense Acquisition Practice," Naval Postgraduate School Acquisition Research Symposium, April 30, 2011.
[35] Department of Defense, "Performance of the Defense Acquisition System: 2014 Annual Report," June 13, 2014.
[36] Charles Josef Duch, "Pentagon Purchasing Is Overdue for an Overhaul," op-ed, *Wall Street Journal*, July 23, 2015.
[37] Government Accountability Office, "Defense Acquisitions: Assessments of Selected Weapon Programs," GAO-15-342SP, March 2015.
[38] Government Accountability Office, "Defense Acquisitions: Applications of Lessons Learned and Best Practices in the Presidential Helicopter Program," GAO-11-380R, March 2011.
[39] Ibid.
[40] Christopher Drew, "Work Halted on Helicopter for President," *New York Times*, May 15, 2009.
[41] Government Accountability Office, "Defense Acquisitions: Better Weapon Program Outcomes Require Discipline, Accountability, and Fundamental Changes in the Acquisition Environment," GAO-08-782T, June 3, 2008, highlights page.
[42] Winslow T. Wheeler, *The Wastrels of Defense* (Annapolis: Naval Institute Press, 2004), p. 83.
[43] These projects were selected from Government Accountability Office, "Defense Acquisitions: Assessments of Selected Weapon Programs," GAO-15-342SP, March 2015.
[44] For example, see Hans M. Kristensen, "B61-12: NNSA's Gold-Plated Nuclear Bomb Project," Federation of American Scientists, July 26, 2012.
[45] Walter Pincus, "The Explosive Cost of Disposing of Nuclear Weapons," *Washington Post*, July 3, 2013.
[46] Steven Mufson, "Energy Secretary is Urged to Halt Nuclear Fuel Program," *Washington Post*, September 9, 2015.
[47] Author's calculations based on *Budget of the U.S. Government, Fiscal Year 2016* (Washington: Government Printing Office, 2015), Public Budget Database.
[48] Government Accountability Office, "Nuclear Waste: Challenges to Achieving Potential Savings in DOE's High-Level Waste Cleanup Program," GAO-03-593, June 2003, p. 17.
[49] Government Accountability Office, "Nuclear Waste: Action Needed to Improve Accountability and Management of DOE's Major Cleanup Projects," GAO-08-1081, September 2008, p. 5.
[50] Government Accountability Office, "Hanford Waste Treatment: DOE Needs to Take Action to Resolve Technical and Management Challenges," GAO-13-38, December 2012, p. 14.
[51] Matthew L. Wald, "Higher Costs Cited as U.S. Shuts Down Coal Project," *New York Times*, January 31, 2008.

[52] Peter Folger, "FutureGen: A Brief History and Issues for Congress," Congressional Research Service, R43028, April 3, 2013, p. 3.
[53] Government Accountability Office, "Hanford Waste Treatment Plant: DOE Needs to Take Action to Resolve Technical and Management Challenges," GAO-13-38, December 2012, p. 14.
[54] Robert Lee Hotz and Lianne Hart, "A Costly Monument to 'Big Science' Difficulties," *Los Angeles Times,* October 21, 1993.
[55] Walter Pincus, "The Explosive Cost of Disposing of Nuclear Weapons," *Washington Post*, July 3, 2013.
[56] Kenneth Chang and William J. Broad, "Giant Laser Complex Makes Fusion Advance, Finally," *New York Times*, February 12, 2014.
[57] Congressional Budget Office, "Comparative Analysis of Alternative Financing Plans for the Clinch River Breeder Reactor Project," September 20, 1983. The $400 million initial estimate was from the Atomic Energy Commission.
[58] Matthew L. Wald, "Higher Costs Cited as U.S. Shuts Down Coal Project," *New York Times*, January 31, 2008.
[59] Burton W. Folsom, Jr. and Anita Folsom, *Uncle Sam Can't Count* (New York: Broadside Books, April 2014), Chapter 3.
[60] *Budget of the U.S. Government, FY2016, Analytical Perspectives* (Washington: Government Printing Office, 2015), Table 29-1.
[61] Don H. Pickrell, "Urban Rail Transit Projects: Forecast Versus Actual Ridership and Costs," U.S. Department of Transportation, DOT-T-91-04, October 1990.
[62] Martin Wachs, RAND Corporation, "Political Aspects of Forecasting: Explaining and Controlling 'Optimism Bias' in Transportation Forecasts," U.S. Department of Transportation Workshop for Transportation Forecasters, September 2009.
[63] Randal O'Toole and Michelangelo Landgrave, "Rails and Reauthorization," Cato Institute Policy Analysis no. 772, April 21, 2015.
[64] Bent Flyvbjerg, "Survival of the Unfittest: Why the Worst Infrastructure Gets Built, and What We Can Do about It," *Oxford Review of Economic Policy* 25, no. 3 (2009), p. 346.
[65] Bent Flyvbjerg, Nils Bruzelius, and Werner Rothengatter, *Megaprojects and Risk: An Anatomy of Ambition* (Cambridge, UK: Cambridge University Press, 2003), p. 47.
[66] Alfonso A. Castillo, "East Side Access Completion Date Extended—Again," *Newsday*, January 27, 2014. And see Federal Transit Administration, "PMOC Monthly Report—East Side Access Project," January 2015, p. 12.
[67] Eliot Brown, "Complex Design, Political Disputes Send World Trade Center Rail Hub Cost Soaring," *Wall Street Journal*, September 3, 2014.
[68] Eliot Brown, "Complex Design, Political Disputes Send World Trade Center Rail Hub Cost Soaring," *Wall Street Journal*, September 3, 2014.
[69] Government Accountability Office, "Opportunities to Reduce Potential Duplication in Government Programs, Save Tax Dollars, and Enhance Revenue," GAO-11-318SP, March 2011, p. 48.
[70] *Boston Globe's* "Easy Pass" series of reports by Raphael Lewis and Sean Murphy, www.boston.com/globe/metro/packages/bechtel.
[71] Alfonso A. Castillo, "East Side Access Completion Date Extended—Again," *Newsday*, January 27, 2014.
[72] News to the Next Power, Prepared for the California Senate Transportation and Housing Committee, "The San Francisco-Oakland Bay Bridge: Basic Reforms for the Future," July 2014, p. 4.
[73] Government Accountability Office, "Denver International Airport," GAO/T-RCED/AIMD-95-184, May 11, 1995, p. 6.
[74] David Dunlap, "How Cost of Train Station at World Trade Center Swelled to $4 Billion," *New York Times*, December 2, 2014.
[75] Randal O'Toole, "Has RTD's FasTracks Been Worth It? No," *Denver Post*, op-ed, April 28, 2013.
[76] Michael Shear, "Springfield Interchange Project Is Defended," *Washington Post*, November 26, 2002.
[77] Bent Flyvbjerg, "Survival of the Unfittest: Why the Worst Infrastructure Gets Built, and What We Can Do about It," *Oxford Review of Economic Policy* 25, no. 3 (2009).
[78] This is called "reference class forecasting." See Bent Flyvbjerg, "Survival of the Unfittest: Why the Worst Infrastructure Gets Built, and What We Can Do about It," *Oxford Review of Economic Policy* 25, no. 3 (2009).
[79] McKinsey Global Institute, "Infrastructure Productivity: How to Save $1 Trillion a Year," January 2013.

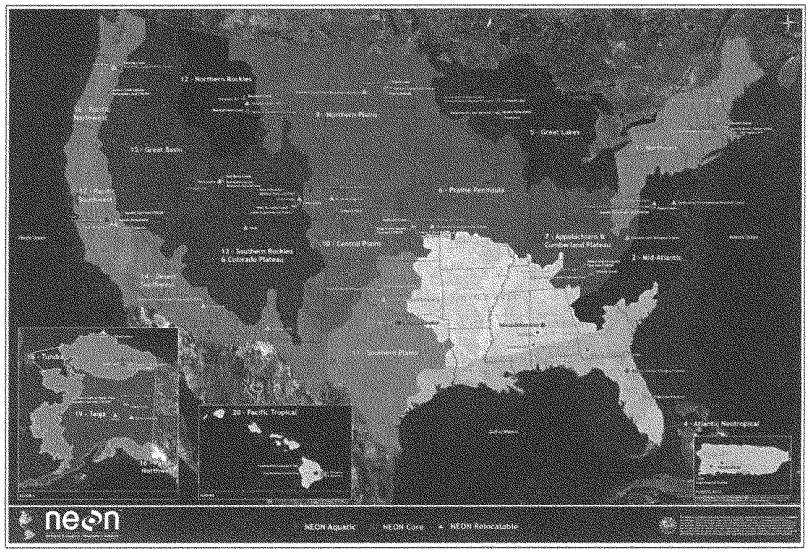
DOCUMENT SUBMITTED BY REPRESENTATIVE LIPINSKI

ESA presidents comment on NEON de-scoping | EcoTone: news and views on ecological science

www.esa.org/esablog/guest-posts/esa-presidents-comment-on-neon-de-scoping/

Liza Lester

A guest commentary from 16 current and past presidents of ESA addressing a recent move by the National Science Foundation to shrink the mission scope of the National Ecological Observatory Network (NEON).



Dear Colleague,

During the recent ESA Centennial Meeting in mid-August, ESA Past-presidents gathered in Baltimore to discuss NEON's (National Ecological Observatory Network) future. Here are some thoughts we'd like to share with you.

The ecological community strongly supports the goals and mission of NEON, despite the recent de-scoping, and looks forward to working with NEON to achieve its potential. A recent article in *Science* by Jeffrey Mervis highlights many of the problems that have plagued a program of unprecedented size and scale for the ecological community.

Nevertheless, we remain excited about the potential new science that could emerge from successful NEON. Years in the planning stage, NEON was conceived to generate consistent empirical data across broad scales of time and space that could reveal regional- and continental-scale contexts and forcing factors driving ecological change. The 30-year lifespan of NEON will benefit a generation of ecologists and generate new hypotheses while accurately documenting environmental change.

Other national and highly successful major-infrastructure projects such as the Hubbell telescope also encountered major problems during deployment. Poor initial performance was solved and the telescope was improved in part through extensive engagement of the astronomy community. Analogously, it is essential to foster transparent communication among the scientific community, National Science Foundation (NSF), and NEON to ensure that the re-scoped NEON best meets the needs of environmental and ecological science in the U.S.

While any project of this scale faces construction, budget, and scheduling challenges, the recent decision by NSF and NEON for a significant reduction in infrastructure shocked many in the research community. We must now confront these challenges in a collaborative and transparent way that can renew much of NEON's mission despite scaling back relocatable sites, some core site capabilities, and eliminating the aquatic experiment.

The de-scoping decisions were made with some input from the scientific community, NEON's Science, Technology and Education Advisory Committee, and representatives of the NEON Board of Directors. While this is a good start toward better communication, much stronger engagement with the scientific community would be achieved by establishing a consortium for environmental biology similar to those of other scientific communities (e.g. astronomers, climate scientists, oceanographers, and seismologists) to coordinate the mission, use and products of large national infrastructures.

We believe successful NEON could generate valuable data to help address problems that currently challenge the very fabric of society and the biosphere that sustains it. NEON can compliment, but not replace, other forms of ecological research, and we are encouraged by NSF's commitment to support STREON, the aquatic experiment, as an investigator-led activity. We encourage NSF and NEON to re-engage with the ecological community to assure that NEON will yield the scientific results it was designed to address.

Jill S. Baron, ESA President 2013

Monica G. Turner, ESA President 2015

David Inouye, ESA President 2014

Jill S. Baron, ESA President 2013

Scott Collins, ESA President 2012

F. Terry Chapin, ESA President 2010

Mary Power, ESA President 2009

Alison Power, ESA President 2008

Norm Christensen, ESA President 2007

Alan Covich, ESA President 2006

Nancy Grimm, ESA President 2005

Ann Bartuska, ESA President 2002

Diana H. Wall, ESA President 1999

Jerry H. Franklin, ESA President 1993

H. Ron Pulliam, ESA President 1991

Jean Langenheim, ESA President 1986

ADDITIONAL RESPONSES SUBMITTED BY DR. JAMES OLD

"NEON Warning Signs: Examining the Management of the National Ecological Observatory Network"

Friday, September 18, 2015 - 9:00am

Inserts for the record

"Dr. Olds, one of the things in the IG's letter, she talked about the NSF hadn't required the incurred cost submissions from NEON nor has it conducted an incurred-cost audit of NEON, and if NSF had taken either action, NSF could have been able to identify unallowable or poor spending money on NEON, and yet I think what we've just heard is, the $80 million wasn't unallowable or poor spending, that it was permitting, it was the shift to operations, and it was the absence of a secure supply chain. Am I reading that correctly, and does that make this particular IG recommendations less meaningful?" p. 43-44

Insert for the Record #1, (page 44, line 980 of the transcript)

Mr. OLDS: ***Congressman Beyer, you are correct; the approximate $80M cost increase was not the result unallowable spending. The original NEON project was approved for $433.8M and reevaluated by a detailed cost and schedule review in August 2014. Based on rising concerns about schedule and cost performance against the new August 2014 plan, NSF requested a revised total project cost estimate in May 2015. NEON Inc.'s revised estimate (received on June 15, 2015) was $517.9M. NEON Inc. has asserted that the potential overrun resulted from a combination of underestimating costs, not appropriately accounting for costs and underestimating time/effort to complete the project as follows:***

- ***Production of sensors and other site components***
- ***Corporate overhead and fringe benefits***
- ***The annual cost escalation***
- ***Toolik site construction***
- ***Data products and cyberinfrastructure***
- ***Schedule delays (12-16 months) associated with permitting, delayed field deployments and field operations***
- ***Contingency to manage future risks***

NSF has relatively low confidence in the estimates presented in June. To inform future decisions, NSF has required a full revised and updated total project cost estimate and schedule by December 1, 2015. NSF officials are closely monitoring the development of these new deliverables for sufficiency.

Insert for the Record #2

"Again, Dr. Olds, the NSF Inspector General has previously recommended that NSF should retain contingency funds for projects like NEON and pay the contractor as those expenses are approved as appropriate contingency costs. The NSF has not agreed with this recommendation. Would retaining contingency funds for NEON have helped NSF notice the cost overrun at NEON sooner." p. 45

(page 45, line 1029 of the transcript)

***Mr. OLDS**: No; the retention of contingency funds has no relation to the projected cost overruns on any project. Under Earned Value Management (EVM), projected cost overruns are the difference between the approved Total Project Cost (TPC) and what the project currently estimates the actual, final total project cost to be (i.e. Estimate At Complete; EAC). EAC is the sum of actual expenses to-date plus the estimated cost of the remaining work.*

Insert for the Record #3

"Dr. Olds, it appears that NEON has moved 35 million of contingency funds into the base construction budget. The cooperative agreement requires approval by NSF for NEON to use contingency funds. Did NSF approve the transfer of contingency funds?" p. 47

(page 47, line 1029 of the transcript)

Mr. OLDS*: *Yes; NSF approved the allocation of contingency on July 28, 2015 after being satisfied with the quality of the required documentation.

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