U.S. Senate Committee on Energy and Natural Resources
June 26, 2018 Hearing: *Pending Nominations*
Questions for the Record Submitted to Dr. Christopher Fall

Questions from Chairman Lisa Murkowski

Question 1: During Alaska National Lab Day I know you heard quite a bit about the opportunities for partnerships between Department of Energy's National Labs and Alaska's innovators – at the University of Alaska, in private industry, and in our local communities. I was wondering if you could share any particular thoughts on how you, if confirmed, can help build meaningful partnerships to find solutions to our common national Arctic challenges.

Answer: The Office of Science is actively engaged in Alaska primarily through its programs under Biological and Environmental Research that actively monitor, sample, and model the region and science related to the Arctic. This research plays an important part in maintaining resilient infrastructure and communities in the Arctic. I had the opportunity to spend an afternoon touring the Geophysical Institute at the University of Alaska at Fairbanks, and to discuss with the Director additional opportunities for collaboration with DOE. I look forward to working with you and your staff on the issues important to the Alaska and the Artic.

Question 2: ARPA-E has had tremendous success by being nimble, innovative, and bringing collaborative groups together to scope out highly focused and impactful R&D programs. It has also had success in translating DOE-sponsored R&D into commercial concepts. While I recognize that the Office of Science works in a much different R&D space, are there particular lessons learned or best practices that you learned from your time at ARPA-E that you plan to bring with you to your new role as the Director of the Office of Science?

Answer: ARPA-E benefits from unique authorities granted by the Congress, including special personnel authorities that allow for term-hire "tours of duty" by exceptional technical experts, and no-year money for S&T funding. In addition, there is a culture of reducing bureaucracy and pushing decision making down to levels where it is most effective. I do believe that many of the cultural aspects of ARPA-E are translatable in part to the Office of Science and, if confirmed, it will be a goal of mine to do this.

Question 3: You've probably heard me discuss the loss of U.S. global leadership in nuclear energy. I've also often discussed the challenge posed to the U.S. by our competitors, like China, in commercializing and deploying other clean energy technologies – notably energy storage, solar, and advanced vehicles. I know that we still have the greatest minds in our universities and National Labs, and that our private industry is ready to aggressively innovate, but we have to build public-private partnerships that accelerate our innovation. The U.S. cannot afford to allow China to corner the international markets on all of these advanced clean energy sectors.

- Are you concerned about a loss of U.S. global leadership in clean energy technology?

  Answer: It is a critical national security and economic issue that America remains the global leader in all energy technologies. Many of these technologies are also dual or multi-use with applications to national security, space, and other areas.

- Consistent with the President's "energy dominance" agenda, how can, and will, the Department of Energy work to reverse these trends and reestablish U.S. global leadership on clean energy technologies?

  Answer: Most advanced clean energy technologies are highly dependent on advances in materials. In addition to existing enablers like advanced computing and future game changers like fusion energy, the Office of Science most directly contributes to renewable energy technology by maintaining world leadership in basic materials sciences.

- Are there other Department of Energy technologies or research areas, for example exascale computing, quantum information science, or microbiome research to name a few, that are particularly important for the U.S. to maintain or reestablish global leadership?

  Answer: Global leadership in science and technology is a key competitive deterrent for national and economic security. Adding to this list I would include artificial intelligence and machine learning, and Quantum Information Sciences is a key opportunity for U.S. leadership. If confirmed as Director, I will work with my counterparts across other offices such as Fossil Energy and Energy Efficiency and Renewable Energy and other agencies to reduce our reliance on foreign supply of critical minerals.

Questions from Ranking Member Maria Cantwell

Question 1: Do you commit to support and advocate for the mission of the Office of Science for delivery of scientific discoveries and major scientific tools to transform our understanding of nature and to advance the energy, economy, and national security of the United States? Do you commit to support the Scientific Integrity Policy and protecting the scientific integrity of DOE's work?

Answer: Yes.

Question 2: A bipartisan Commission recently recommended that the national labs be sufficiently funded to maintain their critical capabilities and facilities. The Commission also recommended numerous reforms targeted at the Department of Energy to improve the effectiveness of the Labs. Secretary Moniz and Secretary Perry have committed to implement these reforms.

- Will you commit the Department of Energy to continue to value and support the important work of the National Labs?

  Answer: Yes.

- Will you commit to continue to implement the recommended reforms of the Commission to Review the Effectiveness of the National Energy Laboratories?

  Answer: Yes

Question 3: If confirmed, you will be responsible for stewarding some of the most advanced scientific facilities and research capabilities in the world, and among the world's best and brightest minds in climate science and related disciplines.

- What are you views on climate change and the human role in climate change?

  Answer: Being careful to highlight that I am not a climate scientist and that I have not studied the issue in any professional detail, I do agree that the climate is changing and that humans contribute to such change.

- Do you believe it is in our nation's best interest to continue to collect and make available to the scientific community the data and modeling capabilities necessary to understand how our climate is changing, and what it means for our national security, our infrastructure investments, our economy and our citizens?

  Answer: Having a transparent data collection process is a necessary step in reaching valid scientific conclusions.

- Will you commit to defending these programs at DOE, ensuring that they are adequately funded, and protecting the integrity of the science they generate from political interference?

  Answer: If confirmed, I will provide my best and most honest counsel to the Secretary, I will represent and defend the Secretary's positions, and I will follow any guidance that the Administration and the Congress agree upon. I will assure that the programs I oversee are conducted with scientific integrity.

Questions from Senator Ron Wyden

Questions: Scientific integrity, and the independence of scientists are very important to me. For the Office of Science to fulfill its mission, DOE employees must be able to do their jobs. This means ensuring sound science without consideration or fear of political interference

Will you commit to protecting the Office of Science from political interference?

Answer: Yes.

Will you advocate to Secretary Perry and the President for the resources necessary for the Office of Science to fulfill its mission?

Answer: Yes.

Questions from Senator Debbie Stabenow

Question 1: First, I would like to express my appreciation to the Administration for requesting $75 million for the Facility for Rare Isotope Beams in the FY2019 budget. As I've emphasized on many occasions to Secretary Perry, the FRIB project, administered by the Office of Science in partnership with Michigan State University, will play a critical role in advancing new national defense, environmental science, and medical technologies. FRIB will be the world's most powerful radioactive beam facility providing more than 1,000 new rare isotopes for research and will generate approximately $187 million in new tax revenues and $4 billion in state-wide transactions.

Recognizing the importance of FRIB, the State of Michigan and Michigan State University have made significant financial commitments to ensure this project is realized. And, as you may know, FRIB is on schedule for completion in FY2021 – with federal funding for the project continuing on a downward path to $5.3 million in FY2021.
Are you familiar with this project, and could you provide me with an overview of how the Office of Science will continue its support for the project through construction?

Answer: I am familiar with this project but have not been briefed in any great (or non-public) detail other than that the Office of Science considers completion to be a key priority, that it is ahead of schedule, and that the project has been, in their opinion, well managed. I have been briefed on the extensive and exemplary Office of Science project management framework, and from what I can tell it should lead to the timely and efficient completion of the project. I plan to visit FRIB in July.

Questions from Senator Joe Manchin III

Questions: I would like to hear your thoughts on what you believe the DOE's role should be for the commercialization of technologies. I think it is fair to say the Administration is prioritizing early stage research and development, and allowing the private sector to step in when the time comes to take new technologies to commercialization. That's fine – but there are some instances where the private sector is not willing to finance and needs the right signals to keep innovative technologies born in our labs and universities from falling into the innovation gap or "valley of death". Congress recognized that this was a potential problem and has armed the DOE with a

few tools in its toolbox to help finance promising technologies. Unfortunately, these programs like Title XVII and ARPA-E have come under fire.

What role do you think to DOE should take when it comes to financing commercialization activities?

Answer: The Department and, in particular, the Office of Science, focuses on early-stage and fundamental research. DOE regularly collaborates with the private sector on research and discovery that enables the development and refinement of technologies, and makes available an extraordinary array of user facilities for such work. It is my understanding that the Administration believes that financing the commercialization of technologies should primarily be a responsibility of the private sector.

Do you support the Title XVII Loan program?

Answer: I am not familiar in any detail with the Title XVII Loan Program, which is a responsibility of the Under Secretary for Energy. I would defer judgement about this program to those responsible for it.

Questions from Senator Martin Heinrich

Question 1: I was pleased to see the Office of Science's 2019 budget request restored full funding for the energy storage innovation hub known as JCESR. If you are confirmed, will you make it a priority to complete a five-year renewal of this important, cutting-edge research partnership among private industry, universities and the national labs?

Answer: If confirmed, I will work to ensure that energy storage remains a priority for the Office of Science. Storage has the potential to transform the electric grid in a positive way, with industry, universities, and the Labs all playing critical roles. I will follow the funding allocations that the Congress and the President agree upon.

Question 2: New Mexico has two of DOE's national security labs, Los Alamos and Sandia; both play key roles in a number of the Office of Science's cutting-edge research programs, including battery storage, bioenergy, nanotechnologies and advanced computing. What do you foresee as the future role for the NNSA labs to contribute to SC's mission?

Answer: The NNSA laboratories are already well integrated into the programs of the Office of Science, and I believe that this should continue and to grow. The NNSA laboratories have unique capabilities useful well beyond the NNSA mission.

Question 3: I continue to be very interested in the potential of electric power from fusion energy. Recently, we've seen some very exciting new developments out of MIT on high-field superconducting magnets. What are your thoughts on the prospects for fusion energy and DOE's future role in fusion research?

Answer: While we are still far from achieving useful fusion technology, the potential benefits from fusion are so great that I believe we should continue to support this work. It is also notable that there is significant private sector investment in even early stage fusion research, which speaks to the perceived importance of the technology and which will allow DOE to better leverage government investment.

Question 4: You cite your previous position at the Navy directing STEM and workforce programs. The Office of Science also has a workforce development program for teachers and scientists. In your view, is the United States on track to graduate enough people with STEM degrees to fill demand in the energy sector? Can you identify the holes in the educational pipeline that is leading to this gap and what more can the Office of Science do to help fill this gap?

Answer: The energy sector is highly dependent on STEM skills both for research and development and for operations, and one concern is the rapid aging and pending retirement of a large cohort of STEM talent across many sectors. In general, experiential learning through internships and educational visits (to labs or energy infrastructure) are a great way to get students of all levels interested in STEM relevant disciplines such as energy, and to attract them to the private sector or to the government. One opportunity that could be better leveraged is technical vocational training for operation of both our laboratories and our energy infrastructure. Veterans often have great technical ability and training and are ideal candidates for such programs. I do recognize and support the idea that the Office of Science has a special responsibility for stewardship of the pipeline of highly trained scientists critical to the physical sciences mission it leads for the U.S.

Question 5: I continue to be very supportive of NNSA's and the Office of Science's cross-cutting Advanced Scientific Computing initiative, a unique private-public partnerships among the National Labs, the U.S. computing industry, and academia that will reassert our preeminence for exascale and quantum supercomputing. Do you agree there should continue to be a high degree of coordination between NNSA's and SC's ASC programs to maximize benefits and take full advantage of synergies among the national laboratories?

Answer: Yes. Coordination and exploitation of synergies are both important, as is supporting more than one approach to this critical area of technology competition.

Questions from Senator Tammy Duckworth

Question 1: The Long-Baseline Neutrino Facility/ Deep Underground Neutrino Experiment is an internationally designed, coordinated and funded program to study neutrino science and proton decay. This experiment seeks to answer fundamental questions about the universe and

will result in revolutionary discoveries in physics. Fermi National Lab in Illinois is a key institution in this endeavor.

The project has 32 partner countries, more than 1,000 scientists, and $300 million in financial contributions from other countries. Dr. Fall, if confirmed, will you commit to continuing the Office of Science's support for critically important research project?

Answer: Yes, presuming Congress and the Administration continue to make it a priority.

Question 2: On June 21, 2018, the White House released its reform plan and reorganization recommendations for the Federal Government, which included restructuring the Office of Science. This plan stated that the Trump Administration is "evaluating several proposals to merge and consolidate field and headquarters activities to improve efficiency and reduce costs." The proposal also references streamlining the office and reducing staff. This is particularly concerning in light of the President's fiscal year 2019 budget submission that proposed dramatically cutting Office of Science funding by 14 percent.

Dr. Fall, if confirmed, would you oppose drastically cutting the Office of Science's funding by 14 percent and will you commit to opposing staff reductions and closing offices as part of a consolidation or restructuring effort?

Answer: If confirmed, I will defend both the Administration's budget proposals and the Administration's proposed reorganization plan. I also will fully and transparently execute the guidance that the Congress and the President agree upon regarding spending and organization of the Department.

Questions from Senator Tina Smith

Question 1: In December, the White House released the latest scientific update to the National Climate Assessment (the Climate Science Special Report). It found that the earth is rapidly warming and that it will continue to do so unless greenhouse gas emissions are drastically reduced. This is leading to all sorts of negative environmental and public health consequences. Do you accept what your own scientists are telling you—that the climate is rapidly changing?

Answer: Being careful to highlight that I am not a climate scientist and that I have not studied the issue in any professional detail, I do believe that the climate is changing.

Question 2: Do you accept that this change is overwhelmingly driven by human emissions of greenhouse gases?

Answer: Being careful to highlight that I am not a climate scientist and that I have not studied the issue in any professional detail, I believe that anthropogenic emissions of greenhouse gases contribute to climate change.

Question 3: Do you accept that a changing climate will bring costs and benefits in terms of economics and human health?

Answer: Yes

Question 4: Do you believe that it is important that we predict and quantify such impacts?

Answer: Yes

Question 5: Will you pledge robust and continued support for DOE Office of Science research on economic, environmental, and health consequences of climate change?

Answer: If confirmed, I will follow the guidance that Congress and the President agree upon regarding this issue.