22 November 2019

Via email: ClimateCrisisRFI@mail.house.gov

The Honorable Kathy Castor
2052 Rayburn House Office Building
Washington, DC 20515

House Select Committee on the Climate Crisis
H2-359 Ford House Office Building
Washington, DC 20515

The Honorable Garret Graves
2402 Rayburn House Office Building
Washington, DC 20515

Dear Chairwoman Castor and Ranking Member Graves:

On behalf of the American Geophysical Union (AGU), a nonprofit, nonpartisan scientific association that engages with more than 110,000 Earth and space scientists, we thank you for the opportunity to inform the policy recommendations of the Select Committee. Climate change is a crisis facing humanity, causing increasingly disruptive societal and ecological impacts that are causing hardships now that will continue into the future. Actions that could diminish these threats and many others posed by climate change to our world include substantial emissions cuts or removal of carbon dioxide from the atmosphere, as well as steps that will help us prepare to cope with and adapt to changes that are now unavoidable.

In December 2019 at our annual meeting, AGU will be releasing an updated climate position statement that reflects our current knowledge of the challenge, evidence, predictions, consequences, and needed responses to the climate crisis. AGU applauds your commitment to gathering necessary feedback and recommendations from stakeholders, and we look forward to working with you in building science-informed policies and strategies to address climate change.

Below, we provide input on a few important areas of interest to AGU and our members.

**Sector-Specific Policies – Building Efficiency**

Traditional buildings account for approximately 40 percent of the greenhouse gas emissions entering our atmosphere. As such, through the current renovation of our headquarters in the District of Columbia, AGU has committed to lead by example and strive to become the first-ever "net zero energy" renovation of an existing building in the District.

This leadership takes many forms. First, we have pioneered the use of innovative technologies and designs that we hope will catalyze new and existing facilities throughout the city and beyond to adopt similar measures. Second, we host public and private net zero energy tours of the building to educate the public and other stakeholders, including local and federal government officials, about the approaches and their benefits and costs. Finally, when it is fully online, the AGU headquarters will be a research building, collecting data that will be displayed in physical and online dashboards that can be accessed and analyzed worldwide.

To achieve net zero energy, AGU's design focused on four key engineering principles—reduction, reclamation, absorption, and generation. Within these four principles, more than 50 different strategies were individually researched and tested, with the project team ultimately selecting the key 24 strategies that would take us to net zero energy. Here are a few of the most unique strategies that will be a part of our net zero energy building:

***Municipal Sewer Heat Exchange System***

We examined using geothermal energy to heat and cool our building, but because our current footprint did not allow for that, we are instead using a municipal sewer heat exchange system to recover thermal energy from wastewater. Close beneath the street on Florida Avenue runs a large combined storm and sanitary sewer line built in the 1890s. The municipal sewer heat exchange system taps into the sewer line and diverts wastewater to a settling tank located outside of the building. Water from the settling tank is circulated inside the building to an exchange system that extracts energy from the water for heating and cooling before the water is returned to the sanitary sewer system.

During periods of the year when the sewer temperatures are cool, the building's radiant cooling system will operate in "free cooling" mode, using the water from the sewer heat exchange system, allowing the building's chiller to be turned off. This saves a substantial quantity of fresh potable water and eliminates the need for a noisy and unsightly cooling tower on the roof.

This is the first time this system has been deployed in the District of Columbia, and the city is using AGU's headquarters as a test case to encourage other buildings to use similar systems.

***Solar Photovoltaic (PV) Array***

The AGU headquarters reduces the use of fossil fuels by making the most of the sunlight available on our roof. The building will ultimately have 720 solar photovoltaic (PV) panels laid out, for a total of 13,200 square feet of panels elevated above the 12,130-square-foot roof. (The panels have not yet been installed). These panels could generate up to 100 percent of the building's total energy in combination with other net zero design strategies—the equivalent of 20 percent of the current building's total energy.

***Direct Current Electrified Grid***

AGU's headquarters saves energy by employing direct current (DC) for staff workstations, which will ultimately be powered from the solar PV panels on the roof.

Ordinarily, electricity is transmitted from utility companies to homes and businesses by alternating current (AC), which allows electricity to travel long distances. However, many devices—LED light bulbs, computers, printers, phone chargers, and kitchen appliances—run on DC, requiring a converter at the end of the electrical cord to bring the higher AC voltage down to DC.

By installing DC electrified grids in the ceiling, the AGU building eliminates the need for conversion of electricity from AC to DC, thus increasing our energy efficiency by about 20 percent. A controller mounted in the ceiling will constantly monitor the power supply to determine if there is an adequate supply of DC power being generated by the solar PV array. On cloudy days and during evening hours the power supply to the ceiling grid will automatically shift to the city's AC power supply as necessary. This technology will also allow the building to have limited functionality should there ever be a catastrophic failure of the city's electric grid.

***Radiant Cooling System***

The AGU headquarters employs a cooling system that helps to maintain spaces at even, comfortable temperatures using less energy than a traditional forced-air system. Chilled water is circulated through a network of pipes installed in the ceiling panels, which evenly absorb heat energy transferred from people, lights, and equipment. That system works in conjunction with the heat and ventilation air provided by a dedicated outdoor air system (DOAS) to provide ventilation, pressurization, and humidity control.

***Hydroponic Phytoremediation Wall System, or Green Wall***

The AGU headquarters will also make use of a green wall to help reduce energy loads and improve indoor air quality. Typically, buildings are ventilated with outdoor air, which must be heated in the winter and cooled in the summer, which can represent more than 30 percent of the energy consumed by a building. The green wall will allow indoor air that is already at the right temperature and humidity to be circulated through the root system of live plants, where it will be cleaned and filtered of carbon dioxide before passing back into the building, providing a large energy cost savings. The plants' air-cleaning capacity is increased by 200 to 300 percent by submerging their roots in water rather than soil, which allows them to remove large particles and oxygenate the air. Sampling of the outside air quality will help determine what types of plants will need to be selected to address the air pollutants found.

***Water Reclamation Cistern***

A water reclamation cistern on the AGU building's roof helps to conserve water and reduce runoff to the Anacostia and Potomac Rivers. It is also an effective way to reduce water and sewer utility bills by reusing rainwater before it is discharged to the combined storm and sanitary sewer system. The cistern collects, filters, chemically treats and conditions rainwater and condensate water from the dedicated outdoor air system, producing all the water needed for flushing toilets and irrigation.

Through these strategies, as well as many others, AGU hopes to demonstrate that we, and the Earth and space science community we represent, can be a model for sustainable design, reducing the carbon and environmental impacts of business operations in a cost-effective and replicable way.

**Climate Information Support**

Federal climate research is vitally important for our nation as we face the challenges of mitigating and adapting to climate change.

***National Climate Assessment***

One vital program has been the congressionally mandated National Climate Assessment (NCA), produced by the U.S. Global Change Research Program (USGCRP) every four years. The NCAs must

not only be continued, but must be augmented in several key ways. First, it should be clarified that the NCA should be based on the best peer-reviewed climate science and utilize the most current models for future projections, including those looking out several decades. Local officials and businesses must plan on such time scales in order to build lasting infrastructure, address zoning issues, and make myriad other decisions. Second, for all such decision makers to have access to the data they need, the NCA should include regional as well as sectoral information.

Third, the USGCRP should be mandated to distribute the report widely, with an emphasis on the strongest possible communications and outreach techniques, such as stakeholder engagement, user-friendly language and images, as well as toolkits and other outreach material. Finally, the NCA should never be allowed to be subject to the whims of political interference or kept from the public—the objective information it provides is simply too important and valuable for the nation.

***Federal Agency Climate Research***

In addition, Congress must continue to support the climate research conducted by our federal agencies. From data collection of temperature and greenhouse gas concentrations to observations and modeling of storms, precipitation, water resources, and more, such research is vital as communities, our military, and businesses confront the future challenges of climate change. Moreover, as much science as has already been done, it is critical that we invest in new research going forward. We must get better at understanding climate consequences at a more local scale and get better at projections, such as flood and sea level rise mapping. Furthermore, Congress must support new interdisciplinary programs within the agencies that will allow us to understand the complex interdependence of the climate system and allow social science to guide how best to keep people safe.

One effective tool to promote strong local and regional decision support would be the expansion of interdisciplinary local and regional climate science centers, expanding beyond individual agencies, such as the USGS Climate Adaptation Science Centers or the USDA Climate Hubs.

One particular area of climate research is on an issue that affects every state and congressional district around the nation—flooding. Recently, AGU released the report *Surging Waters: Science Empowering Communities in the Face of Flooding*, which provided case studies of how federally funded science is helping to address floods—the costliest, most frequent type of disaster in the U.S., accounting for hundreds of deaths and billions of dollars in economic losses every year. Science is essential to empower communities to deal with the aftermath and help prevent future

flood events. Without robust federal investment in science, we're going to lose the progress we've made to protect lives, property, and industry and increase our risk in the face of a changing climate.

Specific recommendations for Congress from the report include: supporting programs that incentivize long-term relationship building and two-way communication of problems and solutions between scientists and their communities; supporting legislation that protects the use and the role of science in decision-making by ensuring that science can be conducted and inform policy freely, openly, and without undue political interference; and developing government policies to manage flooding and the impacts of inundation that account for a changing world and incorporate the best science around climate, human health, and development predictions.

***Climate Intervention Research***

While not a substitute for deep cuts in emissions or the need for adaptation, it is important to understand the risks and opportunities of existing and novel technologies of climate intervention.

Climate intervention approaches, which are defined as a "deliberate large-scale manipulation of the planetary environment to counteract anthropogenic climate change,"[i] require cautious consideration of risks. The most plausible approaches to climate intervention fall into two distinct categories.

The first category, known as carbon dioxide removal (CDR), utilizes approaches and techniques that remove CO2 directly from the atmosphere. AGU endorses calls for substantial CDR research programs such as those outlined by the National Academies.[ii] Understanding the economic, environmental, and practical challenges in scaling these options is essential given the urgency of the climate problem and the potential roles for CDR in overall strategies for lowering the concentrations of warming pollutants in the atmosphere.

The second general category of climate intervention proposals is albedo modification (AM). It involves cooling Earth by reflecting sunlight away from the planet. AGU urges robust funding to federal agencies to create substantial research programs on AM and to embed them, where appropriate, in existing larger programs on climate science because much of the knowledge needed to understand AM systems overlaps heavily with the knowledge needed to understand the changing climate system.

Since 2009, several groups have advocated AM research programs. These include the U.S. National Academies,[iii] whose findings on this topic AGU endorses. Such research, if conducted openly with introspection and self-scrutiny as befits the global scientific community, could help diffuse information widely and help facilitate the development of appropriate international norms about testing and evaluation of AM systems. AGU is concerned that scientific discussions around AM are taking place mainly in a small number of western countries. A proper and full evaluation of potential uses and impacts of AM will require a broader dialogue that engages more societies and the broader public.

AGU is concerned that the debate over research funding for CDR and AM has been prone to paralysis. While legitimate concerns have been raised about scalability and the side effects of climate intervention schemes, those same concerns have been used to block funding of the research that could help understand and address them. The reality is that climate change is happening, and it too creates risks; balancing those risks is essential to effective policy strategies. There are currently no large public research programs on climate intervention and only a few private sector efforts aimed at advancing certain technologies. Public sector research programs are essential to ensuring transparency and an adequate coverage and level of research support.

**International**

The growing climate crisis is not unique to the U.S.—it is a global crisis. AGU considers it vital for the U.S. to stay engaged in international climate discussions. As such, the U.S. must rejoin the Paris Climate Accord and other future global climate negotiations. Moreover, it is imperative that Congress support the means for U.S. scientists' participation and collaboration with the international scientific community, including safeguarding the free exchange of scientific data and information internationally. A broad understanding of the societal consequences of a warming planet and honest and open communication of scientific evidence to the public and policymakers is needed to ensure economic prosperity and global health.

Thank you for the opportunity to weigh in on this critical issue. AGU welcomes the opportunity to work with you and ensure that science can continue to appropriately inform decision-making. Thank you for your consideration, and we look forward to seeing the Select Committee's legislative recommendations to Congress next year.

Respectfully,

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cc: The Honorable Members of the House Select Committee on the Climate Crisis

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[i] Shepherd, J. G. S., et al., 2009: *Geoengineering the climate: Science, governance and uncertainty*, RS Policy Document 10/09 (London: The Royal Society).

[ii] National Research Council, 2015: *Climate Intervention: Carbon Dioxide Removal and Reliable Sequestration* (Washington, DC: The National Academies Press) https://doi.org/10.17226/18805

[iii] National Research Council, 2015: *Climate Intervention: Reflecting Sunlight to Cool Earth* (Washington, DC: The National Academies Press) https://doi.org/10.17226/18988