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Before the
Subcommittee on Energy
Committee on Science, Space, and Technology
U.S. House of Representatives
"Unearthing Innovation: The Future of Subsurface Science and Technology in the United States"
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Good afternoon, Chairman Williams, Ranking Member Bowman, and Members of the Committee. Thank you for the opportunity to address you today and for your efforts to highlight the importance of subsurface science. My name is Allyson Anderson Book, and I am the Chief Sustainability Officer for Baker Hughes and a trained geologist. Baker Hughes is a leading energy technology company that provides solutions for energy and industrial customers worldwide. From the first rotary drill bit to the world's most extensive portfolio of compressors and gas turbines, for more than a century our inventions have helped take energy forward – making it safer, cleaner, and more efficient for people and the planet. Our headquarters are in Houston, Texas, and we have approximately 55,000 employees worldwide conducting business in over 120 countries.

My role at Baker Hughes is to oversee our Sustainability program and drive the company's energy transition. As part of my remit, I work to support several of our core growth areas, carbon capture and storage (CCS), hydrogen, and geothermal, through focused research, development and demonstration activities and partnerships. My team works to identify opportunities for public partnerships, consortia, and other opportunities for enabling the scale up of our technology and services.

Subsurface science and technology is as important today as it was when pioneering scientists began to image the inside of the Earth from the outside for early seismological efforts. Today, we rely on subsurface science and technology to help us characterize the subsurface for energy

production, extract natural resources in the form of oil, gas, and mineral resources, and determine the best sites for waste disposal and numerous other applications. Federally funded research and development programs have supported real innovation for subsurface science and engineering and continue to be essential in driving innovation to meet societal needs.

The energy transition is also accelerating the demand for subsurface science and technology. Baker Hughes is re-engineering the same technologies and services that have helped make the U.S. oil and gas sector a world leader, to meet the challenge of delivering lower-carbon energy. For example, carbon capture and storage, or CCS, is a critical area of research for Baker Hughes because it is an essential solution to reduce emissions within the energy sector and in strategic, hard-to-abate sectors like steel, cement, and petrochemicals. Baker Hughes is active across the entire CCS value chain, beginning with project design to post-combustion capture, compression, subsurface storage, and long-term integrity and monitoring of the reservoir.

However, the importance of subsurface technology does not end with CCS. Hydrogen storage is an emerging area of focus thanks to funding provided in the Infrastructure Investment and Jobs Act to build hydrogen hubs and the Section 45V tax credit contained in the Inflation Reduction Act. Important work remains to understand how to stimulate, control, and monitor geologic hydrogen to ensure it is conducted safely. Robust and reliable sensors for sub-surface monitoring and transportation for such geological applications remain a key challenge for the energy sector. Geological hydrogen production from mineral deposits is one example where the expertise and experience of legacy oil and gas workforce in resource identification and stimulation could be easily transferrable towards realizing this abundant, carbon-free energy alternative.

The last area of great interest to us are geothermal applications, including enhanced and advanced geothermal systems. Enhanced systems involve drilling deep underground, including lateral segments, and injecting a fluid to create fractures in the rock. This same horizontal drilling and stimulation technology was used to open the vast shale gas resources of the U.S. Advanced, closed-loop systems can produce heat for power generation and direct use. Last year we helped launch the “Wells2Watts” consortium with several industry partners to repurpose oil and gas wells at the end of their productive life for geothermal energy and renewable electricity

production using closed-loop geothermal technology developed by GreenFire Energy. Technologies like GreenFire are already being tested in existing geothermal fields in the U.S., which leads the world in geothermal production at 3.8 GW. We are presently using test wells at the Baker Hughes Energy Innovation Center located at the Hamm Institute for American Energy in Oklahoma City to simulate high temperature subsurface environments to test the closed-loop system for many well configurations, validate engineering performance models, and provide scale for field pilot efforts.

The Department of Energy and its various programs provide an essential function in facilitating American technology from its initial development through deployment stages. Baker Hughes has a long history of collaborating with the Department, and our partners include the Office of Hydrogen and Fuel Cell Technologies, Office of Fossil Energy and Carbon Management, Advanced Manufacturing Office, Office of Geothermal Technologies, and Industrial Efficiency and Decarbonization Office. Our key subjects of interest include enhanced geothermal technologies, novel additive manufacturing approaches, and gas flow sensors and monitoring technologies.

I want to highlight the Office of Fossil Energy and Carbon Management as playing a critical role in supporting subsurface research and technological development, including its CarbonSAFE Program. We are involved with several of these projects and see collaboration with DOE as instrumental to our long-term CCS strategy and are looking to increase our participation in its programs, especially CO_2 storage.

I would like to underscore three challenges for your consideration as you look to build on American leadership in subsurface science. First, is the need to sustain—if not expand–support for the programs I have highlighted. A stable federal program produces stronger, broad-based partnerships with the private sector and accelerates scientific progress. This partnership helps identify and address key gaps in research that would be more difficult to address in isolation. Among the areas of subsurface science where additional funding is most needed include downhole sensors and high temperature technology for drilling geothermal wells. Funding for geothermal at a similar magnitude enjoyed by CCS under CarbonSAFE and hydrogen under the

Office of Clean Energy Demonstrations would enable the industry to bring crucial new technologies to scale.

Given the substantial increase in demonstration project funding in recent years, another aspect this Committee might consider is looking at whether or not departmental policies around intellectual property should be adjusted to reflect the difference between early-stage R&D and demonstration projects. Current policies establish government rights to subject inventions that occur pursuant to grants, which is entirely reasonable when the government directly funds the research leading to the subject invention. The intent of demonstration projects, however, is not to develop new inventions but rather scale up existing technology. Technologies involved in demonstration projects may include prototypes that are modified during the course of construction and testing, but were developed entirely by the private sector. Negotiating to overcome a department's rights to subject inventions in this context can, in our experience, create challenges for equipment manufacturers that otherwise own the remaining IP. We would be pleased to work with you and the DOE to ensure such policies do not discourage participation in the hubs.

Finally, while we understand that the issue lies beyond the scope of this hearing and the committee's jurisdiction, I would be remiss if I failed to raise Section 174 of the Internal Revenue Code, which since 1954 has allowed companies to deduct their R&D expenses in the same year in which they were incurred as an incentive to encourage investment in R&D in the U.S. However, due to changes implemented as part of the 2017 Tax Cuts & Jobs Act, as of January 2022, companies must now amortize those expenses over five years for domestic expenses and fifteen years for international expenses. This change to an almost 70-year-old policy in the tax code makes it more expensive for companies to invest in R&D for new innovations and technologies, like those we are discussing today, disincentivizing investment in R&D in the U.S. To encourage companies to continue to invest in these crucial new technologies, we urge Congress to pass a legislative fix to reinstate the immediate deductibility of R&D expenses.

Thank you again for the opportunity to share our views on this important topic. I look forward to your questions.