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"ENERGY TRENDS AND OUTLOOK"

Before the
U.S. HOUSE OF REPRESENTATIVES COMMITTEE ON APPROPRIATIONS
SUBCOMMITTEE ON ENERGY AND WATER DEVELOPMENT

Good morning, Chairwoman Kaptur, Ranking Member Simpson and Members of the Energy and Water Subcommittee. I am Matt Sonnesyn, Vice President for Infrastructure, Energy and Environment of Business Roundtable.

Thank you for inviting me to this hearing to examine current energy trends and the outlook for energy in the United States.

Business Roundtable is an association of Chief Executive Officers (CEOs) of America's leading companies working through sound public policy to promote a thriving U.S. economy and expanded opportunity for all Americans. Business Roundtable is the only national organization that exclusively represents chief executive officers. These CEO members lead companies that employ more than 15 million people, generate more than $7 trillion in annual revenues, and invest nearly $147 billion annually in research and development. As major employers in every state, Business Roundtable CEOs are responsible for creating quality jobs with good wages.

When it comes to energy, Business Roundtable supports policies that build on America's strengths in technology and energy diversity, encourage investment and innovation in our nation's vibrant energy sector, and preserve environmental quality for the 21st century and beyond. Business Roundtable policy on these issues is developed through its CEO Committee on Energy and Environment. I oversee policy development and advocacy for this Committee.

As I prepared my testimony for today's hearing on "Energy Trends and Outlook," I had to remind myself of the need to practice humility when making predictions about the future, especially when it comes to energy. Just 10 years ago, the National Academy of Science – an institution for which I have tremendous respect – wrote a bleak report on "America's Energy Future." In that report the Academy emphasized, among other things, that the then-growing U.S. reliance on foreign sources of oil and that the long-term reliability of traditional sources of energy, particularly oil, was in doubt. The Academy concluded that "a meaningful and timely transformation to a more sustainable and secure energy system will likely entail a generation or more . . ."[i]

Fast forward to today, and the picture is remarkably brighter than the Academy expected it to be.

In my testimony, I would like to take a moment to review where we are today and how we got here. I will walk through some of the challenges facing us as we go forward. And then I'll highlight a key to helping us overcome these challenges: research and development of promising new technologies, an area where this Subcommittee plays a critical role.

America is a Global Energy Superpower

America has re-emerged as a global energy superpower. Fueled by an impressive combination of ingenuity and investment, developments over the last decade have fundamentally altered the U.S. energy landscape. The implications of this energy renaissance are profound. In fact, in 2017, for the first time since 1957, the United States was a net exporter of natural gas. And last year, the U.S. passed Russia and Saudi Arabia to become the largest crude oil producer in the world.[ii] In its most recent long-range energy outlook, the Energy Information Administration predicts that U.S. oil and natural gas production will continue to grow into the future under most scenarios.[iii] Surging oil and natural gas production has dramatically reduced U.S. reliance on foreign sources of energy, and we continue to use energy more efficiently and some of our fastest growing sources of electricity are from renewable resources. Our newfound energy abundance has driven new investments in our economy and in the process has created hundreds of thousands, if not millions, of good paying jobs.

The CEOs of Business Roundtable are optimistic about America's energy future. As major domestic energy producers, energy consumers and technology developers and suppliers, our companies are uniquely positioned to help the nation make the most of this opportunity. Indeed, the unlocking of previously difficult-to-access resources, such as oil and natural gas from shale formations, is a textbook example of the private sector's ability to innovate, capitalize on new opportunities and keep the U.S. firmly on the path toward a secure and sustainable energy future.

While the shale revolution is rightfully credited with transforming the U.S. into an oil and gas superpower, the U.S. also has made impressive gains in adding renewable sources of energy to our energy mix and in using energy more efficiently.

<u>Renewables</u>. Over the past decade, the power-generating sector has experienced a boom in its use of renewable energy. Costs for solar and wind power have fallen rapidly, and the underlying technologies have improved. Renewables (primarily wind and solar) have accounted for the majority of U.S. electric generating capacity added each year since 2013 (though in 2018, renewables were edged out by additional natural gas additions).[iv] Over the past decade, installed U.S. wind capacity has tripled and solar capacity has increased six-fold.[v] While much of this results from state renewable portfolio standards and U.S. tax policy, an increasing share comes from U.S. businesses demanding that their electricity be generated by lower-carbon fuels. Corporate contracts for renewable energy have risen sharply over the past five years. The recent Business Roundtable "Embracing Sustainability Challenge" has shown that several member companies are actively making such purchases today.

At the same time, one should avoid overstating the penetration of these technologies in the market. Wind and solar today account for only 7 percent of power generation in the United States. While the cost barrier has fallen remarkably for renewables, the intermittency of generation from these sources creates significant challenges to further deployment.

Efficiency. As the United States. makes a transition toward lower-carbon sources of electricity generation, the nation has also become much more efficient in its use of power. Even as the economy continues to grow, energy demand is generally flat or declining across most sectors in the United States.[vi] With continued improvements in the energy efficiency of lighting, appliances, vehicles, industrial processes and more, it is unlikely that energy demand will grow significantly. Energy efficiency has been improving in the U.S. transport sector as well.

The Challenge: Delivering Affordable, Reliable Energy While Reducing Environmental Impacts

America's energy sector creates jobs, contributes to growth, and improves competitiveness throughout the economy. Delivering secure, diverse, affordable, and reliable energy to U.S. businesses and consumers is essential to maintaining economic growth and improving standards of living. At the same time these objectives must be accomplished even as the United States reduces environmental impact and, specifically, addressing climate change.

More than 10 years ago, Business Roundtable CEOs identified the potentially serious consequences of climate change for society and ecosystems, agreeing that steps to reduce the risks of global temperature increases are prudent. CEOs recognize the real and growing threat of climate change and believe that America's business leaders have an obligation to contribute to an environmentally responsible future. Indeed, members are actively reducing the carbon footprints of their business operations.

Business Roundtable believes that improving energy efficiency, increasing utilization of renewables, continuing to advance technology and working at a global level are essential to reduce GHG emissions while ensuring economic growth. The United States remains a global leader in research, development and commercialization of energy efficiency, renewable energy, new nuclear and other energy technologies. We believe that the U.S. should capitalize on these advantages and accelerate development of a portfolio of affordable, diverse and efficient options for meeting our economic, environmental and energy challenges. The development and global deployment of new, efficient low-greenhouse gas (GHG) technologies is vital to an effective long-term response to concerns about global climate change.

This Subcommittee has an important role to play in helping ensure that the United States maintains its leadership in developing energy technologies. Research, development and demonstration (RD&D) investment in new low-GHG technologies must be increased in the public and private sectors to levels commensurate with the magnitude of the climate challenge. These RD&D programs should coordinate more effectively across economic sectors and focus on technologies with the greatest promise of reducing GHG emissions on a life-cycle basis. Such programs should also bear in mind that climate change is global in both its causes and impacts, requiring a global response.

Researching and Developing Tomorrow's Breakthrough Technologies

The most significant breakthrough technology of the last decade – hydraulic fracturing – was funded in its earliest stages in part by research dollars from the Department of Energy[vii] – funds provided by this Subcommittee. We do not always know where our next technological breakthroughs will come from, but we do know that we will need them to continue providing diverse, reliable, affordable and sustainable supplies of energy to power our economic growth while also reducing environmental impact.

Business Roundtable will release a report later this year highlighting some of the potential breakthrough technologies that could fundamentally change the U.S. and global energy landscape for the better. Let me preview that report by listing a few of the promising technologies we are currently researching:

<u>Advanced Nuclear</u>. Nuclear power currently provides roughly two-thirds of America's carbon-free power. However, the current generation of nuclear power plants is struggling to stay economically competitive and attempts to build new plants have either failed or gone significantly over schedule and budget. A new generation of nuclear power will likely be required for America to realize an economical, dispatchable, low-carbon power system.

Advanced nuclear energy – a term that encompasses both small modular reactors (SMRs) and non-light water reactors – involves new methods of operation, new types of coolants, and new form factors. Advanced nuclear holds the promise of flexibility, dispatchability, extraordinarily high energy density, increased safety, and the ability to be used in both electric and non-electric applications – all while producing no carbon emissions. Advanced nuclear reactors have the potential to be far cheaper than traditional light-water reactors and to respond to demand peaks and utilize energy storage technologies to better integrate with high levels of variable renewable energy.[viii]

As of early 2018, more than 70 advanced nuclear projects were being pursued by companies, universities, and national laboratories across North America.[ix] Advanced nuclear development in the United States, however, is hindered by a lack of high-assay low-enriched uranium (and U.S. enrichment capacity to produce it), lack of a centralized fast reactor testing facility, shortcomings in materials engineering, and regulations designed for the last generation of reactors that do not necessarily correspond with the attributes of advanced reactors. The projected timelines for actual deployment are also distant. Although the first advanced reactors – SMRs – could be online by the mid-2020s,[x] the Department of Energy (as of early 2017) had set a goal that at least two non-light water advanced reactor concepts reaching sufficient maturity and progress in licensing review to allow construction to begin by the early 2030s.[xi] In addition, advanced nuclear will have to prove cost-competitive with renewables and natural gas.

Carbon Capture, Utilization and Storage. It has become increasingly clear that tackling climate change will not only require reducing emissions, but also addressing emissions that have already been emitted or are still being emitted. Carbon capture, utilization, and storage (CCUS) refers to a suite of technologies that selectively capture carbon dioxide from flue gas or the atmosphere and then either repurpose the captured carbon dioxide in the production of commodities -- such as for carbon fiber or fuels -- or store it, often underground.
A solid base of experience and infrastructure already exists for CCUS. Carbon capture projects were first deployed in the United States for enhanced oil recovery nearly half a century ago.[xii] Today, over 20 million metric tons of carbon dioxide is captured from U.S. manmade sources each year and transported through over 5,000 miles of carbon dioxide pipelines.[xiii] In addition, recent years have seen the commercialization of the first carbon capture system at a U.S. coal-fired power plant and initial testing of a new design for a natural gas plant that can capture these operations' carbon dioxide emissions.[xiv]

However, fewer than two dozen large-scale CCS facilities operate globally,[xv] and CCS developments in the power and industrial sectors are far from reaching the required scale (and affordability).[xvi] Projects face hurdles including unique environmental permitting requirements (including those for carbon dioxide pipelines), uncertain long-term liability, financing difficulties associated with high capital cost and often first-of-a-kind commercial projects, and the slow development of climate policies around the world.[xvii]

Hydrogen. Like electricity, hydrogen is a flexible energy carrier that can be produced from a range of primary energy sources and used across sectors. Because of its flexibility and wide array of potential applications, hydrogen has the potential to contribute to a future energy system with significantly lower levels of emissions of greenhouse gases and other air pollution.

Hydrogen could serve to store and transport renewable energy, enabling large-scale renewable energy integration and long-duration energy storage. It could be used to power vehicles, to meet about 10 percent of global demand for heating in buildings, and/or to be used as a renewable feedstock in some industrial production, such as steel.[xviii]

In the United States, 10 million metric tons of hydrogen are already produced annually, mostly through steam-methane reformation of natural gas.[xix] By adding CCUS, this could become "low-carbon" hydrogen.[xx] There is also the possibility of producing zero-carbon renewable hydrogen by powering electrolysis with wind or solar.[xxi]

However, realizing the promise of hydrogen would require massive increases in investment, deployment of hydrogen infrastructure, and expansion of manufacturing capacities.[xxii] In addition, hydrogen will have to compete against other technologies, for example in such as areas as transportation, where batteries are experiencing growing market share and declining costs. Still, the current drive for a low-carbon energy system, long-term energy storage, and reduced greenhouse gas emissions give reason for cautious optimism about the future of hydrogen, particularly in sectors – like industrial manufacturing – where GHG emission reductions are otherwise difficult to achieve.

Energy Storage. The intermittency of renewable generation underscores the need for continued R&D in another potential breakthrough technology: energy storage. Driven by sharply falling battery prices, government policies, and growing adoption of electric vehicles (EVs) and distributed energy generation, U.S. energy storage deployment is expected to accelerate markedly over the next few years.[xxiii]

In the electricity sector, energy storage technologies are currently dominated by lithium-ion batteries but also include other battery technologies, fuel cells, compressed air, thermal storage, flywheels, and pumped hydroelectric storage. Additionally, with the recent focus on electrification of transport, specifically for passenger cars, sales of battery-electric vehicles (and plug-in hybrids) have been growing; they have just reached 1 percent of vehicle sales – and make up a far smaller percentage of the overall fleet.

Improvements in battery (and other storage) technologies could have large implications for the future energy mix. Continued improvements in battery technologies and costs could make variable renewable generation into a dispatchable resource, provide a range of services to the grid, and accelerate the electrification of transport. As with renewables, precipitous declines in price and improvements in technology have led to a rise in deployment of energy storage. New battery chemistries are also being explored, including ones that do not rely on critical minerals such as lithium and cobalt, although producing these new configurations on a commercial scale could prove difficult

Advanced Substitute Materials. As this Subcommittee well knows, developing new advanced materials to replace existing materials that are in limited supply or are otherwise difficult to acquire hold great potential. Many clean energy technologies, from batteries to solar panels to wind turbines, rely on critical or near-critical minerals such as lithium and neodymium. Limited supplies of these minerals could present an obstacle to further commercialization and deployment of these technologies. Progress has already been made in reducing reliance on such minerals for permanent magnets and for lighting,[xxiv] and a range of advanced battery technologies that do not rely on critical minerals are under development.[xxv]

As for vehicles, a key method for improving their efficiency is “lightweighting” – replacing heavier materials such as steel with lighter ones such as various polymers and alloys – as it takes less energy to move and accelerate a lighter vehicle. Using lightweight materials and high-efficiency engines made possible by advanced materials in a quarter of the U.S. fleet could save more than 5 billion gallons of fuel a year by 2030, without sacrificing safety.[xxvi]

With regard to construction, new combinations of materials could reduce emissions associated with cement and concrete production. For example, a range of materials have been developed or tested to supplement clinker in Portland cement.[xxvii]

Some of these alternative materials require additional testing to ensure adequate performance. Others need government standards or changes to existing regulations to allow greater use of them in the market. Whatever the case, materials science will clearly continue to advance and contribute to the evolution of the energy sector.

Conclusion

As the nation's business leaders, the CEO members of the Business Roundtable understand the opportunities and challenges presented by today's changing energy landscape. For companies and individuals to harness these opportunities, public policy should support a resilient, efficient infrastructure and a stable regulatory regime. Ensuring robust, affordable energy for the world while reducing emissions and facilitating consumer choice represents a considerable challenge – one that requires technological innovation, sound policies, and political and corporate commitment. It also requires stable, predictable and supportive government policies, including expeditious permitting of needed infrastructure to allow resources to be added when and where they are required.

We particularly appreciate the work of this Subcommittee in funding the research enterprise of the U.S. Department of Energy at the national laboratories as well as ARPA-E. Realizing a energy and environmental future that benefits the world and all Americans will continue to require precommercial funding for research and development covering a range of promising technologies. While it is difficult to know which technology will produce tomorrow's biggest breakthrough, such a breakthrough is highly unlikely to come to fruition without government-backed basic research. The uncertainty surrounding such future technology also heightens the importance of researching and developing a broad portfolio of technologies.

Thank you, Madame Chairwoman and Members of the Subcommittee for your dedication to advancing the nation's energy future. I look forward to your questions.

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