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2019 International Pittsburgh Coal Conference

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Remarks of Assistant Secretary for Fossil Energy Steven Winberg as prepared at the 2019 International Pittsburgh Coal Conference in Pittsburgh, PA on September 4, 2019

Thank you, and good morning.

It's great to be back in Pittsburgh, and I appreciate the opportunity to take part in this year's International Pittsburgh Coal Conference. This conference is a premier forum for in-depth discussions on technical and policy issues affecting coal. So, I welcome the chance to talk to you today about what the Administration – and particularly the Department of Energy – is doing to help write the next chapter for coal.

Before I begin, though, I want to thank the University of Pittsburgh and the Swanson School of Engineering for continuing to host this important forum – and for your commitment to academic and research excellence. We at the Department of Energy recognize and appreciate the value of Pitt's R&D capabilities — and we know firsthand the importance of the resources you bring to the table.

You continue to be outstanding partners when it comes to our research and development portfolios. So, as Assistant Secretary for Fossil Energy, I'm personally fortunate to be associated with Pitt — and not only through the various projects we're partnering with you on, but also through your commitment to the University Coalition for Fossil Energy Research, which is collaborating with our National Energy Technology Laboratory – or NETL – on important early-stage fossil energy research.

So, I want to thank you for your valuable contributions.

And I thank all of you for being here this morning.

We all know that coal has faced some pretty stiff headwinds over the last decade. Of course, it's true that coal has had strong competition from natural gas.

But, it's also true that we're still working our way out of nearly a decade of policies that hit coal – and the coal industry – particularly hard. The good news is that today we have real reasons to be optimistic about coal.

And a big reason for that optimism is that President Trump recognizes the reality – and embraces the fact – that we have vast domestic energy resources in the United States — coal, oil, and natural gas — and that we need to develop, produce, use, and export them.

The President supports harnessing the full power of innovation to make these critical fuels cleaner. He is also working to undo overly burdensome regulations on coal and fossil energy more broadly.

We recently had a huge success on that front, with the Environmental Protection Agency replacing the previous Administration's Clean Power Plan with the Affordable Clean Energy, or ACE, rule.

Briefly, the ACE rule establishes standards of performance to reduce CO2 from existing coal plants, but returns power to the states to develop their own implementation plans. It also focuses on "inside the fence line" improvements, giving operators control over how to reduce emissions at their existing plants, rather than forcing them to shift away from coal to other generation sources.

At the end of the day, the ACE rule represents the kind of prudent regulatory approach that – when coupled with innovative technology – can help us meet our environmental responsibilities and secure coal's future.

Now, before I talk about our R&D, I think it's important to survey the current landscape for coal in the U.S.

While it's true that overall coal consumption has declined in the U.S., the production and use of refined coal reached record highs in 2017, and last year's figures will probably show another increase.

And in the second quarter of this year, coal production in Northern Appalachia – including the more than 12 million short tons produced here in Pennsylvania – was the

highest it's been in five years.

At the same time, the Department's Energy Information Administration projects that global coal consumption will remain relatively stable between 2015 and 2040, mainly because of demand in Asia – especially in places like India, South Korea, Japan, and the Middle East – where they're expected to add 41 GW of new coal-fired electric generating capacity over the next decade.

That's encouraging news for U.S. coal exports. In fact, according to EIA, last year we exported 116 million short tons, up from 97 million short tons in 2017 – the second year in a row that coal exports have risen and the highest level in five years.

One more thing about exports. We have enormous coal resources available, and there's a massive market in Asia – but we have a lack of export capacity on the West Coast.

This Administration wants to expand that capacity. And a couple of months ago, as part of one of his Executive Orders on energy infrastructure, President Trump ordered DOE to prepare a report assessing the impacts of the limitations on coal – and other energy exports – from the U.S. West Coast.

Here at home, coal still provides around 30 percent of our electricity. And during extreme cold weather events over the last year and a half, we've seen the critical role coal plays as a 24/7 resource for our electric grid.

So, looking across the landscape, here's what we see – coal will continue to be in demand as a global energy source, and it will continue to be critical to the resiliency, reliability, and stability of the Nation's electricity grid.

At the same time, there are challenges to coal – and we all have a lot of work to do to get coal to where we want it to be and where it needs to be.

Some of the challenges to coal can be addressed through regulation and, as I mentioned, this Administration has been pressing ahead there.

But, when you peel back the onion one layer, the reality is that we have to develop the technology to solve the most pressing challenges to coal. And, again, Pitt is playing an indispensable role in that effort.

One of those challenges, of course, is that our fleet of coal-fired plants is aging and retiring at a rapid clip.

The National Coal Council came out with a report last year noting that nearly a quarter of U.S. coal generation capacity was retired between 2005 and 2017. And EIA recently reported that between 2010 and the first quarter of 2019, power companies announced the retirement of more than 540 coal-fired units, totaling over 100 GW of generating capacity.

And we've seen how plant retirements can affect the grid – most dramatically, when Texas saw capacity plunge and electricity prices hit $9,000 per megawatt hour during a heatwave last month. ERCOT, the grid operator there, has been warning that high demand and plant retirements have whittled its supply margin.

And this follows a similar episode last summer, when real-time electricity prices in Texas peaked as high as $2,160/MWh during a heatwave.

So, over the last year-and-a-half, we've seen just how important coal is to grid reliability – and, we've gotten a glimpse of a future where coal plants leave the grid, a future that is certainly alarming to the President and to us at the Department of Energy. And we're working hard every day to avoid that kind of future.

Today, I want to update you on what we're doing at DOE – primarily through the R&D led by our National Energy Technology Laboratory – to make our current coal power fleet more efficient and competitive, and what we're doing – and will need to do – to make sure we're able to bring the advanced coal plants of the future online.

First, for existing coal-powered plants, we're targeting a suite of advanced processes and technologies to improve their efficiency, resiliency, and competitiveness. Those improvements will allow units to operate on an evolving grid that is accommodating ever more intermittent, renewable generation and that requires more unit cycling and flexibility. And we've made available up to $26 million for projects that will help us do this.

We're also focused on improvements to critical components, like turbines, condensers and boilers, and we're developing the data analytics – and the modeling – to ensure these improvements and upgrades are coordinated and optimized to achieve the best results possible. And we recently selected 17 projects to receive $39 million in funding to improve the overall performance, reliability, and flexibility of the existing coal-fired power plant fleet.

At the same time, though, we need to begin developing the coal-fired power plants of the future. And that's what we're doing through an initiative we call Coal FIRST – which stands for Flexible, Innovative, Resilient, Small, and Transformative.

I'd like to focus for a few minutes on what we want to accomplish through this initiative.

As we move towards more distributed generation, we don't see the need to construct 1,500 to 2,000 MW power plants as we have in the past. We believe that the evolving grid will require different generation options – cleaner, smaller, and highly efficient plants that can overcome the siting, operating, and logistical constraints that limit the deployment of large-scale plants.

So, through Coal FIRST, we're working to develop plants that are:

- Small – in the range of 50 to 350 MW;
- Highly efficient – north of 40 percent, which, by the way, would make carbon capture easier and less expensive;
- Near zero emissions;
- Nimble and flexible to meet the demands of an evolving grid, with the ability to ramp up and down as demand dictates; and
- Modular – think in terms of systems that can fit on a flatbed trailer.

And one of the beautiful things about these plants is that their modularity, size, and flexibility mean they can be sited wherever they're needed.

One other thing – we see an export opportunity for these technologies, especially for developing countries. They can use tomorrow's coal technology to improve their energy security and – in many cases – to expand energy access to people who live without electricity by enabling them to use indigenous fuels, including coal.

At the same time, exporting these technologies to countries that import coal could strengthen and expand the markets for American coal.

We recently selected 13 projects to design these plants of the future, and they represent an impressive diversity of technical approaches that will lay the groundwork for the

Coal FIRST initiative.

Once we've reviewed the designs, we'll issue a funding opportunity of just over $100 million for projects that will develop the critical components and advanced manufacturing approaches required by Coal FIRST systems.

In the meantime, we're also looking at developing advanced energy systems, such as supercritical CO2 and energy storage, to improve efficiency by capturing almost every last BTU of energy.

We're also exploring advanced combustion technologies and novel concepts that can significantly improve efficiency and have the flexibility to quickly respond to grid demands on both the existing and future coal fleets.

Finally, we just selected six projects – a total of nearly $15 million – to develop FEED studies of large-scale R&D pilots over the next year. The projects include three transformational carbon capture systems, focused on membranes and solvents; and three advanced power systems, including modular gasification, pressurized oxy combustion, and indirect supercritical CO2 cycles. These designs and components will also help accelerate the deployment of Coal FIRST power plants.

Now, I want to turn to another important area of our coal R&D – advancing the commercial deployment of carbon capture, utilization, and storage, or CCUS.

No matter where you are on the spectrum of the climate issue – the fact is that coal plants will have to operate with lower CO2 emissions in the future.

Of course, I think it's important to note that from 2005 to 2017 – in the midst of the explosive growth in fossil energy development – the United States led the world in cutting energy-related carbon dioxide emissions, reducing them by nearly 14 percent. U.S. electric sector emissions also fell by roughly 25 percent over that same period.

But, the only realistic path to further reducing carbon emissions is to commercialize and deploy CCUS technologies.

That was made pretty clear by the Executive Director of the International Energy Agency when he told a Senate committee earlier this year that coal is going to be around for a long time and that carbon capture is the "most vital" technology for reducing CO2 emissions.

So, even the IEA, which has prioritized renewable energy when it comes to clean energy technology development, recognizes the role that coal will continue to play – and the need for supporting CCUS as a viable clean energy technology.

DOE has a robust CCUS R&D program and we've had some impressive successes – and we've been recognized as the most productive CCUS research institution by the Science of the Total Environment journal. That recognition is welcomed and, I believe, well-deserved.

But we're not resting on our accomplishments.

Right now, we're funding more than 100 R&D projects to address the technical challenges to CCUS commercialization. One of the most pressing challenges is reducing the cost of carbon capture by about 50 percent, ultimately getting it down to $30 a ton. So, a lot of our CCUS R&D investments are focused on the capture side.

And, by the way, we're also looking at ways that we can leverage our carbon capture work to help develop new Direct Air Capture technologies.

While DAC is often described as new technology, the chemistry of capturing CO2 is very similar to what we have been developing over the last 20 years or so, and there are many similarities to our CCUS technology program. So, we're excited about leveraging our existing R&D to help develop Direct Air Capture technologies.

Now, looking at carbon storage, our Regional Carbon Sequestration Partnerships and our demonstration projects have safely and securely injected over 10 million metric tonnes of CO2 at over 26 different locations across the country.

We're also investigating ways to extract an economic benefit or additional value from CO2. Of course, EOR is the most near-term application, but we're also looking into ways that we can convert CO2 into building materials, chemicals, and fuels – valuable products that can shore up the business case for CCUS.

So, U.S. commitment to CCUS technology development remains strong. That commitment –and our collaboration with international partners – remains critical to the global deployment of CCUS.

But, there are challenges to CCUS that go beyond the technology, and I don't think we can forge a realistic path forward for CCUS without taking a look at those.

The fact remains that the lack of strong policies to support CCUS commercialization — and particularly policies that encourage investment in CCUS — means that CCUS technologies continue to lag behind other clean energy technologies. And that points

to the need for the public and private sectors to do more to advance CCUS technologies from the laboratory to the marketplace.

This means that, in addition to technology development, we need more robust policies for CCUS that will provide the financing and market certainty needed for deployment, and that will support the development of CCUS supply chains, commercial infrastructure, and private investment.

By the way, this isn't just a U.S. issue — it's a global issue, and each nation will have to meet their particular challenges to CCUS. And we've been working with our international partners through our bilateral efforts and multilateral engagements to address the technical, policy, and financial challenges to deploying these technologies.

In the U.S., we're looking at policies that could encourage the use of CCUS technologies. And the government is working with industry to address the challenges and barriers to CCUS commercialization — including financial barriers.

For instance, as most of you probably know, last year Congress expanded the 45Q tax credit to encourage the deployment of CCUS projects in the United States. For example, the credit amount was increased from $20/metric ton of CO2 up to $50/metric ton for saline storage, and $10/metric ton up to $35/metric ton for EOR, enhanced gas recovery, or other utilization methods.

Those are hefty increases, and the expansion of 45Q seems to have energized U.S. industry to find business models that can work to stand-up projects.

And interest in CCUS isn't just confined to the coal industry. We're seeing a global convergence toward CCUS in both the coal and oil and gas industries, which I think could catalyze broader deployment of these technologies.

At the same time, there are a number of things that states are doing to help incentivize CCUS.

So, here in the U.S., we're seeing progress on the policy and regulatory front, and a lot of creativity in the states. And we're seeing where federal action is needed and where state responses are more appropriate. In the process, we're getting clarity on the kinds of policy approaches that can be effective when it comes to commercializing CCUS.

Now, I've been focusing on what we're doing to help coal plants meet 21st century challenges and compete in an evolving grid. But, as the National Coal Council highlighted in their recent "Coal in a New Carbon Age" report, there are growing opportunities to utilize coal in ways that go beyond fueling power plants or steel production – opportunities that include the development of advanced materials and advanced manufacturing.

And one thing they note is that, volume-wise, the utilization of U.S. coal for coal-to-products development has the potential to reach the same order of magnitude as utilization for coal-fired power generation.

So, building out these markets could have enormous benefits for our national and energy security, economic growth, for the coal industry, and for our industrial and manufacturing sectors – and the jobs that go with them.

At DOE, we have a distinct coal-to-products R&D initiative, where we're focused on new value streams and markets for coal – things like coal-to-building materials, coal-to-liquids, coal-to-solid carbon products, rare earth elements and coal beneficiation, as well as life science, bio-tech, medical, and agricultural applications.

A big part of this effort is last year's Memorandum of Understanding between NETL and Oak Ridge National Lab, which joined the expertise of both labs to explore the use of coal as a precursor for products like pitches, fibers, nanocarbon catalysts, and other structural or functional materials.

At the end of the day, advancing new markets for coal can strengthen our national and energy security, expand our economic prosperity, and facilitate a carbon manufacturing "renaissance" and jobs in hard-hit coal state communities. We're excited about the transformative potential of this R&D, and we look forward to working with many of you in this room to realize that potential.

So, that's an overview of the Department of Energy's priorities for coal. At the end of the day, new technologies need to be tested and proven. Innovative processes need to be refined. The groundwork for the next generation of power plants needs to be laid. CCUS technologies need to be commercialized and deployed. And advanced systems to convert coal and CO2 into valuable products need to be in place.

Our research will help do this. But collaboration with industry, academia, and our international partners will continue to be critical to our success in these endeavors.

The International Pittsburgh Coal Conference continues to foster the kind of open discussion and dialogue that can promote that important collaboration. So, again, my thanks to our hosts, the University of Pittsburgh and the Swanson School. I look forward to a productive conference, and to working with many of you here so that, together, we can realize a bright 21st-century future for coal.

Thank you.

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Forrestal Building

1000 Independence Avenue, SW

Washington, DC 20585

202-586-6660

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