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SENATE ENERGY & NATURAL RESOURCES COMMITTEE

AUGUST 29, 2016

Introduction

Good morning, Chairman Murkowski, Ranking Member Cantwell and Members of the Committee. Thank you for the opportunity to testify today. My name is Brian Anderson. I am the Director of the WVU Energy Institute at West Virginia University. The WVU Energy Institute serves to facilitate collaborative and innovative solutions to the energy future of West Virginia and the United States. As the central coordinating institution for energy research at the flagship, land-grant university in West Virginia, it is central to my organization's mission to work with stakeholders within the university and across the state and region to help further the land-grant mission. A key aspect of that land-grant mission is to assist in stimulating economic development in West Virginia.

As you know, the economy of West Virginia has long been grounded in the energy sector. From the early development of oil and gas resources in the United States to the long history of the coal industry, much of the economic base of West Virginia is highly-dependent on the energy resources with which the state has been blessed. Almost 100 years ago, in 1921, the world's first commercial ethane cracker was built in Clendenin, West Virginia due to the proximity to liquid-rich natural gas production in the Elk and Kanawha River valleys. This development spurred on the modern petrochemical and plastics industry we have today.

The Petrochemical Industry Today

Due to the abundance and proximity to the natural resources in the U.S. Gulf Coast, much of the expansion of the petrochemical and plastics industry has occurred in that region over the past half century. However, with advances in horizontal drilling and hydraulic stimulation techniques first developed in part by research done in Morgantown, WV, at what is now the Department of Energy's National Energy Technology Laboratory, we are again now realizing abundant resources of natural gas and natural gas liquids in this region. The Marcellus Shale is now the largest producer of natural gas in the United States, and the Utica Shale shows similar, if not, more prolific potential. These two shales in the region are not only producing large volumes of natural gas, but also of natural gas liquids such as ethane, propane, and butane.

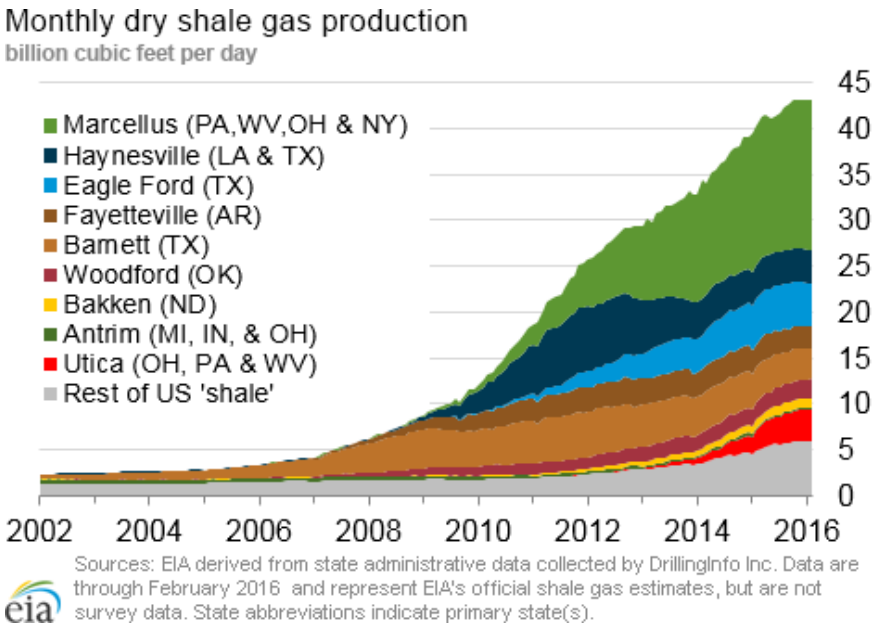

Figure 1: U.S. Natural Gas Production by Play

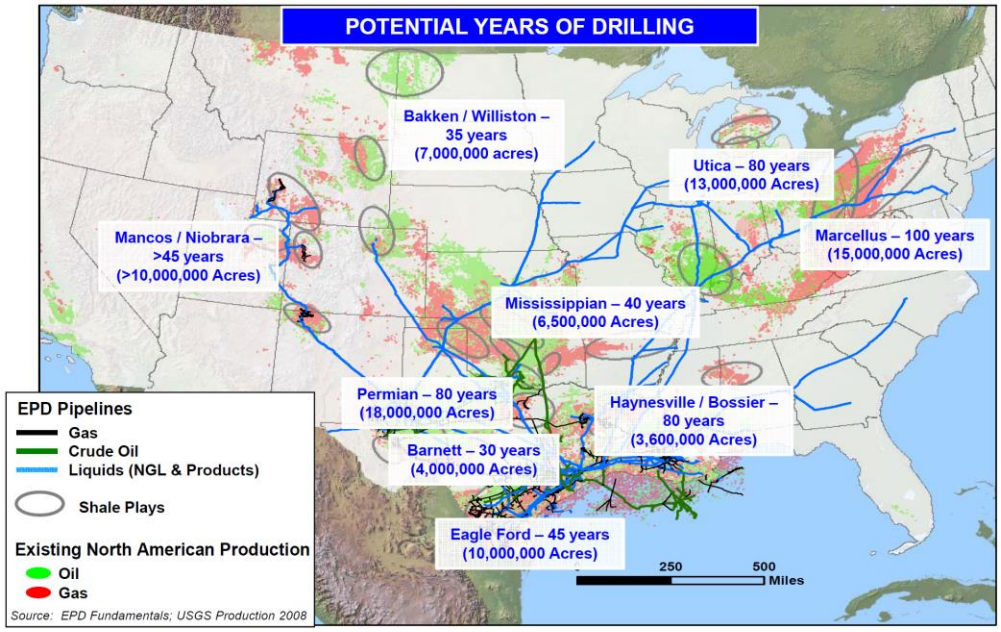

Figure 2: Potential Lifetime of North American Natural Gas

Ethane and propane are the raw materials used to make pharmaceuticals, industrial chemical, and consumer goods. Over the last ten years, production of ethane and propane from the Marcellus and Utica Shales have driven the cost of these valuable raw materials to a price point well below global and national prices. Connecting this valuable resource to the national and global markets will take modern, reliable infrastructure – the topic of this field hearing. I contend that the types of infrastructure necessary to benefit both the region and the nation is not only a reliable, modern network of pipelines, but also a robust, regional system of natural gas liquid storage and distribution.

Table 1: Natural Gas Liquids and Industrial Uses

Purity product	Conversion factor (Mcf/bbl)	Application	End-use product	Primary sector
Ethane	1.558	Ethylene for plastics production, petrochemical feedstock	Plastic bags, plastics, antifreeze, detergent	Industrial
Propane	1.499	Propylene for plastics/solvents/ petrochemicals, residential/ commercial heating, cooking	Plastics, solvents, LPG for home heating, stoves, BBQ, engines	Industrial, residential, commercial
Normal butane	1.288	Petrochemical feedstock, gasoline blendstock	LPG, synthetic rubber for tires, lighter fuel	Industrial, transportation
Isobutane	1.245	Petrochemical feedstock, gasoline blendstock	Alkylate for gasoline, aerosols, refrigerants	Transportation
Natural gasoline	0.940	Gasoline blendstock, ethanol denaturant, diluent for bitumen	Motor gasoline, Canadian crude oil imports	Transportation

Source: U.S. Energy Information Administration.

Ethane Crackers

Recently, Royal Dutch Shell Chemical Appalachia announced a final investment decision on building a multibillion-dollar ethane cracker in Pennsylvania, not far from the West Virginia border. Shell has said constructing the plant would employ 6,000 workers and provide 600 permanent operational positions when it opens. Shell, which has been pulling back in parts of its global operation, said this facility was a particularly competitive project because it will use ethane from the Appalachian Basin, the lowest-cost shale gas basin in North America. The Shell ethane cracker will consume about 105,000 barrels of ethane per day, producing about 1.6 million tons of polyethylene pellets per year to be molded into consumer products and packaging.

Two other global companies are now examining the potential to join Shell in investing billions of dollars into the region and creating thousands of manufacturing jobs due to the proximity and abundance of the natural resources in the Appalachian Basin. Each of these other potential facilities would use another 50,000 to 100,000 barrels of ethane per day. With current ethane production rates in the basin at around 500,000 barrels per day, the resource is certainly sufficient to support a renewed and robust chemical industry, that is as long as there is a modern and robust energy transportation infrastructure to support it.

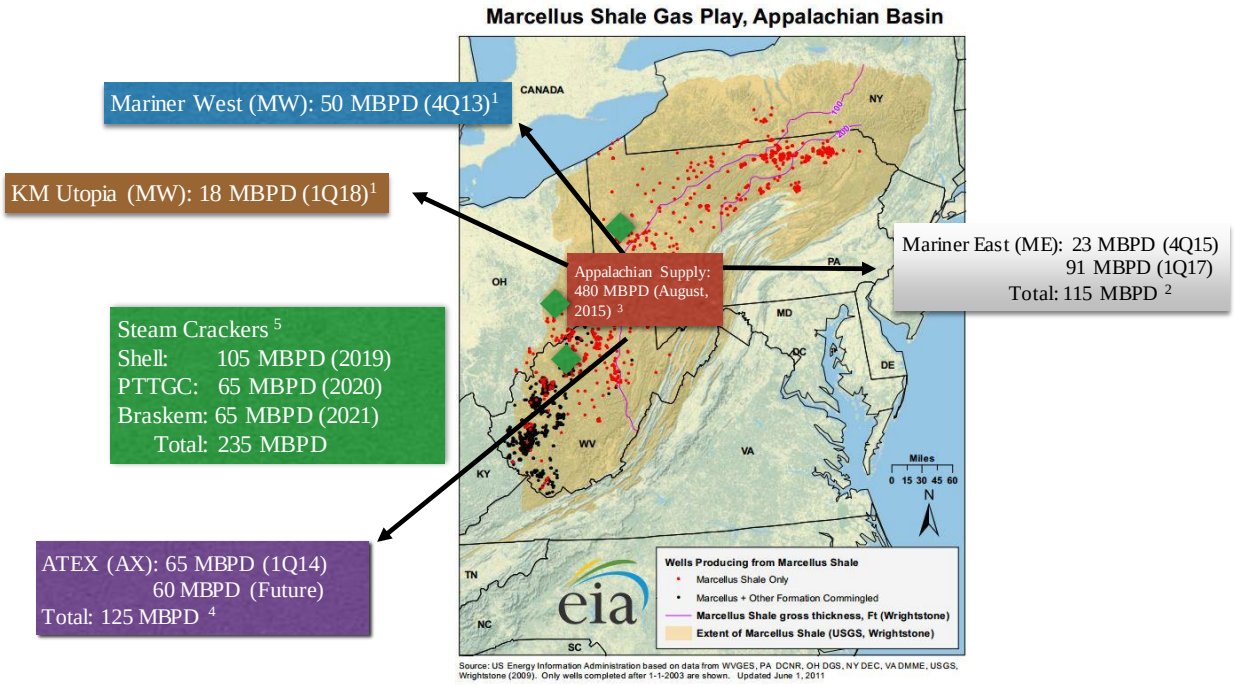

Figure 3: Estimated Ethane Supply and Announced Demand

Regional Cooperation

Last October, the Governors of West Virginia, Pennsylvania, and Ohio signed a Regional Cooperation Agreement titled the "Agreement to Enhance Regional Cooperation and Job Growth Through the Continuing Development of Shale Gas in the Appalachian Basin." In this agreement, four primary Areas of Cooperation were identified: Marketing and Promotion, Workforce Development, Transportation and Infrastructure, and Research. As part of the agreement, the states would work together to support infrastructure like pipelines, railroads, and roadways critical for shipping natural gas and related products. In addition, they will encourage state-supported universities to collaborate on research to find appropriate end uses for natural gas products. They will also collaborate on preparing for emergency response, promote recycling and environmentally friendly practices in the industry, as well as support entrepreneurship.

The WVU Energy Institute is playing a key role in each of the four areas of focus in the Tri-State Governors' Agreement. In particular, we are leading an effort involving the state geologic surveys of these three states as well as an industry consortium currently with twelve members to examine the geologic potential for safe and reliable subsurface storage of natural gas liquids. The goal of this project is to provide essential data to support of the development the chemical manufacturing industry, promoting economic development. As evidenced by the industry's commitment to our project, developing storage and transportation infrastructure is a critical pathway to developing the industry in the region. Subsurface storage and a distribution network of pipelines will benefit both the raw material producers and the chemical industry by:

- Fostering a readily available and reliable source of natural gas liquids,
- Developing a predictable price point for the commodity in the region. There is currently only one spot pricing hub for natural gas liquids in the U.S.
- Promoting regional investment and a more robust ecosystem for the industry, and

- Establishing a reliable trading hub into which producers can sell their products.

The primary example of an ethane storage hub and associated piping, in the United States, exists between Brownsville, TX and Lake Charles, LA. The piping and infrastructure necessarily encourage growth in the region due to its interconnectivity to the multiple manufacturing facilities in the vicinity.

Conclusion

In conclusion, many projects at various stages of development are underway to build take-away capacity from the region – moving the raw materials to the east coast, the gulf coast, and to Canada. However, to spur on a more diverse national economy, a robust regional infrastructure is necessary. Advances in technology have provided us with an opportunity to implement best-in-class construction and monitoring techniques to ensure the safe operation of natural gas liquids storage facilities as well as pipeline infrastructure. Regional and national collaboration is essential to the development of robust and reliable interstate energy infrastructure. The states of WV, PA, and OH have begun collaborating to erase the state borders, and we look forward to working with our federal counterparts in this exciting effort.

Chairwoman Murkowski, Ranking Member Cantwell, thank you for this opportunity to testify today. I look forward to answering any questions.