Testimony of the Pipeline Research Council International

Presented by:
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for the

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Energy Subcommittee

Hearing on *Unleashing American Power:*
The Development of Next Generation Energy Infrastructure

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Good afternoon, Chair Brandon Williams, Ranking Member Jamaal Bowman, and members of the Energy Subcommittee. My name is Cliff Johnson, and I am the president of the Pipeline Research Council International (PRCI).

PRCI was founded in 1952 to solve key challenges that faced the safety and integrity of the energy pipeline network in the United States. Over the past 70 years, we have grown into a global non-profit organization that performs the research needed for enhancing the safety and integrity of the global pipeline network and reducing its environmental impact. The PRCI community is comprised of the world's leading pipeline companies, and the vendors, service providers, equipment manufacturers, and other organizations supporting the industry.

The PRCI mission is to collaboratively deliver relevant and innovative applied research to continually improve the global energy pipeline systems. We investigate the challenges of corrosion, design, materials, construction practices, compressor and pump stations, integrity, inspection, right of way surveillance and monitoring, subsea assets, underground storage, and the measurement of the products within the system. PRCI is recognized around the world as a unique forum within the industry for delivering great value to its members and the industry — both quantitative and qualitative — through the development and deployment of research solutions to improve pipeline safety and performance.

We have worked closely with the US Department of Energy (DOE), Pipeline & Hazardous Materials Safety Administration (PHMSA), Environmental Protection Agency (EPA), National

Institute of Standards and Technology (NIST), Canada Energy Regulator (CER), Natural Resources Canada (NRCAN), and Environment and Climate Change Canada (ECC Canada) to assist our members and the industry to make the pipeline infrastructure safer. We have close partnerships with sister organizations in Europe and Australia.

PRCI has been in the forefront of the transitions to new fuels. In the 1980s, PRCI performed some of the early research done on hydrogen transport and storage. In the late 1990s, PRCI research enabled the industry to safely transport ethanol. PRCI has researched the transportation of biofuels, renewable natural gas, hydrocarbons, and other sources of energy for many decades. Through private and co-funded work with PHMSA, we have been able to lead many key efforts to enable the transport and storage of these fuels. As we move forward, we will need to continue our focus on the safety and integrity of these vital assets for the mosaic of energy that will be needed to meet the future demands.

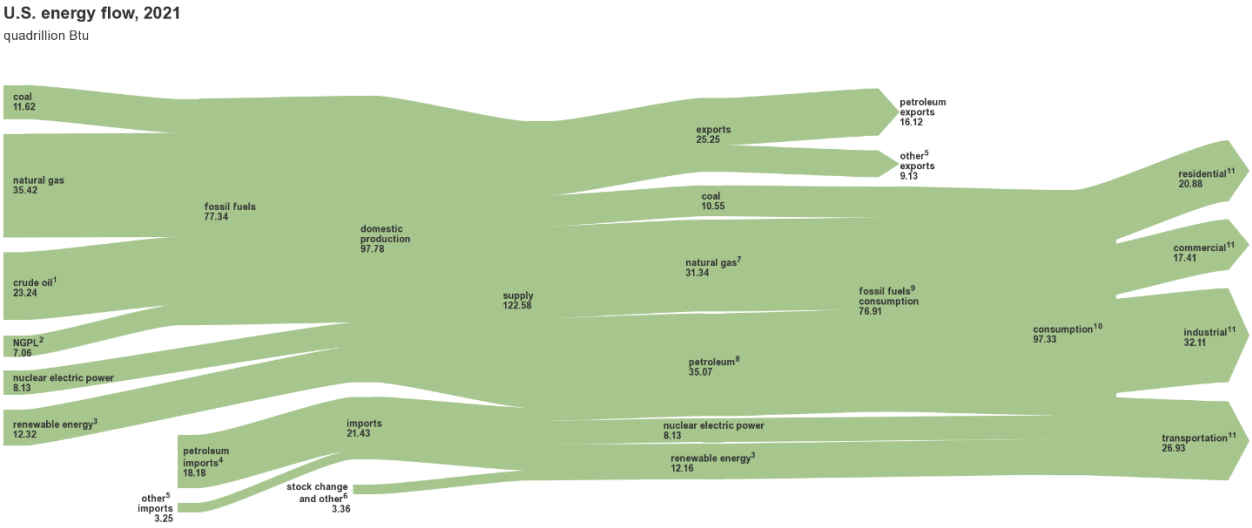
Today, I want to discuss the role that PRCI plays in ensuring the safety of the current energy pipeline infrastructure and the assets needed for the next generation of fuels.

We are at a unique crossroads, both in the US and globally, as we work to develop new sources of energy. As we look to the next generation of energy, it is important to acknowledge the vital role that the current pipelines and associated assets will play in transporting and storing these commodities. Pipelines are the safest mode of energy transportation. With 2.8 million miles of the pipelines in the United States, pipelines are a key backbone of our nation's energy infrastructure. PRCI members continue to innovate this network toward zero emissions and 100% reliability. Therefore, we have many projects being developed and performed, including leak detection and fitness for service.

In 2020, PRCI created the Emerging Fuels Institute (EFI) to answer the questions needed to safely transport and store hydrogen, hydrogen blends, and renewable natural gas. The first efforts of this global collaboration of over 20 companies and four sister world-wide organizations are focused on which pipeline materials will be best suited for hydrogen service. We are leveraging the work that has already been done in Europe and Australia to assist the North American energy pipeline operators and have held four workshops over the last few years to assist in coordinating the efforts within CER, NRCAN, DOE, and PHMSA. The PRCI EFI is a part of the DOE HyBlend effort to understand pipeline properties. We are at the point where the research needs to progress to full scale testing to provide a fuller level of confidence in the understanding of hydrogen's impact on the pipeline systems. This is an area that would be well suited for a public – private partnership.

According to the Energy Information Administration (EIA), 68% of the domestic energy consumption is supplied by petroleum and natural gas, the majority of which is transported by pipeline. To transition that consumption to electrical energy would require enormous infrastructure changes including a massive build-out of the electrical grid and corresponding renewable energy development. Not only would this take time and land, but it would also

demand large amounts of energy, resources, and produce significant greenhouse gas emissions for the steel, copper, aluminum, and cement to build out the electrical infrastructure. Furthermore, applications that require high density fuels, such as the airline industry, are unlikely to ever be electrified. Clearly, the pipeline infrastructure will continue to be a key part of the new energy economy.



[1] Includes lease condensate. | [2] Natural gas plant liquids. | [3] Conventional hydroelectric power, biomass, geothermal, solar, and wind. | [4] Crude oil and petroleum products. Includes imports into the Strategic Petroleum Reserve. | [5] Natural gas, coal, coal coke, biomass, and electricity. | [6] Adjustments, losses, and unaccounted for. | [7] Natural gas only; excludes supplemental gaseous fuels. | [8] Petroleum products supplied. | [9] Includes -0.05 quadrillion Btu of coal coke net imports. | [10] Includes 0.13 quadrillion Btu of electricity net imports. | [11] Total energy consumption, which is the sum of primary energy consumption, electricity retail sales, and electrical system energy losses. Losses are allocated to the end-use sectors in proportion to each sector's share of total electricity retail sales. See Note 1, "Electrical System Energy Losses," at the end of U.S. Energy Information Administration (EIA), *Monthly Energy Review* (April 2022), Section 2. See Note 2, "Other Energy Losses," at the end of U.S. Energy Information Administration (EIA), *Monthly Energy Review* (April 2022), Section 2. | Notes: • Data are preliminary. • Values are derived from source data prior to rounding for publication. • Totals may not equal sum of components due to independent rounding.

eia Sources: EIA, *Monthly Energy Review* (April 2022), Tables 1.1, 1.2, 1.3, 1.4a, 1.4b, 1.4c, and 2.1.

This understanding drives the development and use of alternative gaseous and liquid fuels such as hydrogen, biogas, and biofuels. Of these emerging energies, hydrogen has the most research gaps to address prior to a successful implementation. Some of the existing pipeline system is suitable for transporting hydrogen, but for the remainder, additional research is needed to understand the material limitations of pipelines in hydrogen service under real world conditions including pressure cycling. For example:

- Additional research is needed in the equations of state for hydrogen in blends with natural gas;
- More development is needed for technologies that can identify material properties from within the pipe;
- Better tools are needed to detect the development of cracks in pipeline steels;
- Further research is needed in developing technologies that can optically identify hydrogen leak emissions;
- Research gaps need to be identified and addressed to facilitate the underground storage of hydrogen in depleted and aquifer driven reservoirs; and,

- Full scale testing in a safe and controlled environment must be done to expand upon the excellent small-scale testing that the DOE has performed on hydrogen material compatibility.

The practical use of hydrogen as a clean fuel will be limited by its production. The existing infrastructure does not have sufficient renewable or nuclear energy nor purified water to make the hydrogen needed for the new energy economy. Accelerating the implementation of hydrogen at the needed scale can only be realistically achieved by converting natural gas into blue hydrogen which will require sequestration of the corresponding carbon dioxide that is generated and those related technology and research gaps.

While over 50% of the industry's asset base is at least sixty years old, the current network can be part of the energy transportation and storage backbone for years to come if well maintained. Our goal is to maximize the safety and reliability of the pipeline systems while minimizing the corresponding environmental footprint. We have begun this process using the PRCI Technology Development Center (TDC) in Houston, TX.

The TDC facility opened in 2015 and offers over 1500 pipeline samples from around the world to test and develop tools, processes, and associated people for enhanced pipeline safety. In-line inspection (ILI) tools are used to assess the integrity of pipelines, and we are completing three projects in 2024 that will provide an understanding of the current state of the tools and what is needed to elevate their capabilities. A part of the TDC was co-funded by PHMSA to jointly research the impact of mechanical damage on pipelines. We recently met with PHMSA Deputy Administrator Tristan Brown, US Representative Lizzy Fletcher, and US Representative Shelia Jackson Lee and discussed the opportunity to receive pipeline samples from failure investigations. Continued partnership with PHMSA, DOE, NIST and others is welcomed.

Leak detection is one key area for our focus on safety and integrity. The number one priority if a pipe fails and any product is released is to be able to locate and isolate the source as soon as possible. An area of enhanced investigation for PRCI are devices installed along the pipeline such as handheld sensors, aerial sensors including fixed wing, helicopter, and unmanned aerial vehicles, and even satellite-based sensors. This focus aligns with our commitment to reduce the environmental impact of pipeline systems. Similarly, the opportunity to reduce greenhouse gas emissions is another key area of PRCI research. From the emissions associated with pipelines and those at compressor pump station facilities, we are working to locate and reduce as much as possible as soon as possible.

A continuing challenge to the pipeline industry is corrosion. Recent data shows the internal, external, and stress cracking corrosion are the second leading cause of pipeline incidents. Research to prevent, detect, and mitigate corrosion is vital to extending the life of these assets. We are working to enhance the tools used to determine the fitness for service of current assets and any new pipeline systems being developed.

With increased rainfall and earthquakes, the potential for pipelines to move has increased. Geohazard threats introduce new stresses and strains to the systems that need to be better understood. We are exploring opportunities to modify construction practices to better prepare for such events. Advanced sensor technologies are also being developed and verified.

Data is a rising issue for the energy pipeline industry. As an industry, we have not made the strides from which we would benefit. In 2016, PHMSA was directed to explore the creation of a voluntary information sharing program for the pipeline industry. The final report laid out a strong plan for advancing the use of data, yet it was not advanced by Congress. In parallel, PRCI had already begun to develop the Virtual Technology Development Center (VTDC). It has taken PRCI time to gain the needed momentum, but we are bringing together data from several PRCI projects and beginning to enable the industry to contribute data. To make significant strides, we will need to establish a public – private partnership like the one the Federal Aviation Administration (FAA) developed to enhance air safety. The FAA model was the seed for both the Vital Information Subsystem (VIS) and VTDC. The sharing of data to enhance industry decision-making is the next big step for safety.

Additional government – private coordination is needed to focus and accelerate the research on the practical issues that pipeline operators will experience in the new energy economy. Historically, PHMSA has held workshops to better understand the research and technology gaps needed for the pipeline industry; the DOE, NIST, and other government agencies have not been as active in this understanding with the pipeline industry. Even with PHMSA's coordination, those that best understand pipeline design and operations do not have a direct voice in the research selection process. Improved coordination will not only improve the efficiency to allocate limited research funding but will also reduce the time needed for the corresponding implementation.

Thank you for the opportunity to provide this testimony today. I am always available to answer any questions you might have and to work with you further to continue to reduce the environmental impact of our vital pipeline infrastructure and to ensure that it has the level of integrity and safety that is needed, today and for the future.