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"Electricity Sector in a Changing Climate"

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Introduction

Chairman Murkowski, Members of the Committee, I appreciate the opportunity to testify today and offer my perspective on the dramatic changes that are occurring in the electricity sector. I appear today on behalf of NextEra Energy, one of the largest U.S. electric generators, and the generator with the most diverse supply mix. NextEra Energy is one of the few national electricity companies in the U.S., operating in every regional power market in the country. I offer the perspective of NextEra Energy and a former Chairman of the Federal Energy Regulatory Commission (FERC).

NextEra Energy is a leading clean energy company with consolidated revenues of more than $16 billion, 49,000 megawatts of generating capacity, and 14,000 employees in 36 states and Canada. NextEra Energy is the largest U.S. electricity company in the world by market capitalization. Headquartered in Juno Beach, Florida, NextEra Energy's principal subsidiaries are Florida Power & Light Company, which serves more than five million customer accounts in Florida and is the largest electric utility in the United States, Gulf Power Company, and NextEra Energy Resources, a competitive power company that is world's largest generator of renewable energy from the wind and sun. NextEra Energy generates clean, emissions-free electricity from eight nuclear power units in Florida, New Hampshire, Wisconsin, and Iowa.

I commend you for holding this hearing. The electricity sector is undergoing an unprecedented degree of change. That change has resulted in significant customer benefits, in the form of lower prices, lower price volatility, and improved operational performance. Our electricity supply mix has become younger, cleaner, more diverse, and more flexible. A collateral benefit of the transition in our electricity supply mix is emissions from the electricity sector have declined sharply as a result. While these benefits are significant, there have been impacts associated with the retirement of uneconomic generation.

Changes in U.S. Electricity Sector

As someone who has been involved in the electricity sector in one role or another since the late 1980s, it is striking to see the degree and pace of change in the electricity sector. The U.S. electricity industry is in the middle of a fundamental transition. This transition is being driven by market fundamentals, including a dramatic increase in U.S. natural gas production from the shale gas revolution, the resulting sharp and sustained fall in natural gas prices and significant decline in wholesale power prices, displacement and retirement of inefficient coal, natural gas and oil-fired generation, lower than expected electricity demand, the addition of modern, efficient natural gas generation, improvements in wind and solar technology and accelerated entry of renewables, and the introduction of other technologies, especially storage. Contributing to these market forces are federal and state policies encouraging renewables, and stricter environmental requirements on generation facilities.

Of these factors, the most important by far have been low natural gas prices in concert with the addition of highly efficient new gas generation. When combined with lower demand growth, the result is low wholesale power prices, rendering generation from many older, inefficient facilities uneconomic. Importantly, the sharp fall in natural gas prices changed the longstanding relationship between coal and gas generation, making gas generation significantly lower cost than coal for the first time – that is the real game changer.

There has been sizeable retirement of inefficient and uneconomic older coal and natural gas generation facilities, some retirement of uneconomic nuclear units, and large additions of modern, efficient natural gas and renewable energy generation. As a result, the U.S. electricity supply mix has changed significantly over a relatively short period, and there is now more diversity in U.S. electricity supply than ever before. The coal share of our electricity supply mix declined from 47% in 2005 to 27.5% in 2018, the natural gas share rose from 22% to 35% over the same period, and wind and solar quadrupled, now accounting for 11% of our supply. Overall, the mix of U.S. electric generation facilities is younger, more efficient, more divese, and more flexible than ever before.

These changes have been so significant to have raised questions about whether generation retirements are being driven by market fundamentals or by federal or state policy, and whether the retirement of uneconomic generation poses a threat to electric system reliability. The evidence strongly suggests that the primary factor driving retirements has been market fundamentals, not regulatory policy, and there is no evidence to suggest the retirement of uneconomic generation poses a threat to electric reliability. Because the transition is driven by market fundamentals, it can be expected to continue.

While there are concerns in some quarters that future retirements may result in a loss of electricity supply diversity, the reality is the transition has made our electricity supply much more diverse and is likely to result in even greater diversity in coming years.

The retirement of inefficient and uneconomic generation is a natural aspect of a competitive market. Given the outlook for U.S. natural gas supply and prices, low demand growth, and continued improvements in wind and solar efficiency and cost, the pressure for uneconomic facilities to exit may not relax.

FERC wholesale competition policy played a critical role in this transition. Lowering costs was a primary goal of competition policy in both the electricity and natural gas industries. Competition produced the shale gas revolution, successfully shifted risk away from customers to market participants, and facilitated deployment of new technologies.

In my view, wholesale competition policy has been a major success. The same cannot be said about retail competition. Retail competition has largely been limited to states that historically had very high retail rates, with the exception of Texas, where consumers are mandated to choose a competitive supplier. In many states, retail competition has been a failure, at least for residential customers, resulting in higher rates from competitive suppliers than the rates charged by regulated utilities. Perhaps because of these outcomes, participation by residential consumers in retail programs has been declining since 2014. The real beneficiary of these retail programs appears to have been industrial and other large customers.

There are some who argue the electric sector transition is the result of systemic "market failure" that must be corrected. It should be recognized that the "market failure" these critics are trying to remedy is low prices resulting from market fundamentals. Their "solution" is to raise prices charged by a select few, which would tend to suppress prices for everyone else, discouraging the entry of new, more efficient economic generation. In the end, these types of proposals are designed to shift risk away from generators back to customers, contrary to a primary goal of competition policy. In effect, subsidies grant the owners of uneconomic generation facilities a safe haven from the hazards of competitive markets.

New Technologies

One of the primary drivers of the transition in the electricity sector is the surge of new technologies, including generation, storage, and demand response technologies. The electricity industry is experiencing a greater degree of technology entry than at any point over the last hundred years.

As noted earlier, the renewable energy share of the U.S. electricity supply mix has quadrupled since 2005. That is a remarkable degree of change in such a short period. Since 2013, more than half of new electricity generation capacity added in the U.S. has been wind and solar energy. While federal and state policy encouraged renewable energy, these policies encouraged competition between renewable energy technologies and companies, and the lower cost technologies and more competitive companies have tended to prevail over time.

The surge in renewable energy entry is the result of technological improvements in cost and performance. Since 2009, the cost of wind generation has declined 69%. Even more dramatic is the decline in solar PV costs, down 88% since 2009. Many utilities are purchasing more renewable energy than required under state policy, because it makes economic sense.

Historically, economies of scale have been an important consideration to providing electricity at a reasonable cost. Economies of scale are still important, even with these newer clean energy technologies. As a case in point, Florida Power & Light recently announced a "30 by 30" plan to install more than 30 million solar panels by 2030, making Florida a world leader in solar energy. Small scale private rooftop solar can cost 2 to 5 times as much as utility scale solar generation, and is highly dependent on above-market rates and cross subsidies from nonparticipating customers.

But storage may be the most exciting new technology. Electricity is the only commodity that cannot be readily stored, and historically the only way to storage electricity was in the form of water at a pumped storage project. But battery storage is a breakthrough technology that promises many benefits. Storage can respond very quickly, and is a very flexible product that can be tailored to meet particular system needs and customer preferences. At a very high level, storage can reduce price volatility, and make supply and demand flatter. Battery storage also has many uses. Storage can provide power during grid failures and weather-related outages, can relieve transmission congestion, and can integrate renewables. Storage economics have also improved dramatically, battery storage costs falling 80% since 2010.

Increasingly, electricity companies have become technology companies that deliver power and are looking to combine technologies to improve performance. Last year, Florida Power & Light unveiled the Nation's largest combined operating solar and storage project at Babcock Ranch in Florida. More recently, our competitive power company, NextEra Energy Resources, announced a partnership with Portland General Electric in Oregon to develop the Nation's first project that integrates wind and solar generation and battery storage, the Wheatridge Renewable Energy Facility. We expect these sort of innovative combined projects will become more common in future years.

There are many other technologies that benefit customers. For example, smart meters provide real time data that allows utilities to see outages in real time, pinpoint them quickly, and respond and restore service much faster than in the past.

Energy Infrastructure

A strong energy infrastructure has been a critical foundation for the electric sector transition. Today's electric grid was developed in the past to deliver yesterday's electricity supply, so as our electricity supply mix changes, we need a different grid, one capable of delivering more renewables and new, efficient natural gas generation, while accommodating the retirement of older, uneconomic generation facilities. Changes in the U.S. electricity supply mix were only possible because of robust investment in transmission, and new investments in transmission must keep pace to support the continued transition of our generation fleet. New interstate natural gas pipeline infrastructure enabled the Nation to secure the benefits of the shale gas revolution and facilitated the electricity sector transition.

This Committee has dedicated a lot of attention to studying questions related to the resilience of the U.S. electricity industry. It is quite clear that the key to resilience is the delivery system, the distribution and transmission system. Nearly all outages result from failures of the local distribution or transmission system, and fuel supply emergencies account for virtually no loss of service. For that reason, a more robust power grid and interstate pipeline network will do more to strengthen energy delivery system resiliency than any other action.

Improving resilience through strengthening energy infrastructure will take significant level of investment. Estimates are that $100 billion will be invested in electricity transmission projects over the next five years. Regulatory policy plays an important role in securing the infrastructure investment and affects the level of risk associated with that investment.

Emissions from Electricity Sector

The changes that are sweeping across the electricity sector have not just lowered prices, they have lowered emissions. Electricity sector emissions of CO_2 in 2017 were 28% below a 2005 baseline. SO_2 and NO_x emissions have experienced even sharper declines.

Importantly, the primary causes in the decline of electricity sector emissions over this period are generation retirements and lower output from higher-emitting generation resources attributable to market fundamentals: the steep fall in natural gas prices, the addition of new, efficient natural gas generation and the surge of new renewable resources.

New air, water, and solid waste environmental regulations were only a secondary factor in emissions reductions, with lower electricity demand being another secondary factor. This may not be intuitive and requires some explanation of the relative economics of coal and gas generation, and how the changing relationship of coal and natural gas pricing affected older, less efficient fossil generation, especially smaller, older, inefficient coal plants.

When natural gas prices were high, an inefficient coal plant could produce electricity more cheaply than the most efficient natural gas power plant. But the shale gas revolution drove down natural gas prices, reversed the longstanding price relationship between natural gas and coal, and made inefficient coal and gas plants uneconomic, with no prospect of operating profitably as long as gas prices remained low. This was true even without considering the impact of compliance with new air, water, and solid waste environmental regulations. These fundamental economics led to widespread retirement of uneconomic fossil generation. The units retired tended to be older and smaller fossil plants. The average age of coal, natural gas and oil power plants plants retired through 2017 was 59, 44, and 46 years, respectively.

An inefficient power plant not only uses more fuel than an efficient plant to produce the same electrical output, it produces greater emissions. For that reason, the retirement of inefficient fossil plants has had an outsized impact on emissions reductions. Environmental regulations put added pressure on uneconomic coal plants. Many older, inefficient coal power plants without controls on mercury faced additional cost pressures as a result of the Mercury and Air Toxics rule. The tipping point for some plants may have been the cost of complying with new environmental regulations, but the primary cause for generation retirement was economics attributable to the shale gas revolution.

I discussed the benefits of battery storage earlier. There are potential emissions benefits here as well, to the extent storage displaces peaking units that tend to be relatively inefficient and high emitting. Some estimates are that half of some peaking units that are 30-50 years old may retire in the next 10 years.

Conclusion

In conclusion, U.S. electricity markets are undergoing a fundamental transition driven primarily by economics, the result of low cost natural gas produced by the shale gas revolution combined with increased energy efficiency, lower demand growth, and low wholesale power prices. The transition has been marked by an increase in new, more efficient natural gas generation, a significant increase in ever-lower cost wind and solar generation, and the retirement of inefficient, uneconomic generation. This transition is likely to continue, producing an increasingly diverse and more reliable electricity supply. While this transition has had some impacts, it is delivering significant benefits to the consumers. This transition has also resulted in significant environmental benefits, from sharply lower emissions from a generation fleet that is younger, cleaner, more efficient, more diverse, and more flexible in performance.