BEFORE THE
U.S. HOUSE ENERGY AND COMMERCE COMMITTEE

SUBCOMMITTEE ON ENERGY AND POWER

OVERSIGHT HEARING ON
"AMERICAN ENERGY SECURITY AND INNOVATION:
THE ROLE OF A DIVERSE ELECTRICITY GENERATION PORTFOLIO"

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Good morning Chairman Whitfield, Ranking Member Rush, Vice-Chairman Scalise, and Members of the Committee. My name is William Mohl and I am President of Entergy Wholesale Commodities, 440 Hamilton Avenue, White Plains, New York. I appreciate the opportunity to discuss the importance of nuclear power to a diverse electricity generation portfolio. My company's view and my personal view is that all fuel sources have something to offer and that it is prudent to maintain an appropriate mix. This general approach is consistent with sound utility planning principles that consider reliability, production costs, load-following capability, price stability, supply diversity, environmental factors, and regional or local conditions as some of the key components in developing a generation resource portfolio.

Introduction

Entergy is one of the largest nuclear operators in the United States. It owns and operates 11 nuclear power units in New York, Massachusetts, Vermont, Michigan, Arkansas, Louisiana, and Mississippi. It also provides management support services for a twelfth unit owned by the Nebraska Public Power District. Entergy has approximately 15,000 employees, owns and operates approximately 30,000 megawatts of electrical generating capacity, and delivers electricity as a retail utility provider to

approximately 2.8 million customers in the south central U.S. Entergy was the first U.S. utility to voluntarily stabilize greenhouse gas emissions. Entergy has earned local, national, and international recognition for its leadership on a wide range of issues, including those related to environmental policy and corporate governance.

During my 31-year career in the energy industry, I have worked in utility operations, business development, asset optimization, and system planning and operations, including the procurement of fuel for generation. My immediate past job was President and CEO of two of Entergy's integrated utilities that provide retail electric service in Louisiana. Those utilities have a diverse fuel mix that includes gas, coal, and hydro as well as nuclear. In my current position I am responsible for Entergy's non-utility wholesale business, which includes merchant nuclear plants operating at five locations in the Northeast and Midwest. Entergy's non-utility wholesale business also holds fossil and renewable generation facilities, but my comments today will focus on nuclear generation.

Baseload Nuclear Generators Provide Vital Reliability, Economic, and Environmental Benefits

Regional electric grids require a mix of baseload, load-following, and peaking facilities. Baseload power sources are those plants that can generate dependable power to consistently meet demand. Baseload generation typically runs at full capacity, 24 hours a day, seven days a week, unless a unit is off-line for a scheduled or unscheduled outage. Load-following power sources are typically called upon to increase or reduce output throughout the course of a day as demand for power from end users changes. Peaking units are usually called into service only when demand for electricity is especially high, such as during periods of extreme heat or cold. While each regional electric system has its own unique characteristics, in general, coal and nuclear plants have long supplied baseload power,

while natural gas-fired units have been used as the predominant source of load-following and peaking capacity.

There are 103[1] operating nuclear power plants in the United States generating approximately twenty percent (20%)[2] of the Nation's electricity. Those nuclear plants operate as baseload, high capacity factor (approximately 89% in 2011[1]) units that power -- and help stabilize -- the electric grid in or near many major American cities, including New York, Boston, Philadelphia, Pittsburgh, Baltimore, Washington, D.C., Chicago, Detroit, Cleveland, Charlotte, Miami, New Orleans, and Phoenix, among others. Almost half of U.S. nuclear reactors are located within 50 miles of a metropolitan area that has a population of more than half a million. Throughout the Nation, nuclear generators help keep wholesale electricity prices lower than they otherwise would be.

A misconception about nuclear power plants we sometimes encounter is that they remain as they were when they first began operating. To the contrary, many key components are upgraded or replaced periodically, incorporating technological innovations that have been tested and proven suitable. One example is digital instrumentation, which has replaced other types of instrumentation for multiple systems and sub-systems at Entergy plants. Where digital instrumentation has been installed after rigorous analysis and testing, it generally allows plant operators to exercise finer control of systems and provides more immediate feedback. Another example is replacement components made from innovative new materials, such as working components of feed-water pumps and the turbine blades that are driven by steam to produce power. Components such as these, which often cost much more than the

[1] February 2013 NEI Status Report *"Status and Outlook for Nuclear Energy In the United States"* This figure includes Kewaunee Power Station but not Crystal River Nuclear Generating Plant, Unit 3.

[2] NEI U.S. "Nuclear Generating Statistics 1971-2011" (http://www.nei.org/resourcesandstats/Documentlibrary/Reliable-and-Affordable-Energy/graphicsandcharts/usnucleargeneratingstatistics).

components they replace due to their use of cutting-edge materials, last longer and increase plant reliability.

New turbine blades also are an example of the use of computer-aided design, which together with innovative materials allows them to be considerably more efficient in converting steam into power. Finally, components that are not typically replaced are subjected to rigorous inspection, monitoring and testing using the latest diagnostic techniques. There are many other examples of enhancements that nuclear operators have made to maintain and strengthen safety and reliability at their plants. For Entergy's part, we have made more than $3 billion in capital investments in our Northeastern and Midwest merchant nuclear plants alone since we acquired them.

Nuclear plant owners, including Entergy, also have made very substantial investments in power uprates that increase a plant's generating capability. Each power uprate is, of course, subject to a rigorous Nuclear Regulatory Commission (NRC) review and approval process to ensure that safety is maintained. Nuclear power uprates have added 6,823 megawatts of capacity to the Nation's generation fleet,[3] which is equivalent to construction of more than six large nuclear plants. Entergy has successfully implemented a 178 megawatt power uprate at the Grand Gulf nuclear generating plant in Mississippi, bringing that plant's total capacity to 1,443 megawatts and making it the world's largest boiling water reactor facility.

According to statistics from the Nuclear Energy Institute, nuclear plants collectively employ more than 100,000 workers.[4] Each plant directly employs between 400 and 700 full-time workers.[4] The average nuclear plant generates approximately $470 million in annual sales of goods and services in its

[3] Nuclear Regulatory Commission http://www.nrc.gov/reactors/operating/licensing/power-uprates/status-power-apps/approved-applications.html

[4] April 2012 NEI White Paper *"Nuclear Energy's Economic Benefits – Current and Future."*

local community and nearly $40 million in total labor income.[4] These figures include both direct and indirect spending. Moreover, the average nuclear plant pays approximately $16 million annually in state and local taxes.[4]

Another way of looking at the economic value of existing U.S. nuclear generation is to consider the potential cost of replacing it. Based on data publicly available from the U.S. Energy Information Administration, Entergy has calculated that building gas-fired Combined-Cycle Gas Turbine (CCGT) plants to replace the approximately 101,000 megawatts of capacity provided by U.S. nuclear plants would cost between $100 and $110 billion dollars.[5] An investment of this magnitude to replace an existing asset class would be enormous for the U.S. power industry. To provide some perspective, in 2011 U.S. investor-owned utilities (including stand-alone transmission companies) invested slightly more than $30 billion aggregate in transmission and distribution facilities[6] – well under one-third of the low end of the range of the estimated cost that would be required to replace nuclear generation with CCGT plants. Moreover, the $100 billion to $110 billion replacement cost estimate does not include any costs of expanding pipeline capacity to serve new gas-fired plants. The adequacy of pipeline capacity is a key consideration, as was recently demonstrated in New England.

Nuclear power is a crucial contributor to maintaining America's air quality. Nuclear generation produces virtually no carbon emissions.[7] Since 1995, U.S. nuclear plants have prevented the release of

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5 Total US Nuclear Capacity of 101,419 MW *(Table 8.1 Nuclear Energy Overview, EIA Monthly Energy Review, Feb 25th, 2013)* is gradually replaced over a ten year period using same amount of Conventional or Advanced Gas/Oil Combined Cycle capacity. The cost estimate range is calculated using "Total Overnight Cost in 2012" of $901/kW for Conventional and $1,006/kW for Advanced units *(EIA Annual Energy Outlook 2013 Early Release , Electricity Market Module, Draft Table 8.2 Cost and Performance Characteristics of New Central Station Electricity Generation Technologies).* Ten percent of capacity is replaced each year, and the cost is escalated at 2% inflation rate during the ten year period.

6 EEI December 2012 "Annual Property & Plant Capital Investment Survey."

7 On a life-cycle basis, carbon emissions from nuclear generation compare favorably to emissions from solar, wind, and hydro generation. NEI, Sources of Emission-Free Electricity InfoGraphic (2011) http://www.nei.org/resourcesandstats/Documentlibrary/Protecting-the-Environment/graphicsandcharts/infographicemissionfree.

more than 11 billion metric tons of carbon dioxide into the atmosphere.[8] Renewable energy sources can contribute to environmental sustainability, and should be considered for inclusion in a generation portfolio, taking account of emissions, cost, operating characteristics, land use, and other factors. Clean-coal technology shows promise but is not yet as cost-effective as existing nuclear as a source of baseload power. As reliable sources of baseload generation, nuclear plants provide a foundation in the power supply portfolio to support emerging wind and solar power projects, which are characterized by intermittent availability.

Nuclear Power Plant Operators Are Focused On Safety

While achieving these public benefits, safe operation of our nuclear facilities is our top priority. Entergy has made capital investments of more than $300 million to upgrade safety and security systems at its Northeast and Midwest merchant nuclear plants since acquiring them, all with the overarching goal of making sure our facilities maintain the highest safety and security standards. We ensure safety and security through a defense-in-depth approach that integrates constant training, robust design, multiple layers of redundant safety systems, comprehensive plant security, and detailed emergency planning.

Operator and technical training programs are evaluated on an ongoing basis by the Institute of Nuclear Power Operations (INPO) to identify strengths, weaknesses and recommended improvements. Selected programs are accredited through the independent National Nuclear Accrediting Board.[9] After undergoing extensive training prior to assuming their plant responsibilities, reactor operators continue to receive one week of additional training for every six weeks they are on the job to ensure they maintain high levels of skill and proficiency.

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[8] NEI, Emissions Avoided by the U.S. Nuclear Industry (1995-2011) http://www.nei.org/resourcesandstats/Documentlibrary/Protecting-the-Environment/graphicsandcharts/emissionsavoidedbytheusnuclearindustryyearly

[9] Institute of Nuclear Power Operations (http://www.inpo.info/AboutUs.htm).

In addition to the extensive operational training, the containment structures at our facilities were designed with numerous safety systems and components based on redundant protections, starting with some of the strongest buildings ever built and the most robust containment systems. Moreover, the plants have multiple layers of backup safety systems and diverse features to address emergency conditions, including multiple emergency backup power generators capable of shutting down the plant in the event of a total loss of all offsite power. These systems are monitored 24 hours a day, seven days a week by highly trained personnel.

Each of our nuclear plants has multiple layers of security including highly restricted access that is controlled by state-of-the-art security systems. Access to the plant is restricted to employees who have passed in-depth security and behavioral background checks and who daily undergo a lengthy entry and exit search process at our security checkpoints. A continual behavioral observation program and random drug and alcohol screenings help ensure employee fitness for duty on an ongoing basis.

We handle spent nuclear fuel in ways that are safe, secure, environmentally responsible, and proven over decades of operating history. While awaiting a federal permanent central spent nuclear fuel facility, we can continue to store spent fuel safely for decades to come through a combination of spent fuel pools and dry cask storage.

In the highly unlikely event of an emergency, we are prepared. For each of its nuclear plants, Entergy has invested in a wide-ranging, multi-layered, and coordinated emergency response plan. This plan features central coordination, clear communications, and stringent testing. The involvement of local communities in the emergency planning process ensures the sharing of information and coordination among various levels of government and the plant operator. All of this is designed to

ensure that everyone at and around our facilities is informed and knows how to react in case of an emergency.

The NRC is responsible for ensuring that nuclear plant operators meet federal safety regulations that ultimately assure that the plants are operated safely. Resident NRC inspectors work full-time at each of our plants, reviewing day-to-day activities and programs. Additional inspectors conduct several special inspections of specific areas and programs each year. NRC inspection reports and other regulatory records are readily available to the public.

Nuclear Power Is an Essential Component of a Diverse Energy Portfolio

Earlier in my testimony I noted that nuclear and coal traditionally were the primary fuels used to provide baseload power in the United States. Over the last ten years, improvements in power plant technology coupled with recent low gas prices have created the opportunity to operate CCGTs as baseload units as well. While there are benefits to being able to operate CCGTs as baseload, diversification is a prudent strategy for a generation portfolio, just as it is for an investment portfolio. Sound utility resource planning practices suggest that "you don't want to put all your eggs in one basket." In addition to its other benefits, nuclear generation provides a valuable hedge for electric consumers against potential gas price volatility.

Aside from price concerns, there are also challenges presented by the existing pipeline infrastructure and its ability to meet rising demand, particularly in certain regions of the country such as New England. Consider that replacing all U.S. nuclear units with gas-fired generation would require an additional 14.5 billion cubic feet per day of additional gas supply, a 70% increase over the 20.8 billion cubic feet per day of gas that electric generators used in 2011.[10] Natural gas fired generators do not have

[10] EIA 2011 data.

on-site fuel inventory and must be continuously supplied through a pipeline system, and while some facilities may have access to gas storage facilities to ensure continuous supply, many facilities do not. Supply issues can arise during peak times, when pipeline capacity is needed to satisfy the demands of local gas distribution companies to serve homes and businesses, in addition to the needs of power plants that may not have contracts for firm delivery. By contrast, nuclear plants have up to eighteen months of fuel supply on site and do not compete with residential and business consumers for fuel, making nuclear plants far less likely to be affected by fuel supply interruptions.

Challenges to Merchant Nuclear Generators

We believe the fuel diversity, economic, reliability, and environmental benefits of nuclear power are clear. Maintaining the existing nuclear fleet so those benefits can continue to be obtained will not be easy. One challenge to the merchant nuclear sector that has received some attention lately is the very low natural gas prices I spoke of earlier. While there are unquestioned benefits for consumers from low gas prices, the long-term viability of some power plants, including some nuclear plants, may be in question for a variety of reasons. For example, last October, the owner of one merchant nuclear plant announced that it would retire the facility because it was no longer economic to operate.

Let me be clear that we view natural gas prices as a market condition to which, as a business, we must adapt. That is our job. At the same time, the revenue effects of current gas prices underscore the importance of getting regulation right. In other words, preserving the many benefits of nuclear generation – reliability, economic, and environmental -- depends more than ever before on rational, evidence-based regulation.

Conclusion

The approximately twenty percent (20%) of the U.S. electricity supply safely generated by nuclear plants provides critical reliability, economic, and emissions benefits and contribute to a diverse generation mix for the United States. To preserve those benefits for the public, those of us in the industry must maintain our primary focus on safety while engaging with policymakers, and especially regulators, to ensure that market rules foster open competition and that other regulation is rational and evidence-based.

In summary, every source of energy has advantages and disadvantages. We know this to be true in transportation, home heating and also with electricity. Each generation source varies in terms of cost, economic and environmental impact, and other factors that complement and may be weighed against each other. Generation diversity is simply necessary to ensure a reliable and secure generation portfolio for the nation.

Thank you for the opportunity to testify today. I look forward to the opportunity to answer questions.