TESTIMONY IN SUPPORT OF HB308

By David Amerine

BEFORE THE ENERGY AND PUBLIC UTILITIES COMMITTEE OF THE OHIO SENATE

THANK YOU, Chair Reineke, Vice Chair McColley, and Ranking Member Smith for allowing me to enter this testimony for the record.

About me

Sandusky, Ohio is my hometown. I left Sandusky right after high school graduation to go to the United States Naval Academy and then spent seven years in the nuclear submarine force. After the Navy, I had a career spanning more than 40 years in the nuclear industry, half in commercial nuclear and half in the Department of Energy nuclear complex. My family and I lived all over the United States during the course of that career, but my wife and I decided to retire to Ohio on the shores of Lake Erie.

I held several positions within the industry, beginning as an operator and evolving to executive positions leading multi-billion-dollar companies. The trajectory of my career has focused on program management, project recoveries, safety conscious work environment creation, strategic planning, and business development. Having worked at a number of the country's largest and most vital nuclear stations and Department of Energy (DOE) nuclear projects, some of my greatest successes happened when I was brought in to recover troubled facilities and projects.

My last job was when I was hired as the President of Nuclear Fuel Services, which is vital to the security of the United States since it is the sole producer of nuclear fuel for our Navy's submarines and aircraft carriers. The Nuclear Regulatory Commission (NRC) had shut the facility down for operational and management issues. I led the restoration of confidence of the various stakeholders, including the NRC, the DOE, and Naval Reactors (NR), incorporating participative management, employee ownership, and project management enhancement techniques. The plant was restored to full operation under my leadership.

I was encouraged by colleagues in the nuclear industry to document the experiences of those plant and project recoveries which I led. I did so in a book entitled "Push It to Move It", intended to provide all layers of management in nearly any industry with lessons that I have learned undergoing a variety of very challenging circumstances. This book is dedicated to my late wife, Cindy, who passed away from ALS in 2018. To give back to my community in retirement, I have recently qualified as a firefighter and as an Emergency Medical Responder.

Obviously, I am a proponent of nuclear power as a source of electricity.

Nuclear Education

Most people who have not been educated on nuclear power are concerned about its safety, the issue of nuclear waste, and cost. Other countries, such as South Korea and France, have shown that nuclear is cost competitive, especially when environmental factors are considered. If our country can promote and build Generation IV nuclear plants, they will be much cheaper for a variety of reasons. **But if the public and elected officials are not informed on these matters, these reactors will not become a reality in the United States.**

Finally, the rest of the world is going nuclear. The United States is surrendering its leadership role, which is of grave concern on many fronts. We have set the standards in safety, quality, and conduct of operations in the past. Those standards may suffer under the leadership of China, India, or Russian. Additionally, we will miss out on the commercial opportunities an expansion of nuclear power in the world offers.

Reliability

Our country's standard of living is a function of productivity. The Gross Domestic Product (GDP) measures the economy's productivity and financial vitality. The GDP, in turn, is highly dependent on the availability of reliable and relatively inexpensive electricity. Simply put the cheaper electricity is, the more jobs are created, and the more people are working for a living. Conversely, high energy costs can equate to less people being productive and more social programs for those out of work. Broad-based electricity is measured in megawatts (MW), and it supplies electrical power to cities, factories, government facilities, and other users of electrical power as well as our homes. Therefore, it must be available on-demand and in large quantities (thousands of MW's).

The reliability of electricity delivery is the most crucial factor for our economy. There are many places in the world where electricity is not reliable, or it is only available at certain times. Economies cannot thrive under those conditions. Therefore, the reliability of our electricity has always been of the utmost importance to our economy and our personal comfort.

Reliability is measured by a term called capacity factor (CF), which is simply the ratio of how much power is actually produced from a given energy source over a period of time relative to theoretically what that power source would produce if it operated at 100% full power over the same period of time. Nuclear power averages a CF between 90% to 95% year in and year out. The next most reliable energy source is coal, at approximately 55% CF. Natural gas CF is usually between 35% to 40%. Wind and solar do have no CF.

Environment

If we are indeed concerned about our environment, one also needs to examine the ecological impact of wind and solar. It would take a wind turbine farm stretching from Detroit to Buffalo 1/4 mile deep or a solar panel farm of 8,100 acres to theoretically replace Davis-Besse Nuclear Station, which is approximately 900 Megawatts. And neither wind or solar could deliver power on demand. Both would obviously be ecological disasters. Both would rely on rare earth metals imported from China. Additionally, both wind turbines and solar panels require extensive and expensive maintenance. There are over 14,000 wind turbines in the United States standing idle due to the need for repairs, which cannot happen for various reasons. These facts are among the reasons I opposed the Icebreaker Project, which would eventually lead to 1400 – 1600 giant wind turbines erected on Lake Erie.

Discussing clean energy without including nuclear is worse than specious. It is disingenuous! And it lacks common sense.

Future Demand

Just as technological advancements are increasing exponentially, so too is the demand for electrical energy. The forecast for an increase in electrical power in the next 25 years is approximately 25% just to power things we know about in our expanding economy and increasing population. But what about things we cannot foresee. For example, approximately twenty-plus years ago, the use of personal computers, the Internet, and its warehouses of servers were just getting started. Today, that electrical energy usage has increased from almost nothing to 10% of what is used in the United States.

Who knows what other requirements for electricity, like a significant switch to electric powered cars or artificial intelligence (AI), will emerge?

A Diverse Energy Portfolio is Smart

Where would all that electrical energy required by an increasing demand come from?
I believe in a mixed portfolio of sources of energy including conservation. Conservation, eliminating energy waste and increasing energy efficiency, can help the energy produced go further, but it does not increase supply, and only partially decreases demand. And its contribution only happens once. Likewise, with the known technology today, solar and wind power generation can only help on the fringes. They will **NEVER, NEVER** be a source of reliable broad-based electrical energy. That leaves oil, gas, coal, and nuclear. Each has its own challenges and its own benefits. However, an innovative, safe, ecological deployment of all would permit the United States to again become energy independent if we have the resolve to do it. In my opinion, this goal must be established and intently pursued for national security and international political flexibility.

Nuclear Waste

The waste generated by nuclear is minuscule in quantity and has the least environmental impact compared to all other sources of electricity. Presently we are storing spent fuel assemblies at reactor sites. Those subassemblies are removed from the reactors when only approximately 5% of the nuclear fuel has been consumed. This is done due to very conservative calculations on potential embrittlement of the stainless-steel fuel pins. The pins, which house the uranium fuel pellets, could crack due to that radioactive exposure potentially resulting in release of radioactive fission products to the primary coolant, essentially removing one of three barriers to the atmosphere. However, that results in approximately 95 % of the uranium fuel left unused. If **ALL** electricity in the United States for one year was supplied **ONLY** by nuclear and if we were to reprocess those fuel assemblies to regain the 95% available uranium remaining, the resultant waste for the entire country would fill a single football field ten feet high. Moreover, we know what to do with nuclear waste, as demonstrated by the vitrification plant at which I was the program manager during its construction completion and startup. It has been safely immobilizing highly radioactive waste from the nuclear weapons program in borosilicate glass since 1997. Additionally, Generation IV reactors would produce considerably less waste than the present designs.

Safety and Cost

The safety record of nuclear energy in the United States is unmatched by any other industry. No civilian has ever been harmed by the nuclear generation of power in this country. No other energy source can make that claim. The workers at nuclear facilities are the best trained, most tightly screened, highest monitored of any workforce anywhere. Unlike other sources of energy, nuclear power has no impact on the environment in producing dependable electricity on demand.

While the safety record of nuclear power in the United States is undeniable, Generation III reactors, like Davis-Besse and Perry, require expensive, redundant active safety systems and very expensive, robust containment buildings. There is an additional cost in the surveillance and maintenance of these vital systems to protect against an improbable nuclear accident, such as a breach of the primary boundary. This is because these reactors operate at very high pressures which provides a motive force in the event of such an unlikely occurrence.

Simplify the Reactor and Reduce the Cost

Most of the new Generation IV reactor designs operate at much lower pressures or at atmospheric pressure, thereby removing that motive force. Additionally, many Generation IV designs use a eutectic fluid for its coolant with melting points between 300 - 500 degrees F. That means that if there was a breach of the primary boundary, the liquid would drip out and freeze. Many new reactor designs incorporate passive cooling systems, which are functional for >72 hours following a worst case upset condition without operator or equipment intervention as required by Generation III reactors. This would be the case even with a full station blackout, and can be maintained indefinitely with simple operator actions. Therefore, one could reasonably argue that the expensive, robust containment and redundant active safety systems would not be needed. Passive safety systems and much less robust containment buildings would reduce costs considerably. Combine that with factory construction, modular assembly, and reduced size, and calculations show that those Generation IV designs could be as much as 70% less expensive. Most of the Generation IV designs align with Small Modular Reactor (SMR) applications, extending the Nuclear Option to a broader range of markets such as replacing older, smaller coal units, or in areas of lower population density, or in global markets with smaller grids, etc.

Comprehensive Energy Plan

Our country has needed a viable energy strategic plan for over 45 years since the first energy crisis in 1974. Instead, since that time, our surplus supply of electrical energy has gone down with few broad-based electrical generation plants of any type built (due, in my opinion, to excessive over-regulation and other financial considerations). In addition, although our dependency on foreign fossil energy supplies went down to just specific grades of oil, it has now increased again under present policies. This situation puts our country in a precarious posture concerning national security. In the meantime, our concern for the environment has increased significantly. While that concern is appropriate, many of the actions and limitations imposed on industry and business and utilities are, in my opinion, unreasonable, even unrealistic, and, in some cases, counter to actually protecting the environment.

Barriers

The barriers to deploying new designs are not trivial, with both technical and institutional challenges to overcome. These challenges range from licensing issues to fuel and materials research. The size of investment and the payback periods are beyond typical venture capital horizons, making the investment challenges higher than in other industries or endeavors. This situation, therefore, necessitates some form of government partnering. Government support and resources are needed to demonstrate engineering, regulatory requirements, and business models for new reactor designs, new construction approaches, licensing streamlining, and active promotion. An aggressive public/private partnership to deploy these new designs is needed. Federal government action, assisted by State governments, to reverse the U.S. nuclear industry's impending decline is a national security imperative. The United States cannot afford to become irrelevant in a new nuclear age.

Ohio

Safe, available, reliable, ecologically sound electrical energy is as essential as preserving potable water supply for the future generations of Americans and, for that matter, the whole world.

There are technologies available to solve the challenges listed above with the right national resolve. Nuclear power is one of the most critical technologies. Generation IV reactors need to be developed, tested, promoted, and implemented. Ohio played a vital role in the infancy of nuclear energy in this country and its commercial implementation. HB 308 will help it have a crucial role in restoring our country as a leader in this vital technology. It will facilitate cooperation with the DOE, the NRC, NR, and other government agencies in re-vitalizing this critically important technology.

Few people realize Ohio’s significant contribution to the development of the nuclear industry. H.B. 308 will allow Ohio to continue its nuclear research and development legacy to benefit Ohioans and all of America.

Ohio's Nuclear History

1. Battelle helped to produce the first fuel assembly for the Navy's Nautilus Submarine.
2. The Portsmouth Gaseous Diffusion Plant Facility helped to produce enriched uranium for warheads during the Cold War and fuel assemblies for civil nuclear power plants.
3. Piqua, Ohio was the site of a unique experimental demonstration reactor
4. Mound Laboratories worked with the nuclear weapons program. The lab pioneered Radioisotope Thermoelectric Generators used on deep space probes.
5. The Fernald Feed Materials Production Center near Cincinnati produced fuel cores for plutonium reactors
6. NASA Plum Brook Station/Neil A. Armstrong Test facility is America's only nuclear propulsion test facility.
7. Wright Patterson AFB had a research reactor on site.
8. Ohio State University has a research reactor on site.
9. Materion produces materials for nuclear reactors.
10. BWXT in Barberton Ohio produces the pressure vessels for the Navy's fleet of Nuclear Submarines.
11. American Tank and Fabrication in Cleveland rolled the core barrels for the AP 1000 reactor plants being built in Georgia.