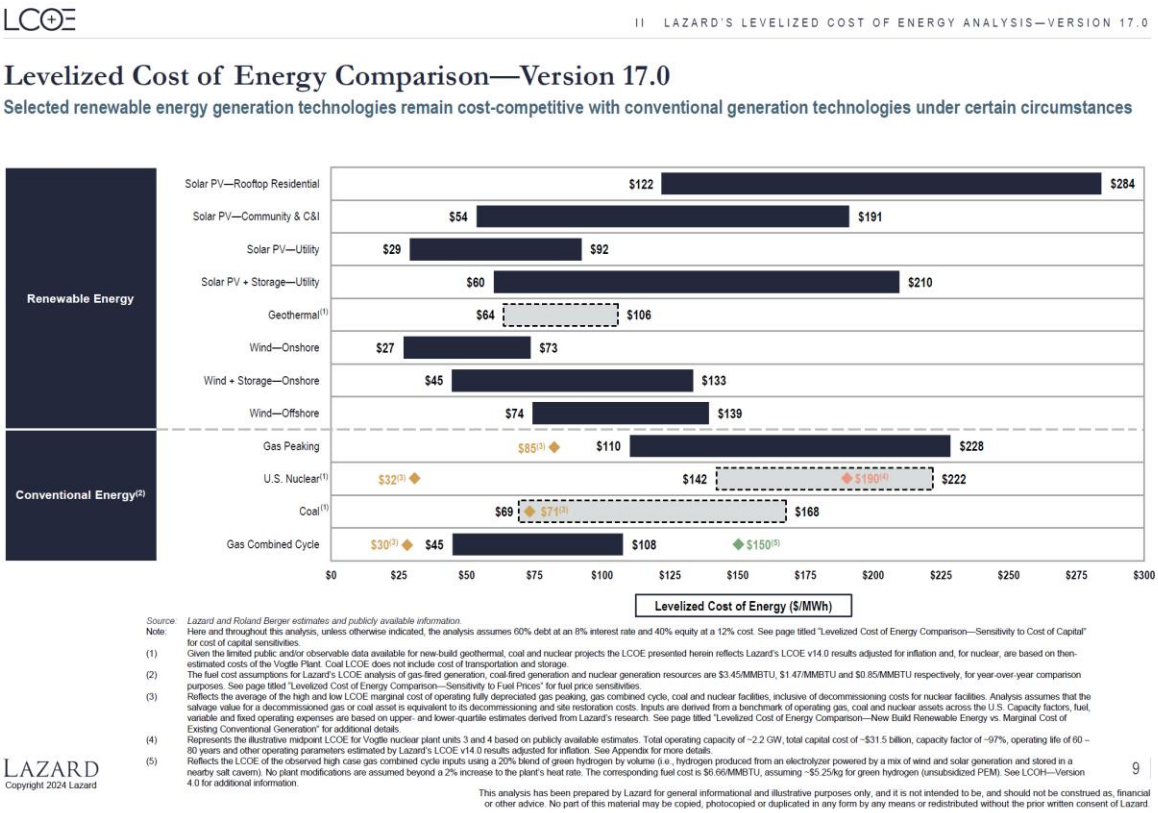
Testimony to the Ohio Senate Energy and Public Utilities Committee

Opposed to HB 308
Ned Ford
9533 North Cincinnati Columbus Road
Waynesville, Ohio 45068
513/600-4200 Ned.Ford@fuse.net December 10, 2024

Nuclear Power has long since escaped any practical cost range:

https://www.lazard.com/media/xemfey0k/lazards-lcoeplus-june-2024-_vf.pdf



The full Lazard report includes the same data modified to show these costs with and without U.S. subsidies. For a layperson, the values on these pages reflect dollars per MWh, which are the same as cents per KWh with a decimal point before the last digit. In other words, Onshore wind at $27/MWh equals 2.7 cents per KWh.

Note the data point of $32/MWh for nuclear power fuel and operating costs alone. This was Lazard's illustration of the cost of a fully amortized plant's fuel and operating cost alone. In Ohio, during the 2019 hearings on HB 6 the company testified that fuel and operating costs for the Davis Besse and Perry nuclear plants were 4.2 cents per KWh, which at the time was higher than the fuel and operating cost for natural gas

plants, or wind farms existing at the time in Ohio. Also more expensive than solar generation from new solar farms opened in Ohio after 2019.

The current Lazard report does not reflect the fact that during the first six months of 2024 the U.S. has experienced lower natural gas prices than any time since 1999.

Rooftop solar is nominally more expensive than nuclear power, but it competes with retail prices where all the other technologies compare to wholesale production costs.

Other ways of viewing Nuclear costs:

https://ieefa.org/resources/eye-popping-new-cost-estimates-released-nuscale-small-modular-reactor

NuScale and its partner Utah Associated Municipal Power Systems have raised their estimated cost for a 462 MW reactor from $58/MWh to $89/MWh in the brief period from mid-2021 to January of 2023. This would be $119/MWh without the 3 cent per KWh subsidy from the Inflation Reduction Act. The construction cost for the plant would be $9.3 billion.

Since that article was published the project has been cancelled.

https://www.utilitydive.com/news/nuscale-uamps-project-small-modular-reactor-ramanasmr-/705717/

The Vogtle nuclear plant in Georgia was completed last year at a massive $38 billion, less $4 billion refunded from the bankruptcy of Westinghouse Nuclear. At least five rate increases have punished Central Georgia citizens and businesses, and will continue to do so for at least a quarter century.

Vogtle is two nuclear units completed in the late 1980's and long since paid for. Two new units were initiated around 2006, and added 2,234 MW's to the existing capacity, in 2023 and 2024.

A common convention in power plant conversations is to describe the cost in capital dollars per MW of capacity. This ignores financing costs and fuel costs, but for people who know the industry it is a useful metric. Vogtle costs are upward of $15,220 per KW, or $15.2 million per MW.

So the NuScale proposal is to build a 462 MW plant that costs $20,000 per KW or $20 million per MW, or 25% MORE than the Vogtle plant, per MW.

The Lazard page above shows $190/MWh or 19 cents per KWh as a median price for electricity from Vogtle.

This compares to the average cost of new utility scale wind or solar plants in the U.S., and the cost of a new natural gas plant as follows:

https://www.eia.gov/todayinenergy/detail.php?id=63485

This link identifies wind at $1,451 per KW in 2022, solar at $1,588, and natural gas at $802.

The report at the above link (from the U.S. Government Energy Information Administration) explains these values in great detail, but for the layperson, these are costs for utility scale projects (not rooftop solar) and the natural gas plants include a significant number of less efficient "peaker" plants. The impressively low cost of combined cycle plants combined with the extremely low price of natural gas for utilities, since the price spike caused by Putin's closure of the Nord Stream1 Pipeline in September of 2022, is tempered by the fact that new U.S. combined cycle plants are less efficient than the technology allows. Therefore, we get very cheap electricity from natural gas when fuel prices are low, but the electricity prices rise quickly when natural gas prices rise. In 2023 the U.S. got 43% of all electricity from natural gas and Ohio got 50.7% of its electricity from natural gas.

Wind and solar power are cheaper than natural gas in the 2023 Lazard report because they cost more, but have free fuel. One would expect 2024 natural gas prices to be lower than 2023, except that there has been a dramatic failure in the U.S. electricity industry to pass the savings from low fuel costs along to customers. I don't know how Lazard will treat that disparity.

Nuclear hucksters make a great deal of noise about the "baseload" character of nuclear power, but the typical electricity market experiences a 50% rise and fall every day, which older nuclear plants cannot follow because of design problems, and newer ones cannot afford to follow because their extreme capital costs require maximum output even when the plant is being paid less than its actual production and capital cost.

Lawmakers and regulators in the U.S. tend to be willing to treat nuclear plant owners much better than they treat the customers of those plants. In 2022, Finland completed a long-delayed Olkiluoto 3 unit. The story of this plant is obscured by legal battles, but it is clear that the Finnish government fought and won a massive write-off from the plant contractors, about half of the reported $12 billion. The final cost appears to be $7,500 per KW and half of that would still be more expensive than average Finnish power. However, Finland is actively engaged in both buying and selling power and in the European grid, where natural gas is still more expensive than before Putin's 2022 war, and more than three times more expensive than natural gas in most of the rest of the world, this plant is affordable.

But you can rest assured there will be no new Finnish nuclear plants at that cost, given the successful lawsuit.

Global interest in nuclear power seems to be waning:

https://www.iea.org/reports/world-energy-investment-2023/overview-and-key-findings

This report shows that global investment in nuclear power has dwindled to less than 10% of global investment in wind and solar power.

2023 was the first time in history that wind and solar investment exceeded all fossil and nuclear investment.

https://world-nuclear.org/our-association/publications/world-nuclear-performance-report/global-nuclear-industry-performance

The above link shows that nuclear generation peaked globally in 2006. There was a near new peak in 2018, but total nuclear generation is declining.

There are other sources of this information with minor differences. They might show a different peak year, but they do not show an industry that is growing.

Similarly, in the U.S. most new natural gas capacity is replacing older, less efficient natural gas capacity. Natural gas continues to grow globally and in the U.S., but not as fast as it was growing two decades ago.

The Crowning Glory of Nuclear Cost Tragedies:

https://www.reuters.com/business/energy/edfs-nuclear-project-britain-pushed-back-2029-may-cost-up-34-bln-2024-01-23/

The Hinkley Point C nuclear unit in the UK is likely to be the most expensive power plant ever built in the world. The article above performs a sleight of hand which the author observes, but does not correct. Other sources point out that the 2024 announced "34 billion Pounds is stated in 2015 equivalent values. Correcting this makes a completed plant around 46 – 48 billion pounds, which is about $54 billion U.S. The delay that was recently announced will add billions more to this cost.

Hinkley Point C is a 3,200 two-unit addition to a site which has two decommissioned plants, apparently 900 MW's each, both decommissioned around the year 2000.

At 46 billion Pounds the plant will cost 1,437 British pounds per KW, or approximately $1,653 per KW. If there is another power plant, nuclear or otherwise, anywhere in the world with higher per KW costs, I cannot identify it. The major saving grace for the Hinkley Point C is that the obscene cost of this plant will be distributed over the entire UK National Grid, and softened by the UK's more than 30,000 MW's of wind, 16 GW's onshore and 15 GW's offshore according to multiple sources, all of which is lower than the average cost of electricity from European natural gas, which is still about 38% of the UK's supply.

In 2022 the UK accomplished the important feat of delivering offshore wind to the mainland for the same low cost as onshore wind, which at the time was 3.7 to 3.9 british pence per KWh. At the time, the British Pound was at parity with the U.S. dollar, but it has gained about 15% since then.

This is an important point going back to the Lazard Report at the start of this report, which identifies U.S. offshore wind costs as being much higher than onshore wind. The U.S. has fewer than 30 offshore wind turbines and probably half of them were built after the 2024 Lazard Report was finalized. Nascent industries have high costs and can be expected to see steep cost declines over time, if they are not stifled.

Asia (China) and Nuclear Power:

One of the most frequent claims from Small Modular Reactor (SMR) advocates is that they will be able to build such reactors inexpensively. This is challenged by the NuScale reference above, and by Rolls Royce, which is still pursuing an SMR it claims will produce power at 6.7 pence per KWh, almost double the current cost of wind or solar power.

Asia builds nuclear plants for less than half as much money as Western countries do. In fact, there are only three countries in the world still building nuclear plant equipment – Russia, China and South Korea. The key to understanding this is that China and other Asian countries also build wind and solar farms for less than half the cost of Western wind and solar farms, so the price differential remains almost identical and one can view the cost differential as a matter of exchange rates or of labor costs.

SMR advocates have often cited these lower Asian nuclear costs as their targets.

Nuclear power in general wouldn't exist if promoters hadn't lied about costs from the 1950's on, and there is every reason to believe that many of the promises of Small Modular Reactors are just carnival huckstering by fundraisers who plan to move on before the "investors" realize they bought nothing. Or less than nothing.

The Sad Story of Nuclear Power in Ohio:

In 1953 the Piketon nuclear fuel refining facility was opened. Two coal-fired power plants were built to provide power for the uranium enrichment program, but in between the construction of the power plants and the opening of the uranium enrichment plant a new enrichment process was developed that required a third of the electricity. These two coal power plants were used to sell above market electricity to the U.S. Department of Energy from 1953 to **2003, when the DOE terminated relationships with the two plants.** One of these coal plants is in Ohio, the other in Indiana. Both were owned by Ohio Valley Electric Cooperative (OVEC) which over the years became an Ohio subsidiary of the Ohio electric utilities.

The ancient history of these coal plants is not worth digging up. The point we need to recognize today is that in 2012 and 2013 the Ohio utility owners of OVEC decided to install scrubbers on the two plants, at a time when they KNEW that coal generation was uncompetitive with natural gas and they KNEW that scrubbers would make these plants uneconomic to run in the competitive electricity market established by Ohio law in 1998, and radically improved in 2008.

The Ohio nuclear power experience is three plants: Davis Besse was opened in 1977. The Perry nuclear plant was opened in 1986. The Zimmer nuclear plant failed to be completed and was opened in 1991 as a coal plant, essentially priced at $5.6 billion which at the time was so expensive that regulators refused to recognize it as either a coal or nuclear plant in terms of cost.

Davis Besse and Perry caused Ohio electric rates for the three Northern Ohio utility owners to be ranked in the top 20 most expensive electric utilities in the U.S. for more than thirty years. The three companies are now part of First Energy/Energy Harbor.

The impact of this has been ignored by public officials who benefitted from it, and the public, and the commercial energy users who paid the most for the bad decisions.

In 2008 – 2010, during the Great Recession the Northern Ohio cities, Cleveland, Toledo and Youngstown were the focal point of home foreclosures. This was never publicly associated with the obvious loss of more than 2% of regional economic product due to the two Ohio nuclear plants. Detroit was also affected by a different nuclear plant and Pennsylvania was not associated with high home foreclosures, but was obviously affected by high nuclear costs along the same several decades.

After losing money for several years the OVEC owners (again, the four Ohio Electric Distribution Utilities or EDU's formed after the 1998 deregulation and the 2009 improvements in that law) decided to seek bailouts from Ohio lawmakers.

The Ohio Legislature eagerly granted the OVEC owners a subsidy for their investment in scrubbers at a time when coal was declining in the U.S. by large margins. The original subsidy was made around 2015.

Fast forward to 2019.

HB 6 subsidized two nuclear plants which were failing economically. It also extended the subsidy to the two OVEC coal plants and gave a subsidy to six of about twelve solar farms that had been approved by the Ohio Power Siting Board. The subsidies were about $150 million per year for the nuclear plants, $25 million per year for the coal plants and would be $25 million per year for the solar plants if all of them were built.

HB 6 terminated the 12 year energy efficiency programs which cost $1.7 billion and saved $11 billion over that period. Annual lost net efficiency savings were in the range of $600 to $700 million

Witnesses giving testimony on HB 6 on behalf of the nuclear plants stated that the two northern Ohio nuclear plants required 4.2 cents per KWh at a time when the average retail cost of production was 3.3 to 3.5 cents per KWh. HB 6 is largely viewed as a law that subsidizes the two nuclear plants, but it also killed the energy efficiency programs and killed more than $2 billion worth of wind development, $1 billion worth of additional solar development, and a $2 billion natural gas plant. Total lost economic growth in Ohio to date is more than $8 billion but we cannot know how much additional investment in Ohio would have been made if this legislation had not killed free enterprise in the energy sector in Ohio.

Ohio has made more mistakes with energy policy than most people can track. The only point that is really worth bearing in mind going forward is that we can make responsible decisions about energy based on known economics, and that attempts to fly in the face of economics always fail, one way or another.