Load Growth Fever, LNG, and the Risk of Higher Electric Rates

We Are Being Bulldozed Into Making Our Electric System More Dependent on Natural Gas

Photo: Howard J, [Flickr]

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KEY TAKEAWAYS:

- Utilities and the independent system operators (ISOs) who run the nation's power grid warn that, without huge expansions of generating capacity, particularly from natural gas, the system may not be able to meet rising demand for electricity.
- But industry demand forecasts are highly unreliable and prone to exaggeration, particularly forecasts by PJM, the independent system operator that serves utilities in northern Appalachia.
- Responding to PJM's load growth forecast with expanded natural gas generation will set the stage for potential double-digit hikes in the price of electricity.

LOAD GROWTH FEVER

A panic over power system adequacy is upon us.

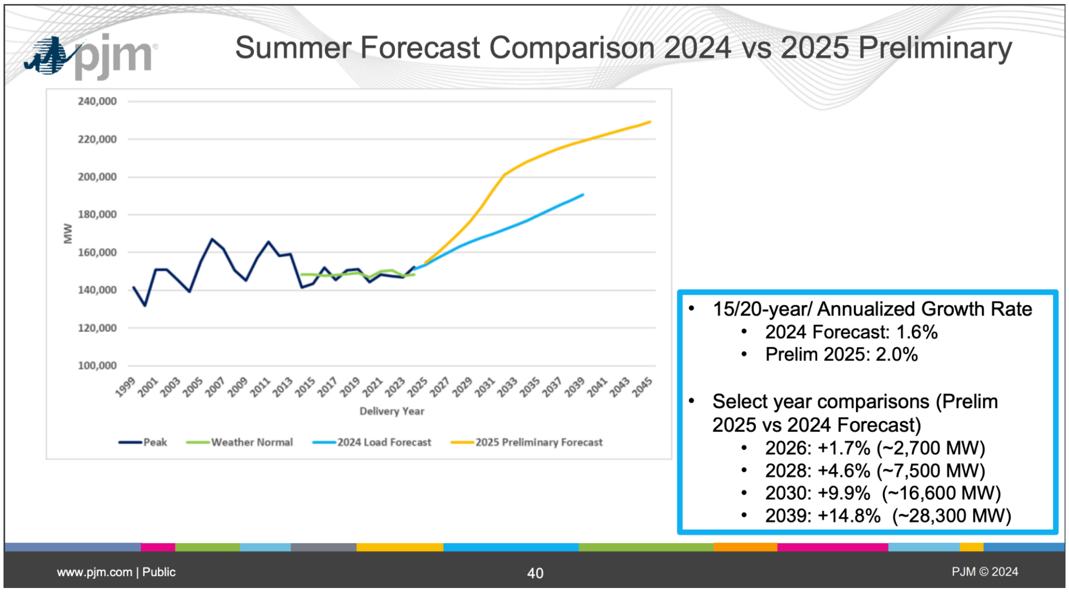
> *"Utilities can't keep up. Vast swaths of the United States are at risk of running short of power as electricity-hungry data centers and clean-technology factories proliferate around the country, leaving utilities and regulators grasping for credible plans to expand the nation's creaking power grid."*
> The Washington Post, Mar 7, 2024[1]

Some utilities predict a doubling or tripling of demand for electricity in the next two decades. The Conference Board, the most venerable of independent forecasting groups, recently increased its predicted rate of growth in electricity demand from 2.6% annually to 4.7% through 2030.[2] And PJM, the non-profit independent system operator (ISO) that manages the power grid in thirteen eastern and midwest states, including Ohio, Pennsylvania, and West Virginia, sees a need for roughly 67 additional gigawatts of generating capacity by 2039[3].

[1] Evan Halper, "Amid explosive demand, America is running out of power," Washington Post, March 7, 2024, https://www.washingtonpost.com/business/2024/03/07/ai-data-centers-power/

[2] Alexander Heil and Ivan Pollard, "Smart Power: Will AI Spike Electricity Demand or Reduce It Through Efficiencies?" The Conference Board, May 30, 2024, https://www.conference-board.org/topics/AI-for-business/press/ai-electricity-demand

[3] Load Analysis Subcommittee, "2025 Preliminary PJM Load Forecast," PJM, December 9, 2024, https://www.pjm.com/-/media/DotCom/committees-groups/subcommittees/las/2024/20241209/20241209-item-03---2025-preliminary-pjm-load-forecast.ashx



Source: PJM

And the PJM estimate does not take into account the need to replace retiring assets, principally aging coal and gas-fired power plants. They represent an additional 40 to 60 gigawatts. So, in total, PJM expects that it will need 100 gigawatts or more of new generating capacity in the next 15 years.

This is all quite stunning since demand for electricity in PJM has actually declined on average for the past 15 years. After peaking at nearly 170 gigawatts in 2008, electricity consumption fell to less than 150 gigawatts last year before rebounding a little to 153 gigawatts in 2024. Now, however, PJM forecasts that the digital economy's rising need for data centers, combined with increasing electrification in the transportation and heating sectors, is reversing the downward trend and portends increasing demand for at least the next two decades.

To put the predicted increases in context, a major thermal plant, coal or gas-fired, typically has the capacity to produce between one and two gigawatts of power, which means that, if the region responds to PJM's demand growth expectations by adding only new thermal resources, we will be looking at the construction of 70 or more new power plants. And, if the plants are gas-fired, since coal is no longer economical, we can reasonably expect them to emit over 100 million additional tons of carbon dioxide (CO2) annually.

RESPONDING TO THE THREAT

The imminence and scale of this predicted growth in energy demand and its potentially dire implications for system reliability are being used to argue for massive expansions in generating capacity. And, because natural gas is the region's dominant resource, it is the first and in some cases the only solution to which many utilities and policymakers propose to turn.

Not being taken into account are factors that are likely to make generating electricity with natural gas a much pricier proposition than it already is. Pressures are building that will likely drive up the cost of natural gas. Toby Rice, the CEO of EQT, the nation's second largest natural gas producer has been on a year-long public relations campaign[4] to promote immense increases in natural gas exports. And President Trump has already announced his intention to help the industry increase LNG exports to parts of the world where prices are much higher.

If that vision is realized, Americans' pocket books will feel the impacts. A recent Department of Energy analysis[5] found, "a triple-cost increase to U.S. consumers from increasing LNG exports – the increasing domestic price of the natural gas itself, increases in electricity prices (natural gas being a key input in many U.S. power markets), and the increased costs for consumers from the pass-through of higher costs to U.S. manufacturers." In all, the report found that domestic natural gas prices might increase by 30%. Whether that will actually happen is unknowable, but it's the risk we take when we expose our energy supply to the volatility of global commodity prices.

And it isn't as if we don't have available alternatives to natural gas as a generating resource. PJM currently has over 90 gigawatts of wind and solar capacity in its queue of proposed generation projects. And there is growing pressure to develop new nuclear resources as well as proposals to extend the lives of existing facilities and restart old ones. But these alternatives face challenges.

According to LAZARD's levelized cost of energy (LCOE), nuclear power is very expensive compared to other generating resources and, in recent decades a single project has required a decade or more to go from final investment decision (FID) to being operational.

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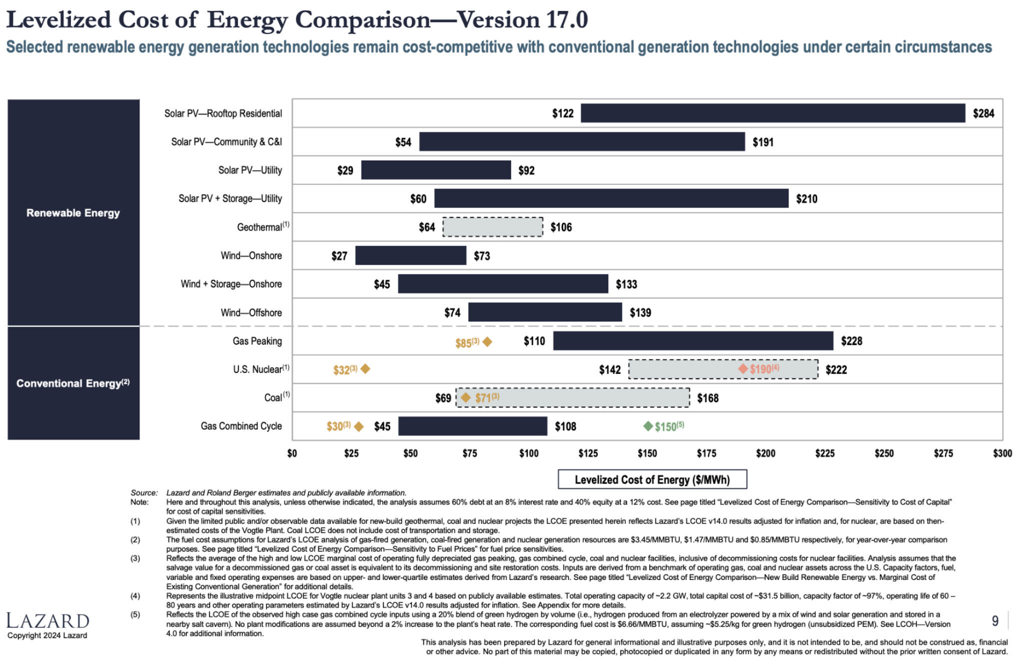
[4] Jim Cramer, "Unleashing LNG on the world stage will bring energy security to America, says EQT CEO Toby Rice," CNBC's Mad Money with Jim Cramer, September 22, 2023, https://www.cnbc.com/video/2023/09/22/unleashing-lng-on-the-world-stage-will-bring-energy-security-to-america-says-eqt-ceo-toby-rice.html

[5] US Dept. of Energy, "2024 LNG Export Study: Energy, Economic, and Environmental Assessment of U.S. LNG Exports," US Dept. of Energy, December 17, 2024, https://www.energy.gov/articles/us-department-energy-completes-lng-study-update-announces-60-day-comment-period



Source: Lazard[6]

On the other hand, renewable resources, which are arguably the least expensive solution and the fastest to build, face a variety of barriers, including financing challenges, local political opposition, and operational challenges associated with integrating variable wind and solar resources into a system that was largely built to rely on major baseload power plants.

Renewables also face institutional barriers within PJM, which is controlled by a membership that is dominated by utilities and power generators who have financial interests that may be threatened by a transition to cleaner and less expensive sources of energy. Not surprisingly those interests are also highly influential in state governments, which also have a say in how PJM chooses to operate.

MORE REASONS FOR CAUTION - WHOOPS!

While natural gas currently dominates the region's power generation, it is becoming less competitive as costs for wind and solar power and batteries continue to fall and technology for integrating renewable resources into the grid improves. In fact, recent data suggest that a portfolio of renewable resources, supported by some nuclear and a little gas, could provide reliable power at little additional cost in PJM[7].

In short, time is not on the side of natural gas, making it reasonable to ask whether the natural gas industry, PJM, and the region's utilities might feel an urge to exaggerate the imminence and severity of

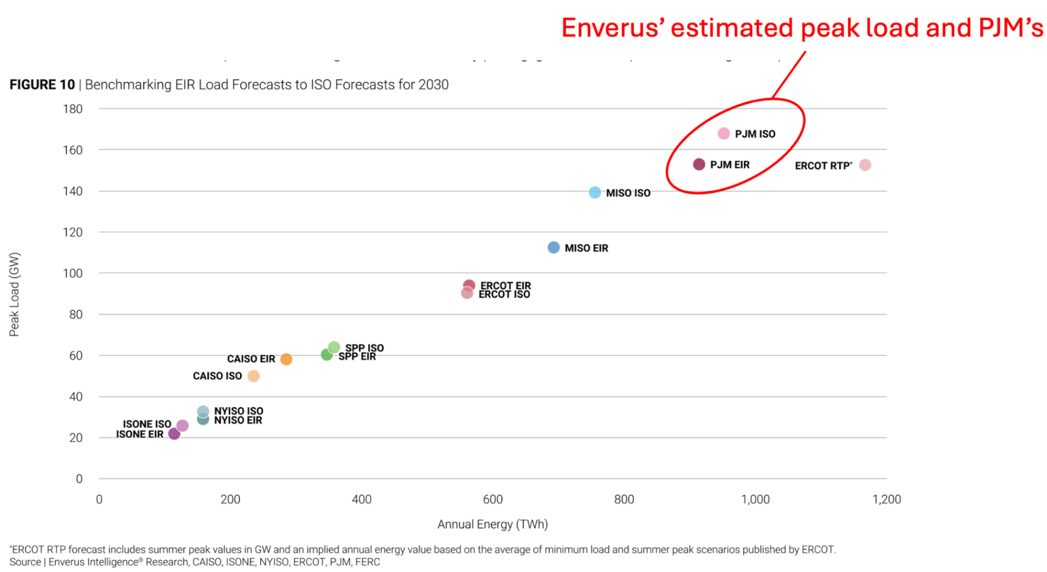
[6] Lazard, "Levelized Cost of Energy Version 17.0," Lazard, June 2024, https://www.lazard.com/media/xemfey0k/lazards-lcoeplus-june-2024-_vf.pdf
[7] Joe Goodenbery et. al., "A Clean Energy Pathway for Southwestern Pennsylvania," Strategen, December 2022, https://ohiorivervalleyinstitute.org/a-clean-energy-pathway-for-southwestern-pennsylvania/

the load growth problem in order to accelerate policy choices while gas is still on top. A decision now by utilities and policymakers to meet future generation needs with natural gas would likely lock in the region as a major natural gas market for decades to come.

Also, there are signs that PJM's load growth predictions, which represent a major deviation not just from historical trends but also from PJM's own forecasts of a year ago, may be exaggerated. In a recent research brief, the energy analytics firm, Enverus (EIR), said this:

> *"EIR's PJM forecast tracks below the ISO forecast primarily due to differences in our data center demand forecasts. PJM's data center forecast incorporates incremental load expectations from each of its respective regions totaling about 22 GW in 2035. We believe those data center load estimates are overstated and expect an incremental 7.5 GW by 2035 in PJM. Our data center forecast is generally more conservative across the U.S. than published forecasts, mainly due to our outlook including chip efficiencies and other important constraints."*[8]

In other words, Enverus (EIR) expects data center-driven load growth to be only a third of the amount forecasted by PJM.



Source: Enverus

Another consideration is that PJM has a long and established history of overestimating future demand. The following chart, which was provided by PJM, illustrates the ISO's 15-year load forecasts released annually between 2013 and 2021. In 2013, PJM forecasted that 2024 summer peak load would be nearly 180 GW, yet the actual figure was 152,803.7 MW

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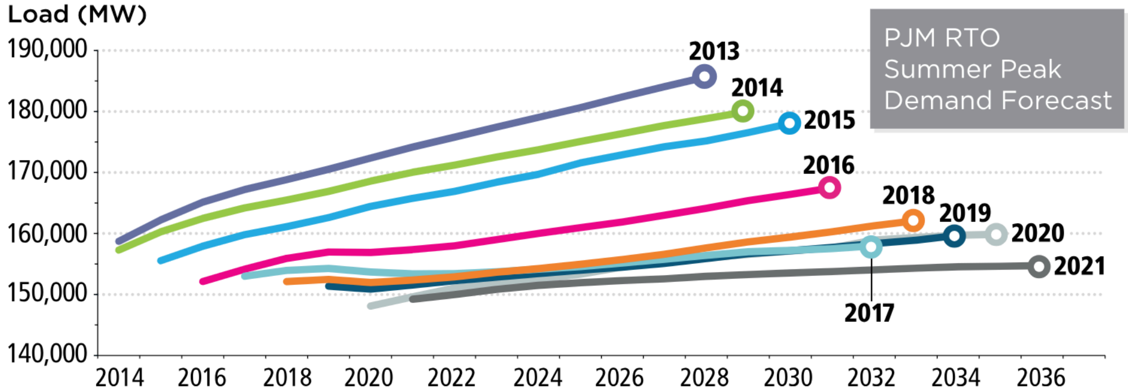
[8] Riley Prescott et. al., "Long-Term Load Forecast: Returning to Growth," Enverus, July 10, 2024, https://intelligence.enverus.com/research/101647



Source: PJM

Finally and perhaps most ominously, exaggerated load growth projections in the past have influenced policy decisions that resulted in economic catastrophe. In the 1970s, expectations of massive growth in electricity demand caused Washington state and the Pacific Northwest to embark on a scheme to construct five nuclear power plants at a cost of over $4 billion[9]. But the utilities that subscribed to the Washington Public Power Supply System (WPPSS - an acronym that gave rise to the unfortunate nickname, “Whoops!”) watched in bewildered astonishment as project costs skyrocketed and doubts about the accuracy of the load forecast proliferated.

Eventually, the project budget ballooned from $4 billion to $24 billion, causing utilities that could not pass along the skyrocketing costs to ratepayers, to drop out. As a result, investors lost confidence and the project collapsed. In the end, although construction was started on three of the nuclear plants, only one was completed. The project collapsed and WPPSS defaulted on over $2 billion worth of municipal bonds. At the time, it was the largest municipal bond default in history.

The unfinished and abandoned Satsop nuclear power plant in Gray’s Harbor, Washington.
Photo: Edward Oliver, Photohound

[9] Daniel Pope, “A Northwest distaste for nuclear power,” Seattle Times, July 31, 2008, https://www.seattletimes.com/opinion/a-northwest-distaste-for-nuclear-power/

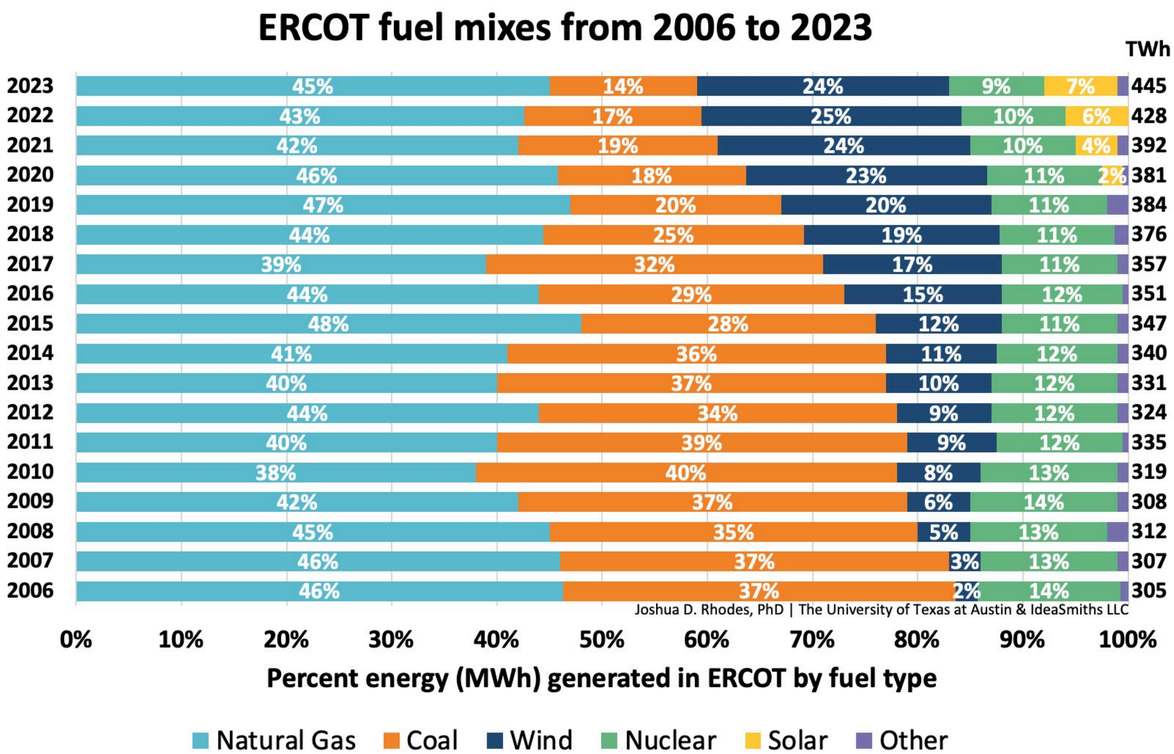
PJM'S STRATEGY

The pressure for the construction of new capacity has asserted itself in PJM's newly proposed strategy for dealing with the putative demand crisis. PJM has developed a Reliability Resource Initiative (RRI), which it intends to propose to the Federal Energy Regulatory Commission this month. According to a story reported by Peter Behr of E&E News, "The plan would allow a new round-the-clock gas generator to 'jump the queue,' moving in front of some renewable energy projects that have been waiting for years for permission to connect to the PJM grid."[10]

PJM justifies this preference for gas resources on the grounds that gas power does more to support system reliability than renewable resources, which are variable in their ability to supply power to the grid. Whether that is truly the case is debatable. ORVI's analyses indicate that a power system that relies principally on renewable resources with some support from nuclear and natural gas could in fact be both cost-effective and reliable.[11] And PJM itself recently published a scenario[12] in which reliability is maintained while eliminating coal, reducing gas generation by about two-thirds, maintaining current levels of nuclear power, and relying on renewable resources to meet over 60% of demand.

Also, in Texas, which for the last decade has had to grapple with the kind of load growth PJM fears, the region's ISO has embraced a massive buildout of renewable resources. Between 2006 and 2023, peak demand in Texas grew from about 60 gigawatts to nearly 90. At the same time, wind and solar power's share of Texas power generation grew from 2% to over 30%. Meanwhile, power from coal declined from 37% to just 14%. And the transition has been accompanied by increased reliability, particularly over the last three years as solar and battery storage have assumed much larger roles in Texas' energy system.

[10] Peter Behr, "PJM boosts gas in contentious grid plan," E&E News, December 5, 2024, https://www.eenews.net/articles/pjm-boosts-gas-in-contentious-grid-plan/
[11] Joe Goodenbery et. al., "A Clean Energy Pathway for Southwestern Pennsylvania," Strategen, December 2022, https://ohiorivervalleyinstitute.org/a-clean-energy-pathway-for-southwestern-pennsylvania/
[12] PJM, "Energy Transition in PJM: Flexibility for the Future," PJM, June 24, 2024, https://www.pjm.com/-/media/library/reports-notices/special-reports/2024/20240624-energy-transition-in-pjm-flexibility-for-the-future.ashx



Source: Joshua D. Rhodes[13]

Also noteworthy is the fact that the average retail price of electricity in Texas is 2% less than the price in West Virginia, 9% less than the price in Ohio, and 20% less than the price in Pennsylvania. That's quite a change when we look back to the year 2006, before the rise of renewables in Texas and before the natural gas boom that supposedly drove down energy prices in Appalachia. Back then, the average retail price of electricity in Texas was 19% higher than Pennsylvania, a third higher than Ohio, and more than twice that of West Virginia.

In other words, the rise of renewable energy in Texas was accompanied by a major reduction in electric rates relative to Ohio, Pennsylvania, and West Virginia, which were supposedly benefitting from cheap energy as a result of the natural gas boom.

Nonetheless, PJM has proposed its gas-friendly RRI and, in doing so, triggered opposition from the Illinois attorney general's office and consumer counsel offices in New Jersey, Maryland, and Ohio. Environmental groups, including the Natural Resources Defense Council, Earthjustice, Penn Future, and the Sierra Club, have also raised objections.

The objections have to do not just with the potential harm that dozens of new gas-fired power plants would do to the planet, but also local damages resulting from increased fracking, the emission of criteria

[13] Joshua D. Rhodes, "ERCOT Fuel Mixes from 2006-2023," X, January 15, 2024, https://x.com/joshdr83/status/1747042447358664970

pollutants, likely increases in utility bills, and the associated need for new natural gas infrastructure, including more pipelines, processing plants, and compressor stations.

But, as pertinent and pressing as these concerns may be, they do not yet take into account another potential cost that may dwarf all other costs of increased reliance on gas-fired power.

THE CRIPPLING COST OF DECARBONIZING A GAS-DOMINATED POWER SYSTEM

So far, neither PJM nor the gas industry has addressed the question of what it will cost if we decide, after the new plants have been constructed, that they must be decarbonized in order to mitigate the impacts of global warming. Such a scenario may not arise during a Trump administration. But future administrations may find the need to deal with the problem of climate change unavoidable. And, in a system dominated by natural gas, the options for doing so will be few and very expensive. Future administrations will face a choice between remediating existing gas-fired power plants or retiring them and writing off the cost while replacing the lost power with clean, renewable energy.

A widely cited 2020 study[14] by Gal Hochman and colleagues at Rutgers University found that retrofitting existing gas-fired power plants in the northeast and midwest to capture and sequester carbon would cost about $81 per metric ton. Given that gas-fired plants typically produce about .45 metric tons of carbon per megawatt hour, a 1,000 MW plant that runs at 75% of capacity would generate about 6.57 million megawatt hours of electricity and about 3 million metric tons of CO2 annually.

Assuming that the system would capture 90% of the available carbon, the plant's incremental cost for CCS would come to about $216 million per year. Meanwhile, at PJM's average wholesale price of energy in 2024 of $34.54/MWh[15], the plant would generate $227 million worth of electricity. In other words, implementing CCS would cause the cost of electricity from the plant to nearly double, from $227 million to $443 million. On a unit price basis, the cost would rise from $34.54/MWh to $67.41/MWh, a 95% increase. And, because energy costs represent only about two-thirds of consumers' total electric bills, the net increase in customers' utility bills would be about 62% for whatever portion of their power they get from natural gas.

Some of the potential cost increase might be addressed with federal subsidies. But, whether the price is paid by ratepayers or taxpayers, or more likely some combination of the two, the bill will have to be paid.

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[14] William J. Schmelz, Gal Hochman, and Kenneth G. Miller, "Total cost of carbon capture and storage implemented at a regional scale: northeastern and midwestern United States," Interface Focus, August 14, 2020, https://royalsocietypublishing.org/doi/10.1098/rsfs.2019.0065

[15] Devin Leith-Yessian, "Consumer Advocates, Environmentalists Urge Holistic Thinking at PJM," RTO Insider, May 13, 2024, https://www.rtoinsider.com/78529-consumer-advocates-environmentalists-urge-holistic-thinking-pjm/

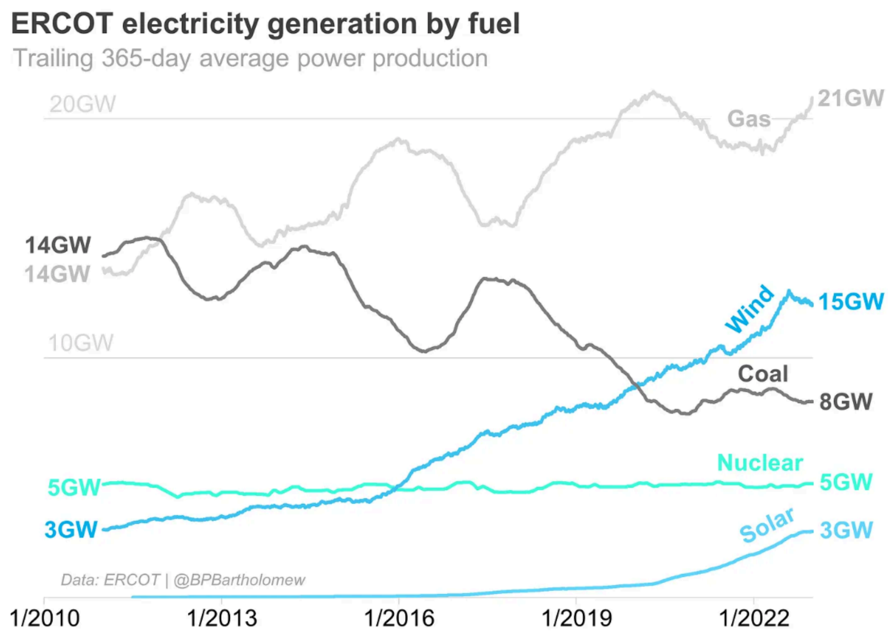
Whether or not an increase of as much as 62% in electric bills will be more or less expensive than simply mothballing polluting gas-fired power plants and replacing them with renewable resources will depend on many events that may take place between now and when and if a choice has to be made. But either way, it will be expensive as hell.

CONCLUSION

The “Whoops!” fiasco in Washington state played out because data modelers inadvertently exaggerated load growth expectations. Specifically, they assumed that per capita consumption of electricity would remain roughly constant as the population in the Pacific Northwest continued to grow. However, between 1975 and 2000 the region’s economy saw a decline in heavy manufacturing as a share of gross domestic product, electric appliances and home heating systems became more energy efficient, and the region’s population became more urban, all of which contributed to a 25% reduction in per capita electricity consumption. The reduction in per capita consumption was large enough to almost entirely offset the effect on electricity demand of the region’s population growth. Thus, the need for four additional nuclear power plants was avoided except of course for the funds that had already been invested and couldn’t be clawed back.

Whether or to what degree similar factors may change load growth expectations in Appalachia in the next quarter century are difficult to predict. But the situation is highly volatile, hence the radical change in PJM’s load forecast between 2023 and 2024. Meanwhile, it’s possible and in fact probable that many factors will chip away at expected load growth. Data centers and automobiles will become more energy efficient as will appliances and the myriad of devices that run on electricity. And, if prices for electricity rise as we struggle to meet demand, the added cost will only incentivize even greater efforts at improving efficiency and reducing consumption. This combination of factors may make the load forecasts that utilities and ISOs are trumpeting today look as nonsensical as the load forecasts that precipitated WHOOPS 50 years ago.

And, even if they don’t, rapid advances in renewable generation, battery storage technology, and energy efficiency offer alternative and increasingly effective, affordable, and reliable means of addressing demands for more energy. In fact, we’re watching it happen in Texas where, between 2010 and 2022 wind and solar resources did far more than natural gas to meet rising demand even as coal-fired resources were being retired.



Source: The Merit Order[16]

And, unlike natural gas, wind and solar resources are already clean and, therefore, will not burden us with a serious case of buyer's remorse if at some future date we determine that carbon emissions must be minimized in order to avert environmental catastrophe.

[button link="https://ohiorivervalleyinstitute.org/wp-content/uploads/2025/01/Backing-Into-the-Worst-Possible-Power-System-FORMAT.pdf" type="big" color="red" newwindow="yes"] Download research brief[/button]

Utilities and the independent system operators (ISOs) who run the nation's power grid warn that, without huge expansions of generating capacity, particularly from natural gas, the system may not be able to meet rising demand for electricity.But industry demand forecasts are highly unreliable and

[16] Brian Bartholomew, "Texas generated record electricity from renewables, natural gas in 2022," The Merit Order, February 23, 2023, https://themeritorder.substack.com/p/texas-generated-record-electricity

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