



JUST THE FACTS

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The Present and Future of Electric Efficiency and Reliability

The days are numbered for the iconic Homer City Generating Station in Indiana County, a development caused by a number of factors, including stringent environmental regulations, coal pricing and the increased use of natural gas to produce electricity. The plant's closure will cost Indiana County about 125 jobs that have supported families for decades, and remove a two gigawatt-rated electricity source from the PJM Interconnect grid – with the potential to serve about 1.5 million households at its rated capacity.

As we enter the summer season and periods of peak demand for electricity to run air conditioners without the might of the Homer City plant, PIOGA thought it made sense to calculate how other power sources – evaluated individually – might fill this void in our electricity supply, including an estimate of the amount of land required to produce an equal amount of power.

To do so, PIOGA did its best to make an equal, apples-to-apples, comparison of multiple sources, including natural gas combined cycle facilities, “peaker” natural gas plants, nuclear generating stations, and wind and solar farms. Each of those sources' efficiency ratings were also factored into the comparisons.

For a baseline, Homer City generates electricity at an efficiency of 38 percent, producing a net output of 760,000,000 watts (760 MW) from a single source. More comparisons – and a few key additional points – are provided here.

Solar Power

With an efficiency rating of 20 percent, producing 760 MW would require the construction of 10,270,270 advanced solar panels, on 5,135.14 acres of land, or about 3,883 football fields. This estimate makes the assumption that this large solar installation is located in an area with optimal production capabilities, such as Nevada. A similar installation in western Pennsylvania would produce a fraction of that amount.

Wind Power

Wind turbines generate electricity at an efficiency of 36 percent, which would require the construction and operation of about 704 high-capacity windmills to produce 760 MW. The acreage required to site those turbines would be considerable, at 56,296.3 acres or 42,547 football fields, which would be required to account for setbacks to avoid turbulence from individual towers. This estimate also assumes the turbines are sited in a location with optimal wind conditions, such as the high plains of Texas or Kansas.

Natural Gas Combined Cycle

As most people in the natural gas field are aware, modern combined cycle power plants have a number of attributes that make them an attractive option today. These include a highly efficient operating capability of 55 percent and rapid start-up capabilities. The largest combined cycle facility in the U.S. is the West County Energy Center in Palm Beach County, Florida. It includes three state-of-the-art natural-gas fired combined-cycle generating units on a 220-acre site, with each capable of producing approximately 1,250 MW. The electricity from one-third of natural gas combined cycle plant like this one can produce 760 MW on 80.5 acres of land.

Natural Gas Peaker Facility

The more-nimble natural gas peaker plants cannot match the combined cycle facilities in operating efficiency, with the peakers coming in at 35 percent. A little more than five peaker plants (5.28) are needed to generate 760 MW, with each sitting on about 40 acres, or 211.4 acres in total.

Nuclear Power

Like combined cycle natural gas facilities, the benefits of nuclear power are relatively well known, even with the policy challenges of managing and disposing of spent fuel being equally prominent. A nuclear power generating facility operating at its peak reaches an efficiency of 45 percent, with 760 MW of electricity produced by a little less than one-half of a 3.3 gigawatt rated plant. That portion of the plant would fit on about 1,772 acres, a little less than half of the 4,000 acre-footprint needed for the full-sized reactor facility.

PJM, FERC and Pennsylvania and What's Ahead

As recently as last month, PJM announced it had sufficient capacity to meet the needs of the 13 states and 65 million people in its service area as the region enters the summer cooling season – under normal circumstances. PJM's mid-May statement also noted, "While its assessment shows that PJM is prepared to maintain reliability this summer, modeling of extreme scenarios indicates tightening reserve margins and the potential need to reduce load by deploying demand response in certain conditions." PJM's President and CEO added, "We're not saying these extreme conditions will happen, but the last few years have taught us to prepare for events we have never seen."

On the national scale, Federal Energy Regulatory Commissioner Mark Christie expressed a more concerning view of the trajectory of the nation's ability to generate electricity, with coal-fired plants being shuttered at a pace that is not being equaled by the development of new renewable sources. He told the U.S. Senate Energy and Natural Resources Committee in early May, "I think the United States is heading for a very catastrophic situation in terms of reliability."

Finally, with Pennsylvania's role as a major energy exporter - and the potential consequences a carbon tax would have on fossil fuel facilities if the Commonwealth joined the Regional Greenhouse Gas Initiative - it is little wonder that Gov. Josh Shapiro raised his concerns about grid reliability in a May letter to PJM. Specifically, he noted, "In addition to the difficulties in bringing new generation into the grid, I am concerned about PJM's inability to ensure that capacity sources are ready and able to meet the critical market needs at the right time. Pennsylvania's confidence in PJM's Capacity Performance design greatly diminished through the serious grid capacity issues experienced due to Winter Storm Elliott."

The Facts

Replacing the baseload power provided by the Homer City Generating Station for the long-term will not be simple. In addition to the closure of coal plants, new natural gas electric facilities - equipped with the most advanced air emissions control systems - are facing opposition in many areas. In April, Bechtel Corporation abandoned a proposed 1,240 MW plant (to be built on just 68 acres) in Renovo, Elk County, after years of permitting challenges from the Philadelphia-based Clean Air Council and other groups, and despite significant local support. New renewable sources, which will also require transmission infrastructure to reach consumers, are not being added quickly enough at this time and will likely not be sufficient to equal the production of what is being lost. What happens in the next several years to our electric reliability is anyone's guess at this time.



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