

Nigeria's latest gas-related power shortages could have been avoided. Here is why.

On 28 May 2021, Nigeria's national power generation dropped to 3,059 MW and for the subsequent seven days remained below 4,000 MW, six percent below average production. Low pressure on the Escravos-Lagos Pipeline System (ELPS) left several gas turbine power plants with insufficient gas supply, leading to plant shutdowns and widespread power blackouts.

Unlike gas turbine power plants, gas engine power plants have the flexibility to function during low gas pressure events. This flexibility significantly lowers power production risk, a supreme advantage in context of gas supply disruptions and systemic power shortages.

Power cuts in Nigeria are a regular occurrence. Data from the Transmission Company of Nigeria (TCN) shows that from 2013 to 2020, the national grid system failed 84 times and partially collapsed 43 times. The World Bank data on countries with the most electricity outages in Africa showed that in 2019, Nigeria suffered outages for 191 days out of 365. The economic cost of power shortages in the country is estimated at around \$28 billion annually – equivalent to two percent of its Gross Domestic Product.

Power plants suffer from disrupted gas supply

Gas is used to fuel more than 80% of power generation capacity, in Nigeria that has the largest gas reserves in Africa. Despite major progress achieved over the past years, gas infrastructures development and maintenance remain insufficient, and this situation combined with infrastructure sabotage results in the country suffering from insufficient pipeline capacity and a lack of pipeline connections. The condition of the gas transmission and distribution system is a major constraint as domestic supply shortages and insufficient pressure severely affect the reliability of the power supply.

What does this mean in practice?

Trunk pipelines like the ELPS require sufficient volumes of natural gas to be fed into the system within a specified pressure range to ensure that gas is delivered to all consumers along the pipeline as per the contracted quality and quantity. A drop in the volumes leads to a drop in the pressure leading to disruptions between the ELPS and end consumers. In such a scenario, high pressure off-takers such as gas turbine power plants can no longer operate and drop out as consumers, thus freeing up the remaining gas volumes for low pressure off-takers such as reciprocating gas engine power plants which can continue to operate at full rated capacity.

Workable solutions adapted to fluctuating fuel supply and load

The flexible power plants, made up of multiple engine modules which can be turned-down or fired-up instantaneously, offer a large range in power supply availability. In addition to being robust and versatile to manage the current generation and transmission side disturbances, they are also the perfect ally of renewable energies since they can adjust output in response to the intermittent nature of the weather.

Engine-based technologies also provide the best response times to effectively adapt to sudden excess or shortfall in electricity production. Furthermore, their modular format means that they can be sized to meet specific requirements, for a city, for manufacturing industries, or for local micro-

grids. This makes them easier and faster to install than larger gas turbine plants and facilitates expansion as energy requirements increase.

Gas turbine power plants on the other hand involve a continuous combustion process. They require a constant energy supply to generate consistent output. They are not adapted to operate on a stop-start basis, nor are they designed to cope with the intermittent nature of renewables. To maintain a balanced system, flexible forms of electricity must be available to ramp up output at the same rate that wind or solar output fluctuates. Using small, modular, combustion engines to provide load flexibility enables larger combined cycle plants to provide a stable base load taking advantage of high efficiencies when operating at full capacity and reducing overall energy costs.

Unlocking the full potential of Nigeria's power sector

The reality today is that Nigeria's power system faces several challenges, including blackouts, fuel shortages, financing, maintenance, demanding operating conditions and reduced cooling water availability. The size of the gap between the country's energy needs and its current provision is daunting but not impossible to close.

As the largest economy in Africa, with huge gas reserves and high solar energy potential, Nigeria has all the natural resources necessary to meet the country's power needs. To realise the full benefits of this potential, flexible engine technology offers a superior solution over gas turbine technology. Increasing access to electricity ranks as one of the major drivers for business growth. Improving power sector performance, particularly for manufacturing and services, will be central to unlocking Nigeria's economic growth post COVID-19.

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NOTE TO EDITORS

About the Author

Yusuff Wale is the Managing Director, Wartsila Marine & Power Services Nigeria Ltd. Wartsila is a global leader in smart technologies and complete lifecycle solutions for the marine and energy markets. He is a seasoned professional in Management, Sales, Marketing and Business Development in the Nigerian Oil and Gas and Power Industry. He started his career as a process engineer in one of the Nigerian Petroleum Oil Refineries. Over the years, he has been actively involved in large transactions of Turbo-Machineries into major FPSO projects in Nigeria as well as Internal combustion engines for both Industrial and Captive Independent Power Plants. He has presented technical papers at both local and international Oil, Gas and Power Conferences. He holds a MSc. and Bachelor of Engineering degrees in Chemical Engineering from the prestigious University of Lagos and Federal University of Technology, Minna, respectively and a miniMBA in Innovation, Growth & Digital Execution techniques for building category king companies, from the Takeda Institute. He has attended many trainings both in Nigeria and abroad. He is a corporate member, Nigeria Society of Engineers (MNSE).

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About Wärtsilä

Wärtsilä is a global leader in smart technologies and complete lifecycle solutions for the marine and energy markets. The company has delivered 72 GW of power plant capacity in 180 countries around the world. Wärtsilä has a strong presence in Nigeria, with a total installed capacity of 667 MW. The company has been in the country since 2010, and has about 90 employees.