

Gas-to-power: Starting small

A failure to mobilise investment has scuppered many an African power project. A more modular approach to developing gas-fired projects is starting to change things. **Ian Lewis** reports.

Gas has long been touted as the ideal complement for renewable power in Africa's energy mix, providing a relatively clean and more controllable alternative to coal that is becoming more readily available.

It is becoming a cheaper option too, as the industry adopts a more modular approach to developing gas power plants. That enables developers to start off with a more modest project, likely to be more attractive to a wider range of investors, and then build up from there.

"Power projects, from a gas perspective, can be run at different scales that can still be accommodated by the private sector, as opposed to very large coal or nuclear projects that may need a big sovereign engagement and can't really be handled by the private sector in the same way," says Rishav Bhattacharyya, Head of Global Gas to Power at GE.

Coal-fired power stations typically require a capacity of at least around 1 GW to make them viable, which makes them both expensive and, potentially, unnecessarily large for countries with small grids and relatively limited short-term power requirements – even if they have ambitions to scale up over coming decades.

South Africa may have the future demand projections – and the coal reserves – to merit the construction of several 4 GW-plus coal-fired power plants, but few other African countries can match it in that respect. A typical large gas-fired power plant in West Africa may

be around 500–600 MW capacity, and where there is need for off-grid or distributed power, an African power plant can be as small as 20–40 MW.

Few countries can mobilise the same financial resources as South Africa either. According to South African state utility Eskom, the 4.8 GW Kusile Power Station – the world's fourth largest coal plant, which is currently under construction – will cost some \$10bn in total.

"Countries might have big long-term power needs, but putting [all their investment] for the next 20 years into one asset is an unnecessary stretch. In gas, you have the ability to modularise that expansion over time, and more thoughtfully in terms of location and technology," says Bhattacharyya.

An example of a phased project is the recently completed 450 MW Azura-Edo open cycle gas turbine independent power project (IPP) near Benin City in Nigeria, which is estimated to have cost around \$900m. It is the first phase of a planned 1.5 GW IPP on the same site – close to the main artery of the existing Escravos–Lagos Pipeline System – which will be the country's largest power plant when complete.

Efficiency gains

While there is little revolutionary in the latest iterations of combined cycle technology, incremental changes in efficiency over the years have meant that the same amount of power can be generated from a more compact and potentially cheaper set-up, with fewer carbon emissions.

"We've recorded something like 63% efficiency, which is many percentage points better than a decade or two ago. I think you'd be hard pressed to think of efficiencies much beyond the 50% range at that stage," says Bhattacharyya.

Just moving from 63% to 64% efficiency could save around \$50m in fuel costs over the lifecycle of a large gas-fired power station. This would be a valuable saving anywhere, and particularly so in African countries with limited financial resources.

Further improvements in the deployment of gas power could be obtained by integrating it with renewables projects. Output from gas plants can be ramped up and down in minutes, making it much more dispatchable than coal or "on-all-the-time" nuclear power. So, it's highly compatible with the intermittent wind and solar power responsible for an increasing share of Africa's energy mix.

"You can have a set-up where gas can complement renewables in a pretty seamless manner. So, it's able to complement an emerging source of cheap, very clean fuel," says Bhattacharyya.

GE is one of a handful of companies with involvement right across the energy supply chain – a position they hope will make them attractive business partners and bring their customers some synergies, as the power sector evolves in Africa.

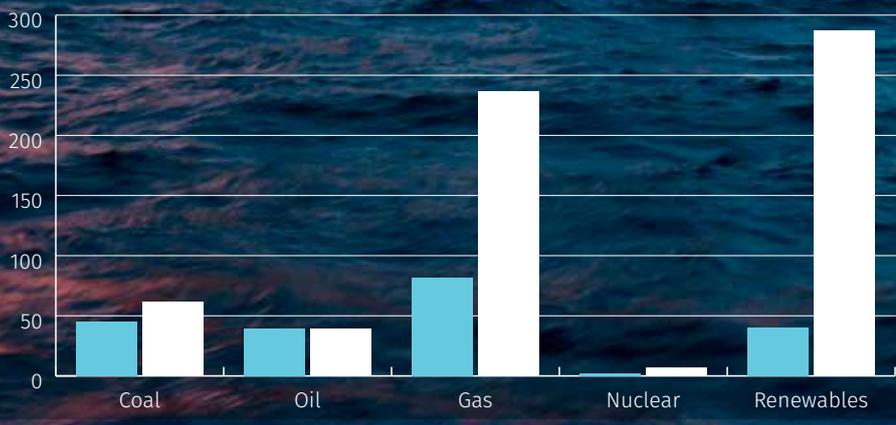
So, for example, an integrated project could be designed from scratch to have a chunk of renewables, some gas and a battery system, to keep load fluctuation to a minimum.



Forecasts for generating capacity in Africa

Source: IEA World Energy Outlook 2017, New Policies Scenario

2016 | 2040 Units: GW of capacity



Assuming hydropower’s mantle

Hydropower is the ultimate dispatchable power source, with output capable of being altered in seconds. It is also generally cheaper than other forms of power generation over the longer term. However, it is prone to seasonal variation and many of the “low-hanging fruit” have already been picked, leaving few options for rapid expansion.

That means gas power is in prime position to pick up the reins and is becoming more readily attainable, thanks to large offshore discoveries around the continent, together with the import options offered by the growth in global liquefied natural gas (LNG) trade and Africa’s growing network of gas pipelines.

The task now is to get the gas from the reserves and import terminals to the

places where it is actually needed – that has not always been possible in Africa, but it is a situation that is improving.

The better availability of feedstock, as supply networks improve, is likely to be the biggest spur to the development of gas power, especially for smaller plants, whose development has often hamstrung for lack of supply.

This has been underpinned by new funding instruments from development finance institutions. “There is a ton more to do, but having the sort of liquidity and a pool of capital that’s available globally and locally to invest in the infrastructure allows the projects to proceed,” says Bhattacharyya.

“What’s intriguing and exciting is allowing the fuel delivery to come at a smaller scale that can adapt with the smallish to medium-sized generation

that countries need. That evolution of technology changes on the supply chain is something that’s playing out as we speak now.”

Rosy outlook

The sector could be on the cusp of a boom era in sub-Saharan Africa, with a plethora of states lining up ambitious gas-to-power projects, based on indigenous reserves – a trend that reflects a growing awareness of the benefits of gas as an agent of domestic development, rather than just an asset to monetise through gas export revenues.

Senegal is a case in point, with the government making domestic gas supply – as well as LNG exports, an intrinsic part of its agreement with the BP-led Greater Tortue project to develop an estimated 25 trillion cubic feet of gas reserves in an area straddling the Senegal’s border with Mauritania. The reserves are being developed by BP on behalf of both countries. With a final investment decision expected in late 2018, prospects there look bright for production by around 2021.

Ghana, Nigeria, Cameroon, Cote d’Ivoire, Angola, Mozambique and Tanzania are among other current or potential gas producers also using gas for power, as well as – in most cases – for export. South Africa’s stalled gas IPP plans also look set to get a new lease of life under the country’s new president, Cyril Ramaphosa. Meanwhile, steady improvements in regional power grids across the continent mean African countries can also think in terms of gaining cross-border revenues from gas-fired power.

Whether all the planned projects come to fruition on schedule remains to be seen. Wider availability of funding, better regional coordination of power projects and the growth of IPPs are helping to speed up gas-to-power projects.

No one is expecting gas to dominate the power mix across a continent already wedded to hydropower, coal and, increasingly, renewables, but it promises to play a key role in the renewables transition. “We’re bullish about gas. As a company, we are extremely long on gas and we are also long on renewables. We see a big interplay between the two fuels,” says Bhattacharyya. ●