

NUCLEAR REALITIES

West Africa is Realizing its Nuclear Ambitions

BY KERRY DIMMER

There is a lot of talk in Africa about nuclear energy, and why not? It is a reliable source of virtually zero carbon emissions and nuclear plants run on uranium, a resource that the continent has a great deal of, particularly Niger, which is regularly in the top five ranking of the world's largest uranium producers.

Africa is plagued with power issues — due largely to accelerated population and urbanization growth as well as industrialization. With demand far outstripping supply, the strain on national power grids has created an acute form of energy poverty — one that stifles the economic development that the continent so desires and needs. It's a particularly acute problem in West Africa.

REGION IN FOCUS

Nigeria has a complex energy supply crisis, Niger is only satisfying some 47 percent of its energy needs with the balance imported, and Ghana is increasingly experiencing intermittent supply problems, along with industry concerns about the high cost. Tellingly, these are the only three nations in the region that have undertaken, or are updating, energy planning studies to determine their needs for additional electricity generation capacity, according to the International Atomic Energy Agency, or IAEA.

"To date, these countries have not identified major obstacles that would preclude nuclear power from their energy mix," the IAEA confirmed to *Breakbulk*. "But equally, these countries have not yet completed all the studies or preparatory work necessary to reach the stage where they would be ready to sign contracts for the construction of their first nuclear power plant."

Even if they were at that point, it would take at least 10 to 15 years to complete the infrastructure and

the support required for a nuclear power plant. South Africa provides the evidence, given that it is the only country in Africa to have a nuclear power station.

Koeberg Nuclear Power Station is under the control of Eskom, the country's generator, transmitter, trader and distributor of electricity. It has been in operation for more than 33 years and took from May 1971 until April 1984 to complete and be able to contribute the first nuclear-generated electricity to the national grid.

Velaphi Ntuli, Koeberg Nuclear Power Station general manager, said, however, that planning started even earlier, with the site, 30 kilometers north of Cape Town and purchased in 1967. It was chosen because "it measured up to the U.S. Atomic Energy Commission guidelines for siting requirements," Ntuli said. It is also close to other power generators, predominately coal-fired stations, so plays a pivotal role in ensuring the security of the Cape region's power network.

"Two pressurized water reactor units of about 1,000 megawatts each contribute nearly 6 percent of South Africa's energy needs from the 1,860 megawatts generated, 50 percent of which takes care of all the Western Cape's needs," Ntuli said.

Koeberg's reliability is undisputed. Its performance is regularly benchmarked against the world's best-performing and reliable stations. "Koeberg Unit 2, for example, set a record of 492 days of [uninterrupted] reliable power generation in 2016/2017, and Unit 1 topped at 474 during 2016," Ntuli said.

The station's Finance Manager Renee Ovis added that the Rand/MWhour of Koeberg's operational expenditure, especially primary energy, has proven to be the most cost-effective within Eskom.

FACING REALITY

This reliability and cost effectiveness of energy supply is just what West Africa needs, but does any country have the staying power, let alone the finances, to endure the long processes to reach turnkey?

"There are some high-level requirements to be considered before embarking on a new nuclear power plant program, not least of which are safety, economic and technical capability, nuclear skills development and training capacity, site suitability, nuclear power legislation and regulation, and the level of maturity of other supporting industries, such as manufacturing, engineering, etc.," Ntuli advised. And, of course, there is the expertise in necessary large-scale logistics and project cargo to consider.

This is where the IAEA's guidelines, in terms of the considerations before deciding on implementing a nuclear power plant program, are powerful tools. Called the Milestones Approach, the guidelines emphasize three progressive phases of development, each dependent on the degree of commitment and resources applied by a country. Each phase is underpinned by specific milestones, at which progress can be assessed and a decision can be made about the readiness to move on to the next phase.

But the choices made will already be dependent on the location and energy needs. "It is not possible to state that one region or country is ideally suited, or not, to produce nuclear power without undertaking appropriate energy planning studies, projecting energy demand and capability to supply, and [taking into account] the mix of different energy sources and technologies that best meets the country or region's needs," the IAEA said. "While it is



each country's sovereign decision whether to add nuclear power to its energy mix, each country or region has specific characteristics and needs that should be taken into account when considering introducing nuclear power."

SAFETY RISKS DEBUNKED

While nuclear disasters such as Three Mile Island in 1979, Chernobyl in 1986 and Fukushima in 2011 cannot be ignored, the World Nuclear Association pointedly noted that apart from Chernobyl, where there was a death toll of 56, no nuclear workers nor members of the public have ever died as a result of exposure to radiation due to a commercial nuclear reactor incident.

Therefore the real concern for Africa is cost. The IAEA's Milko Kovachev said that while a government's investment to develop the necessary infrastructure is modest – relative to the cost of the first nuclear power plant – "is still in the order of hundreds of millions of dollars.

"Most countries in Africa will find it difficult to invest this amount of money in a nuclear power project, but there are financing mechanisms, like, for instance, from export agencies of vendor countries," he said. "Tapping into a reliable, carbon-free supply of energy when vendors are offering to fund it can make sense for several countries in Africa."

There is another option in small modular reactors, or SMRs. SMRs produce up to 300 megawatts of power per unit and can be easily transported to sites making them ideally suited to African conditions.

ROSIER PICTURE

One of the major players circling the African nuclear energy scene is Rosatom, the Russian state energy corporation, which is considered No. 1 in the world in terms of the number of simultaneously implemented nuclear reactor construction projects. Last year, Rosatom signed an agreement with Nigeria on the construction and operation of a nuclear power plant and research center, which will house a multipurpose nuclear research

reactor. It also agreed to a roadmap for cooperation in the field of "peaceful usage of nuclear technologies."

Using the IAEA's Milestones Approach, Nigeria commenced with its nuclear energy program 10 years ago, with Rosatom becoming involved five years into that process. Dmitry Shornikov, Rosatom's CEO for Central and Southern Africa, said that a great deal has been done in terms of the legal framework and educating specialists. Shornikov also said that Rosatom is committed to assisting Nigeria to achieve its nuclear ambition, noting that the IAEA has undertaken two missions to Nigeria, proving its support of the nuclear program and advancement of relative infrastructure development.

Ghana is also moving ahead, with an announcement in July by Robert Sogbadzi, deputy director in charge of nuclear and alternative energy at the Ministry of Energy, that nuclear will be included in the nation's energy mix by 2029.

"This year, we are to finalize our progression report and then issue a white paper on our nuclear program," Sogbadzi said.

The government said it has signed a memorandum of agreement with Rosatom for the construction of a nuclear power plant. Ghana does actually have a nuclear station, situated in the city capital Accra, but it is only used for research and training.

EMPTY EXPERTISE CLAIMS

While there are a number of logistics organizations that claim to provide nuclear transport expertise to Africa, there has been relatively limited opportunity to date to supply that expertise. That there will be opportunities is obvious. However, these West African nations, particularly landlocked Niger, are going to require strategic solutions for the complex transport delivery of components for nuclear power stations.

Africa is a continent known for its underdeveloped infrastructure and complicated, longwinded protocols – ports included – and with nuclear plants likely to be situated far from developed environments, engineering, procurement and construction companies are going to have to be prepared to maneuver around the challenges. Competition is also likely to be fierce considering the number of nuclear vendors from Russia, China and South Korea that are keen to be involved in the development of Africa's nuclear technologies and construction of plants.

It will therefore only be after the first delivery is made that any service provider can lay claim to having the expertise to help realize Africa's nuclear ambitions. ■■

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