

South Africa came under the global spotlight in June as it hosted the World Cup, the biggest event in the nation's history since the brutal era of apartheid ended in 1994 with the election of Nelson Mandela.

But the lights in South Africa sometimes grow dim, and those periodic brownouts and rolling blackouts threaten to become more frequent with the growth of the nation's economy and population, now about 49 million.

With that in mind, the nation's quasi-governmental electricity corporation, Eskom, decided to build a huge power plant at Medupi in northern South Africa, close to the mines that will supply the coal. It is the nation's first new power plant in 20 years and will be the largest in the Southern Hemisphere, as well as one of the largest in the world.

The plant will consist of six 800-megawatt units. The first is scheduled to begin operating in 2012, with the others to follow every five or six months.

A similar plant in Kusile, located in the eastern part of the country, will have an identical "six-pack" configuration. It is operating on a schedule about 18 months behind the Medupi plant.

By the time both are completed, they will provide an estimated 25 percent of the nation's electricity needs.

Altogether, Eskom awarded 37 contracts for the Medupi project, all through competitive bidding. Parsons Brinckerhoff, a U.S.-based engineering and consulting company, was chosen to manage the Medupi project. Black & Veatch, another U.S. company, is managing the Kusile project.

Hitachi Africa Ltd., a unit of Japan's Hitachi Group, won the contract to supply the boilers and is building them in South Africa. The giant supercritical boilers, designed to operate at more than 1,100 degrees Fahrenheit, will be about 500 feet tall with a footprint of 9,100 square feet.

Johannesburg-based Murray & Roberts, the prime contractor, is doing all of the civil construction, including the production of steel and concrete.

Another big winner was Alstom, a French company that is providing the generators, turbines, heating plants, air-cooled condensers, boiler feed water pumps, condensate extraction pumps, turbine





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By William Armbruster

POWER FOR THE PEOPLE

Alstom ships generators from China to South Africa for coal-fired power plant

hall steel structures and other equipment.

Eskom and the government want to develop industry in South Africa, so more than 50 percent of the components are being manufactured locally. These include the turbine hall steel structures, the boiler feed water and condensate extraction pumps, the heating plants — consisting of heaters and feed water tanks — that Alstom is providing for each of the six units. Local suppliers are doing the manufacturing.

Much of the equipment is being sourced from Europe, but the generator stators, which are the biggest pieces, are being made in China. The stators — the outer part of the generators — weigh almost 360 metric tons. Alstom is building the stators at its manufacturing facility in Beijing and shipping them through the Port of Xingang, about 110 miles away.

It takes two nights to deliver the equipment from the factory to the port of export.

Alstom's preferred port of entry for pieces weighing up to 120 metric tons is Durban, South Africa's largest port. The generator stators and other cargo weighing more than 120 tons are being shipped through Richards Bay, which has built roads specifically designed to handle heavy-lift cargo moving out of the port, said Adamo Pitzalis, Alstom's transport and logistics manager for the Medupi plant.

"One of the biggest challenges is to coordinate all deliveries from all over the world in order to avoid a bottleneck in our two main ports of import and to avoid any difficulties with the carriage to Medupi," he said. "To coordinate and to share all information and inputs with all parties, as well as to ensure that everybody is up to date, needs a strong but open communication culture."

Alstom began planning the heavy-lift transport several years ago, and detailed planning started in early 2009, just more than 12 months before the first generator stator was shipped from China.

MEDUPI POWER PLANT TIME LINE

2006 (MAY)	ESKOM ISSUES INVITATION TO TENDER FOR CONTRACTS.
2007 (MAY)	GROUND BREAKING.
2007 (SEPTEMBER)	ALSTOM SIGNS CONTRACT.
2007 (OCTOBER)	HITACHI SIGNS CONTRACT.
2009 (JANUARY)	ALSTOM BEGINS DETAILED PLANNING FOR SHIPMENTS OF GENERATOR STATORS.
2010 (FEBRUARY)	FIRST STATOR SHIPPED FROM CHINA.
2010 (APRIL)	WORLD BANK APPROVES \$3.75 BILLION LOAN TO ESKOM.
2012 (FIRST QUARTER)	LAST GENERATOR STATOR TO BE SHIPPED FROM CHINA.
2012	FIRST 800-MEGAWATT PLANT TO BEGIN OPERATING.

"Normally, we try to consolidate as many pieces as possible in all our vessels, whether it be full charters, part charters, breakbulk shipments or container shipments," Pitzalis said. Shipment of the generator stators is subject to inducement.

Alstom's primary ocean carriers are Jumbo Shipping and BBC. "We know them well and trust them with our equipment," he said. The carriers employ special self-gear heavy-lift vessels, so they do not require any special equipment landside.

But it's a different story once the generator stators are offloaded. Alstom had to obtain special permits to transport the stators from Richards Bay to Medupi. "The transport permit application process took approximately four months, but it was quite complex, so we had to involve a team, including consultants, civil engineers and route specialists to support us in the application process," Pitzalis said, adding that this is normal practice in such cases.

Alstom had to reinforce several bridge crossings along the 600-mile route, which crosses into Swaziland, to avoid some areas with particularly difficult road conditions. The shipment from Richards Bay to the site takes approximately 27 days.

The contractor is using a specialist girder frame trailer that is engineered to suit the road

conditions in South Africa. The trailer is pulled by two truck chassis in front, with two or three chassis in back, depending on road conditions.

The deliveries of the generator stators are being staggered about five months apart. The second will be arriving in August. Alstom expects to deliver the last of them during the first quarter of 2012. The first of the six generator stators for the Kusile plant will be ready for shipment around the beginning of August, said Bruno Fall, Alstom project manager for the Medupi plant.

Alstom's main partners are Cosco International Freight, Furness Shipping, Natco AG Switzerland, Natco Pty Ltd. South Africa, and ALE-Heavylift. The Medupi contract is worth \$1.7 billion for Alstom.

The Medupi project carries a price tag of \$18 billion, including road construction and other infrastructure. "There are days when we have 100 or 200 trucks coming in," said Hans Van Winkle, Parsons Brinckerhoff's project director. Van Winkle is a retired U.S. Army major general and former deputy commander of the U.S. Army Corps of Engineers. At the corps, he helped oversee dredging projects at numerous U.S. ports, including the Port of New York and New Jersey.

The contractors also had to build housing for more than 8,000 workers. Many of the workers were unskilled and therefore required training.

South African labor unions are very strong, and a strike in May 2009 shut down the entire project for a month. There was additional labor unrest this past spring.

The project has created a storm of controversy because of concerns over greenhouse gas emissions. Critics say it will emit 25 million tons of carbon dioxide annually. Despite those concerns, the World Bank voted on April 9 to provide a \$3.75 billion loan for the project, a small portion of which will fund alternative energy sources. The United States, the U.K., and the Netherlands abstained. **BB**

JUST THE FACTS: MEDUPI POWER PLANT

AGENCY IN CHARGE	ESKOM - GOVERNMENT-OWNED POWER COMPANY.
PRODUCTION CAPACITY	4,800 MEGAWATTS OF ELECTRICITY.
COMPOSITION	SIX 800-MEGAWATT PLANTS.
COST	\$18 BILLION.
LOCATION	180 MILES NORTHWEST OF JOHANNESBURG.
PRINCIPAL CONTRACTORS:	
PARSONS BRINCKERHOFF	PROJECT MANAGER.
HITACHI	BOILERS AND OTHER EQUIPMENT.
ALSTOM	GENERATORS, TURBINES.
MURRAY & ROBERTS	CIVIL CONSTRUCTION.
TOTAL NUMBER OF CONTRACTS	37.
LARGEST EQUIPMENT	GENERATOR STATORS - 360 METRIC TONS.
NUMBER OF WORKERS	8,000.
COAL CONSUMPTION	14.6 MILLION METRIC TONS ANNUALLY.

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