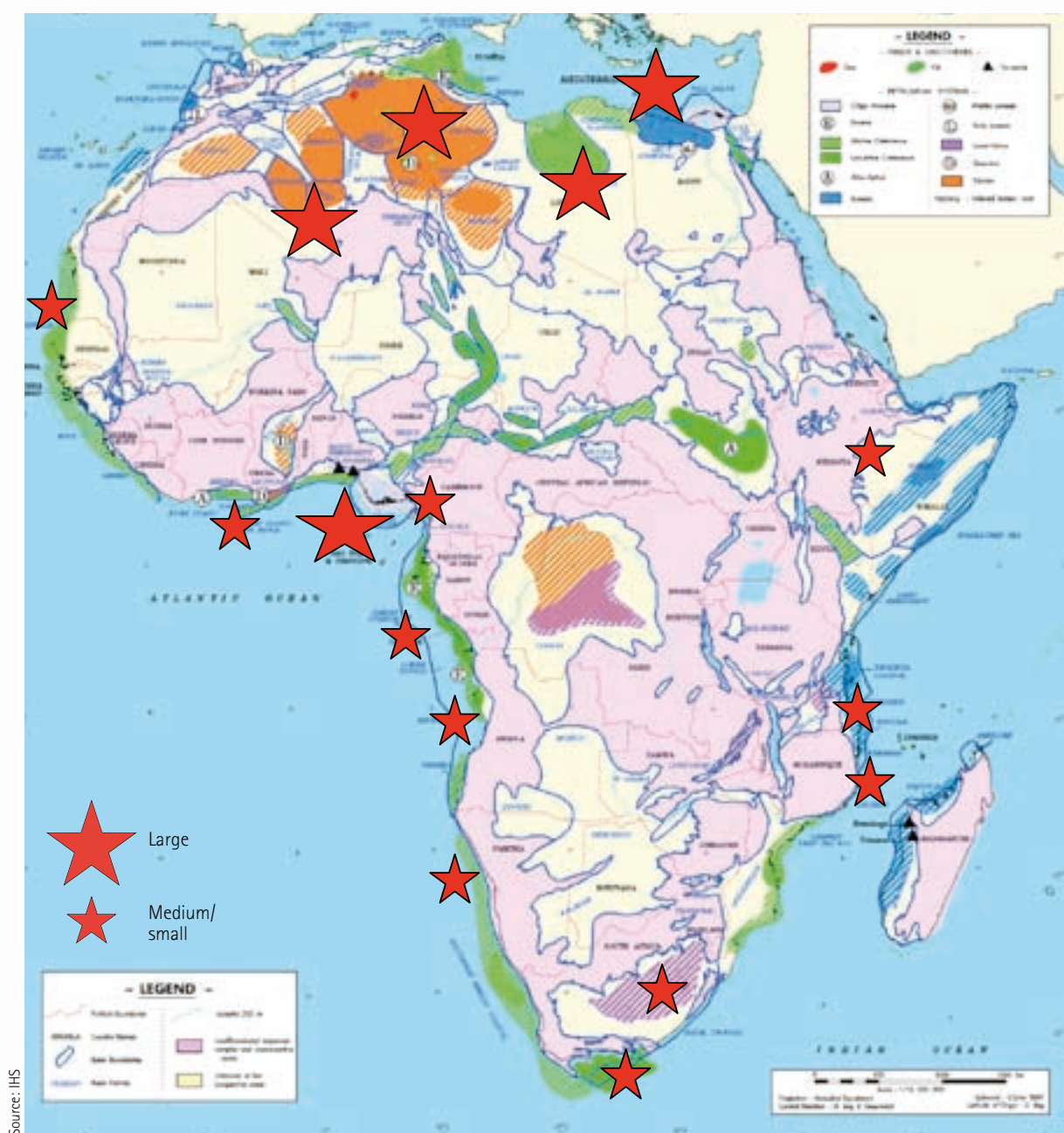


# More African Countries Become Gas Exporters

With exploration underway in almost every country in the continent, Africa is playing an important part in the exploitation of the world's gas resources. Successful commercialisation of smaller fields, however, still presents challenges.



"Global demand for gas has been rising at 4% per annum, as gas becomes the 'cleaner' preferred fuel for many organisations in the US and Europe, while demand continually increases from the rapidly developing industries like China and India," explains Andrew Hayman, Director of Industry Relations at IHS. "Africa is playing an ever-more important role in supplying these markets with gas."

After exceeding 100 Tcf (2,831 Bcm<sup>3</sup>) for the first time in 2003, global natural gas production has continued to climb, and production for 2006 was almost 111 Tcf (3,143 Bcm<sup>3</sup>). Africa's share in this production has also increased, rising to nearly 10% in 2006, with growth coming from both Saharan and sub-Saharan Africa. Local African gas markets are very restricted, so, apart from flaring, the bulk of this gas is exported, with the range of countries receiving African gas increasing annually.

"The size of a discovery is, of course, crucial to its commercial development," Andrew explains. "Roughly speaking, in the absence of existing infrastructure a 3 Tcfg discovery can be considered large enough for economic development for export, while fields less than 1 Tcfg can be exploited for domestic market only. It is in the 1 to 3 Tcf range that problems arise."

### Gas from 14 countries

"Nigeria has been known for many years to have an abundance of gas, discovered as a by-product to oil exploration, and recently giant deepwater gas fields such as Nnwa-Doro and Bosi have been added to the portfolio. Although resources are cited at around 150 Tcf (4,247 Bcm<sup>3</sup>), many Nige-

Total African gas reserves, end 2006. Nigeria and Algeria together account for nearly half Africa's reserve figures.



Source: IHS PEPS statistics

rian geologists believe that 300 Tcf (8,500 Bcm<sup>3</sup>) is attainable with targeted exploration. There are many new developments, in particular in the onshore swamps, to feed gas to the export schemes," Andrew says.

"Increasing contributions are also expected in coming years from Saharan African countries, like Algeria, Libya and Egypt, as well as from Sub-Saharan Africa. A total of 14 African countries are, or soon will be, gas producers. At the end of 2006, IHS calculated remaining resources of natural gas in Africa to be 467 Tcf (13,223 Bcm<sup>3</sup>)."

Algeria is now a large-scale African gas producer, and the extensive pipeline network into the Sahara has allowed operators to access 'stranded' Palaeozoic gas, to the extent that Andrew believes that Algerian gas has become critical to the long-term economic future of Europe. "Algeria remains very exciting," he adds, "as there is still a lot of gas to be brought on stream from unexploited fields, and there are many new basins such as the Reggane and the Ahnet awaiting full exploration."

"Egypt has also been developing fast

as a gas producer, with over 60 Tcf (1,700 Bcm<sup>3</sup>) discovered in the Nile Delta, and significant new gas-condensate finds in the Western Desert. Ultimately, Egyptian gas should be able to underpin the economies of the northern Middle East, with pipelines to Jordan, Israel, Syria and Lebanon."

### Gas export innovations

New LNG capacity will be a major stimulus to African gas production, and schemes are underway in Algeria, Libya, Egypt, Equatorial Guinea, and Angola. "3 Tcfg is the crucial figure for export, because that is the level of proven reserves needed to make the building of an LNG plant economically viable for at least 20 years of production," Andrew explains. "By the end of 2006, Africa had 28% of the world's total online LNG capacity, with Algeria and Nigeria the leaders in LNG production in Africa."

"In Nigeria, access to LNG facilities for gas export is a key conundrum for new exploration players, given that routine gas flaring will be outlawed in 2008. The LNG plant at Bonny, the most successful-ever industrial scheme in Southern Africa, is only open to equity holders Shell, Total and ENI. New domestic gas-to-power schemes are under construction, but these will only take up part of the available resource. Gas development does not present technical problems in West Africa, but it does introduce financial, contractual and risk management issues."

Significant new contributions to the total gas production of Africa will come from other sub-Saharan African countries, with new LNG, GTL (gas-to-liquid) and LPG (Liquid Petroleum Gas) projects in the pipeline. West African gas exploitation could be further encouraged by plans for a 4,000 km long trans-Saharan gas pipeline, costing over US\$10 billion, from Nigeria ▶



Africa accounts for over 10% of world gas production – yet it represents only 3% of world energy consumption, as shown by this satellite image of Africa at night.



Photo: IHS © Gittings 2002



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via Niger, to Algeria for export to Europe.

To overcome the issues involved in exporting gas from large-scale projects in Africa, a number of interesting innovations have been suggested. These included a floating deep-water single-train LNG barge offshore Nigeria, capable of exploiting the 10 Tcf Nnwa-Doro field, but this was costed by Statoil, and deemed to be too expensive at the moment. Another highly complex, multi-million dollar project, a floating GTL barge, was proposed by Syn-troleum for stranded gas in the Nigerian swamps; again, this may prove too risky for international financiers.

## Medium size resources hard to commercialise

"Medium-scale (1-3 Tcf) resources of gas are proving more difficult to monetize, although some of the majors are looking closely at opportunities again," Andrew continues. "Export schemes do not appear to be viable so far, particularly for Southern Africa, remote from export markets. Given a local requirement and realistic commercial terms, the most appropriate use for smaller-scale gas discoveries is to convert the gas into power locally, and help build local economies and gas markets. A good example of an intermediate size find which could revolutionise a local economy is Kudu, a 1.45 Tcf (41 Bcm<sup>3</sup>) discovery offshore Namibia. If the planned \$450 million,

800MW power plant goes ahead using gas from Kudu, it will greatly reduce Namibian dependence on imported South African power."

"However, there still remain some major issues with commercialising these medium-scale discoveries. Local gas-powered plants are in competition with coal and hydroelectric projects, while increasing costs, especially the price of steel, make offshore developments expensive. Operators still try to increase reserve size to convert a medium scale domestic discovery to a larger, export scheme. For example, Shell was the original operator of the Kudu Field, and drilled several appraisal wells, hoping to push reserves to 10 Tcf, before withdrawing in 2003 when the wells were not successful. Current operator Tullow also unsuccessfully drilled appraisal wells this year to see if the field size could be increased."

A promising innovation to enable the commercial exploitation of medium-scale African discoveries is compressed natural gas (CNG), with gas stored and distributed in highly pressurized containers. This is particularly suitable for offshore or swamp areas, as gas can be loaded directly onto barges, where it is compressed and

contained onboard, eliminating the need for costly liquefaction and re-gasification processing.

"East Africa is also developing," Andrew says. "Production of natural gas started in 2004 with Sasol's Temane field in Mozambique, and Songo-Songo field in Tanzania is onstream, and is expected to continue to develop. To date, however, most finds in the region have been relatively small, less than 1 Tcf."

"Similarly, smaller fields have been discovered in Cameroon, Ethiopia and South Africa, and attempts are being made to monetise these. With about 75% of Sub-Saharan Africans having no access to electricity, this is a vital area for development, but to achieve it innovative financing, trans-national initiatives and world community support will be needed."

"Africa is becoming an increasingly important player in the world gas market," Andrew Hayman of IHS concludes. "However, gas projects of all sizes in Africa are frequently still taking well over 10 years to come to fruition, and the gap between the 'local' 0.5 Tcf discovery and the 'export', 3 Tcf field still represents a big challenge for companies to overcome." 🌟



In spite of progress in many spheres, lack of infrastructure means the hydrocarbon industry is predominantly hunting for 'elephants' in Africa.

Photo: Jane Whaley