West Africa offshore activity continues to grow
Nigeria to add 0.5 MMb/d by 1Q/2006

Offshore Magazine, Nov. 1, 2005

West Africa is poised for more growth offshore, and Nigeria is leading the way.

Forecasting growth in oil production from 2.5 to 4.0 MMbbl/d by 2010, Nigeria is looking to a string of deepwater developments. Nigeria's Minister of State for Petroleum Edmund Daukoru, speaking at the World Petroleum Congress in Johannesburg last month, said, "Nigeria is going to put 0.5 million barrels more per day on the market by the end of the first quarter next year, from Bonga, from Erha and from two other smaller sources."

Royal Dutch Shell says that the Bonga field, the country's first large-scale deepwater project, will start production in late October, quickly achieving 100,000 b/d. Shell Nigeria Exploration and Production Co., a wholly owned unit of Shell, is the operator and 55% shareholder of Bonga. The remaining equity is held by Total, ExxonMobil, and Eni.

Shell, which produces nearly half of Nigeria's oil, plans to invest $10 billion there in the next four to five years to develop another deep offshore hub and other prospects including natural gas

Offshore West Africa oil production is expected to more than double to 351.5 metric

Offshore forecasts for West and East Africa

	Actual 2003	Estimate 2004	Forecast 2005	Forecast 2006	Forecast 2007	Forecast 2008	Forecast 2009
Offshore oil production (million tons)	163.1	178.9	201.0	235.9	284.9	325.7	351.5
Offshore gas production (bcm)	22.2	24.7	27.6	40.6	52.7	69.9	89.1
Offshore exploration & appraisal wells	90	82	83	85	85	82	77
Total offshore expenditure ($MM, constant 2004 values)	14,084	16,610	18,900	19,820	20,670	21,890	22,160
Offshore production expenditure ($MM, constant 2004 values)	7,180	7,970	8,880	10,470	12,785	14,790	15,635
Offshore development expenditure ($MM, constant 2004 values)	6,040	7,855	9,220	8,530	7,075	6,315	5,800
Offshore exploration expenditure ($MM, constant 2004 values)	864	785	800	820	810	785	725

tons in 2009, which implies an increase of 188.4 metric tons, equivalent to just under 4.0 MMb/d. This accounts for 28.5% of the total forecast increase in world offshore oil production. The forecast increase in gas production is related to the development of commercial/export markets associated with the growth in the number of LNG plants and production. Offshore West Africa's gas previously flared is now increasingly being converted into LNG. Growth will be more modest than for oil production, but the region is expected to account for 10.9% of the overall global increase, and the market share will more than double to 7.0% in 2009. Total offshore expenditure is forecast to increase in West Africa by $8.1 billion in 2009, second only to the Asia-Pacific region's increase of $9.8 billion. Forecast market share increases of the two regions are 4.0% and 4.4%, respectively. Source: Prospects for the Offshore Oil and Gas Industry in North and Central America 2005-2009, Mackay Consultants, Revised June 2005.

ExxonMobil's Erha oilfield is also due to start production late this year. Located in oil prospecting license (OPL) 209 and operated by ExxonMobil subsidiary Esso Exploration and Production Nigeria Ltd., Erha will raise Nigeria's crude oil production by 150,000 b/d and reserves by 560 MMbbl when it comes on stream.

ExxonMobil previously indicated its intent to invest about $10 billion in Nigeria's petroleum sector over the next five years - $3 billion would be invested in projects aimed at ending gas flaring by 2006; another $3 billion would be spent to develop new deep offshore fields; and $1 billion would go into funding joint venture projects with the Nigerian National Petroleum Corp. (NNPC).

Meanwhile, Total has announced several offshore developments this spring and summer in the Ukot and Usan fields. In July, its Nigerian operating subsidiary, Elf Petroleum Nigeria Ltd. (EPNL), signed a production sharing contract (PSC) with NNPC for OPL 223 located offshore southeast Nigeria. OPL 223 lies in water depths of 200 to 1,000 m just east of OPL 222 where EPNL has made significant commercial discoveries in the Ukot and Usan fields.

The Usan field, discovered in 2002, is 110 km offshore in water depths of approximately 800 m. In 2004, a western Usan extension was confirmed by the drilling of Usan 5 and 6. This year, Usan 7 and 8 confirmed an eastern extension of the Usan field. In August, EPNL successfully drilled two appraisal wells in the Usan field in OPL 222.

The field development plan has been approved by NNPC, the concessionaire of the licence. Additional approval will be sought from the Department of Petroleum Resources in the near future. The plan features a development of the Usan field with 35 subsea wells connected to a 2 MMbbl capacity FPSO by subsea pipelines and risers. The processing capacity is around 150,000 b/d. First oil is planned by 2010.

NNPC is concessionaire for OPL 222 under a PSC operated by EPNL (20%), in partnership with Chevron Petroleum Nigeria Ltd. (30%), Esso Exploration and Production Nigeria (Offshore East) Ltd. (30%), and Nexen Petroleum Nigeria Ltd. (20%).

In May, NNPC authorized Total, as operator, to begin developing the offshore Akpo field on the oil mining license (OML) 130 in Nigeria. Total holds a 24% interest in OML 130, alongside NNPC, Petrobras, and Sapetro.

Discovered in 2000, the Akpo gas and condensate field is located around 200 km offshore Port Harcourt in water depths ranging from 1,100 to 1,700 m.

The field development plan calls for 22 producing wells, 20 water injection wells and two gas injection wells, tied back to an FPSO with a storage capacity of 2 MMbbl.

Technip as leader, in consortium with Hyundai Heavy Industries, was awarded by Total Upstream Nigeria Ltd. a lump sum turnkey contract worth approximately $1.08 billion (Technip's share about 50%) for the engineering, procurement, supply, construction, and offshore commissioning of the FPSO.

Akpo will come on stream in late 2008 and is expected to quickly reach peak production of 225,000 boe/d, of which nearly 80% is condensate. The condensate will be exported via a buoy located 2 km from the FPSO, while the gas will be piped 150 km to the Amenam/Kpono platforms, from where it will be sent to the Bonny liquefaction plant.

Eni has acquired from Nigerian companies Allied Energy Resources and Camac International a 40% stake in both OML 120 and 121, located in the Nigerian offshore some 200 km off the coast at a depth ranging between 200 and 900 m. Eni already operates the fields through its subsidiary Nigerian Agip Exploration.

The agreement establishes a tight cooperation between the partners in both technical activities and operating management, with the aim of supporting education and skills development amongst Nigerian resources.

The Oyo field, one of the first oil discoveries made in the Nigerian deepwater during the previous exploration phase, is located in OML 120. The new ventures will start drilling the first well by end 2005. Two other appraisal wells have been scheduled during 2006 to verify the potential of OML 120 and 121.

Nigerian Agip Exploration is today the only company operating in Nigerian deepwater with the Abo field, which started production in 2004 and lies next to OML 120 and 121.

Shell companies have made discoveries in two Big Cat prospects offshore Nigeria, both regarded as deepwater frontier areas. Further appraisal will be required to determine the discoveries' resource potential, according to a Shell statement.

Bobo-1X was drilled in block OPL 322, to a total depth of 5,173 m in 2,479 m of water, the second deepest well in offshore Nigeria. Drilling was completed in July, under budget, and found over 140 m of hydrocarbon-bearing sands. Shell has a 40% shareholding in the block.

Etan-1X was drilled in block OPL 245, held 100% by Shell, to a total depth of 4,574 m in 1,720 m of water. The well logged 120 m of hydrocarbon-bearing sands. Drilling was completed in February.

September saw the commencement of the installation of the 569-km main offshore segment of the West African Gas Pipeline (WAGP) by the West African Gas Pipeline Co. Ltd. (WAPCo). Chevron, through its affiliate company, the Chevron West African Gas

Pipeline Ltd., is a 38% shareholder in WAPCo.

Commenting on the importance of the start of the pipeline installation, John Watson, president of Chevron International Exploration and Production said, “This event represents a significant achievement for the WAGP shareholders and is testimony to the strong commitment of the governments of Benin, Ghana, Nigeria and Togo to make this project a reality.”

He added that when complete, the estimated $590-million project will be the first regional natural gas transmission system to have been developed in sub-Saharan Africa. First gas delivery is scheduled for December 2006.

The offshore route of the 475-MMcf/d capacity pipeline will be parallel to the coastline, approximately 15 to 20 km offshore in water depths of 30 to 75 m.

Crude oil imports (top 15 countries) (thousand b/d)

Country	July 2005	June 2005	YTD 2005	July 2004	Jan-July 2004
Canada	1,624	1,705	1,608	1,667	1,628
Saudi Arabia	1,499	1,598	1,522	1,622	1,422
Mexico	1,497	1,616	1,558	1,603	1,598
Venezuela	1,327	1,292	1,329	1,228	1,335
Nigeria	**1,047**	**1,012**	**1,041**	**1,020**	**1,094**
Iraq	615	608	558	593	648
Algeria	325	292	214	297	213
Russia	324	116	264	206	137
Kuwait	272	184	198	268	232
United Kingdom	259	269	232	264	262
Angola	**219**	**397**	**399**	**355**	**297**
Ecuador	217	288	278	249	205
Colombia	172	227	147	83	147
Brazil	138	212	88	95	62
Gabon	**124**	**64**	**120**	**117**	**137**

Source: U.S. Energy Information Administration, data as of 09/23/05

“Natural gas flare reduction is a key business driver for the company,” says Jay Pryor, managing director of Chevron’s Nigeria/Mid-Africa Business Unit, “and the West African Gas Pipeline is one of several projects we have in Nigeria to eliminate the practice of routine associated gas flaring in our areas of operation. According to expert analysis, it is estimated that when fully operational, the pipeline could reduce greenhouse gas emissions by as much as 86 million tons over the next 20 years through flare reduction and changing to a cleaner-burning fuel.”

When the offshore section is completed, it will be connected to a new onshore pipeline and compressor station in Nigeria, and the entire 678-km pipeline will link the Volta River Authority's power plant at Takoradi, Ghana to Nigerian natural gas from an existing pipeline located near the city of Lagos.

In addition to the delivery point at Takoradi, there will be other onshore delivery points, including regulating and metering/custody transfer stations at Tema in Ghana; Lome in Togo; and Cotonou in Benin. Construction of facilities for these additional delivery locations will commence in January 2006.

Angola

After Nigeria, Angola is the second-largest oil producer in sub-Saharan Africa, with oil accounting for 40% of the country's GDP. Over the next three years, oil production is forecast to double, reaching 2 MMb/d by 2008.

Angola has announced plans for an offshore licensing round later this year. The round will include seven blocks - 1, 5, and 6, which are located on the shelf of the lower Congo and Kwanza basins; blocks 15, 17, and 18 (excluding development areas) in deepwater of the lower Congo basin, and block 26, a deepwater block in the Benguela sub-basin.

Beginning 3Q 2005, Saipem has been awarded an offshore drilling contract for the charter of the drillship Saipem 10000 by Total Exploration and Production Angola, operator of offshore Angola block 17. The Rosa field is located 200 km offshore Angola, at water depths of up to 1,700 m. The contract will last two years, and Total has the option to extend it for a further two years.

Sonangol, Angolan state oil company, is the block 17 concessionaire. Total's co-venturers in the block are Esso Exploration Angola (block 17) Ltd., BP Exploration (Angola) Ltd., Statoil Angola block 17 AS, and Norsk Hydro.

The Kissanje and Dikanza fields in deepwater offshore Angola started production in July, largely ahead of schedule. The two fields, about 350 km from the capital Luanda, will reach a production of 250,000 b/d by the end of 2005.

Kissanje and Dikanza fields are part of the Kizomba B project and are located in block 15 in water depths of approximately 1,000 m. Partners in the project include Eni (20%), ExxonMobil (operator, 40%), BP (26.67%) and Statoil (13.33%).

Overall investment amounts to $3.5 billion, and total reserves amounting to 1 Bbbl of oil will be developed.

A fixed platform and subsea wells linked to an FPSO will be employed to develop the project. Oil treatment and storage will be done in the FPSO.

Kizomba B is the third project to be developed in block 15 after Xikomba start-up in 2003 and Kizomba A start-up in 2004. The three projects will allow overall production of approximately 550,000 b/d by the end of 2005.

An eighth discovery was made in early August in block 31 off Angola, which is operated by BP and Sonangol. Licensees in block 31 are BP with 26.67%, ExxonMobil 25%, Sonangol 20%, Statoil 13.33%, Marathon Petroleum 10%, and Total 5%.

The Astraea-1 wildcat drilled from the Jack Ryan drillship to a total measured depth of 3,511 m in 1,496 m of water. The well was tested at a rate of 6,513 b/d.

Astraea lies 10 km southeast of the Palas field, found earlier this year. Other discoveries in block 31 are Pluta~o, Saturno, Marte, Venus, Ceres and Juno.
Congo

Through its local subsidiary, Elf-Congo, Total is the leading oil producer and foreign investor in Congo, producing approximately two-thirds of all Congolese oil output. Total (51% interest) operates N'Kossa, located on the Haute Mer permit. The company hopes to increase its output when the new Moho and Bilondo fields on the Haute Mer C permit come onstream.

The Congolese authorities have given Total permission to begin developing the Moho-Bilondo project, located around 80 km offshore in water depths ranging from 600 to 900 m.

Phase 1 of the Moho-Bilondo development comprises 12 subsea wells - seven producers and five water injectors - tied into a floating production unit. Expected to peak at 90,000 b/d, production will be exported to the Dje'no terminal, which already handles nearly all of the country's crude oil output. The development is scheduled to come on stream in 2008.

Total E&P Congo's (53.5%) partners in the Moho-Bilondo permit are Chevron Congo Overseas Ltd. (31.5%) and the Socie'te' Nationale des Pe'troles du Congo (15%). The percentages indicated take into account the recent acquisition by Total E&P Congo of a 2.5% interest in the Haute Mer permit that had been previously held by Energy Africa (subsidiary of Tullow Oil).

Agip (Italy), the second largest producer in Congo, produces approximately 25% of Congolese oil output. Agip operates the following fields (interest percent): Djambala (65%), Foukanda (100%), Kitina (55%), Loango (50%), Mwafi (100%), and Zatchi (65%).

Twenty-two development wells are planned for the M'Boundi field, where a subsidiary of Maurel and Prom (France) discovered approximately 250 MMbbl barrels of new reserves in mid-2004. In March 2005, the subsidiary announced that the field's Well 1001 tested at an initial flow rate of 4,000 boe/d, while the nearby Well 1303 encountered an unproductive reservoir. As a result of new finds, Maurel and Prom's subsidiary hopes to increase production from 25,000 b/d in 2004 to 73,000 b/d by 2007.

UK-based Burren Energy Plc completed and tested four development wells since the beginning of August, with a combined aggregate test rate of 14,800 b/d from the Vandji reservoir on the M'Boundi field. Three of the wells now account for M'Boundi production in excess of 52,000 b/d. The fourth well, MDB 1102, is undergoing pressure build-up and is expected to be placed on production imminently.

Equatorial Guinea

Equatorial Guinea's total proven oil reserves are estimated at 1.28 Bbbl. Oil production is expanding rapidly, averaging 371,700 b/d in 2004, a large increase from the 1996 oil output of 17,000 b/d. Since the 1995 discovery of the Zafiro field, Equatorial Guinea's oil production has increased more than tenfold, accounting for nearly 90 percent of the value of total exports in 2003. In October 2004, Equatorial Guinea told oil companies operating in the country to cap production at 350,000 b/d due to concerns that oil revenues from increasingly high prices could destabilize the economy.

GE Petrol became Equatorial Guinea's national oil company in 2001. Its primary focus has become managing the government's interest stakes in various production sharing contracts with international oil companies, although it also participates in joint ventures and markets its share of crude oil production.

Zafiro field, located northwest of Bioko Island, was discovered in 1995 by ExxonMobil and Ocean Energy (bought by Devon Energy in 2003) and contains the majority of the country's oil reserves. In recent years, ExxonMobil has focused on increasing production from Zafiro by expanding drilling capacity. A new FPSO vessel introduced in 2003 also successfully increased production capability. Zafiro is Equatorial Guinea's largest oil producer, with output rising from an initial level of 7,000 b/d in August 1996 to approximately 280,000 b/d in 2004.

Ceiba, Equatorial Guinea's second major producing oil field, is located just offshore of Rio Muni in exploration block G and is estimated to contain 300-800 MMbbl of oil. The field - discovered by Amerada Hess in 1999 - began production in December 2000. Both Amerada Hess (85% interest) and South Africa's Energy Africa (15%) have experienced successful exploration of block G, resulting in discoveries in 2001 (Okume and Oveng fields) and 2002 (Akom, Elon and Abang fields). In July 2004, Amerada Hess received government approval for its plans to expand operations in block G. The expansion project requires an investment of approximately $1.1 billion by Amerada Hess, Tullow Oil and GE Petrol, with production expected to reach 60,000 b/d when it comes online in 2007. Additional production from Amerada Hess' fields in Northern block G is also expected to come online in 2007.

Alba, Equatorial Guinea's third significant field, is located 12 miles north of Bioko Island. Walter International Inc. discovered it in 1991. Original estimates of reserves at Alba were around 68 MMboe, but recent exploration has increased new estimates to almost 1 Bboe. Unlike the Zafiro or Ceiba fields, E&P at Alba has focused on natural gas, including condensates. Recent production improvements at Alba resulted in average production of 50,000 b/d by the end of 2004.