

Ghana National Petroleum Corporation

Summaries of Recent Activities In The Oil And Gas Sector

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EXPLORATION HISTORY IN GHANA

Introduction

Ghana has four sedimentary basins. These are:

1. Cote d'Ivoire-Tano Basin (including Cape Three Points Sub-basin)
2. Central (Saltpond) Basin
3. Accra/Keta Basin and
4. Inland Voltaian Basin

Hydrocarbon exploration in Ghana started in the late 19th Century in the western region of Ghana. Following are the synopsis of the country's hydrocarbon exploration history up to June 2007.

1. Under British Colonial Rule (1896 – 1957)

According to the "Ghana Geological Survey Bulletin No. 40" authored by Dr. Mohsin H. Khan, Senior Geologist with the Ghana Geological Survey, exploration for oil and gas in Ghana started in 1896 in Onshore Tano basin in today's administrative Western Region. This was due to the presence of onshore oil and gas seepages found by early explorers in that area. Early wells were drilled without geological understanding and benefit seismic data back then. Those early wells have scant documentation.

Five wells were drilled by a company called the West Africa Oil and Fuel Company between 1896 and 1903 (WAOFCO – 1, 2, 3, 4 & 5). **WAOFCO – 2, the first documented discovery well in the country, produced 5BOPD between 1896 & 1897. Total depth was 35metres.**

Six wells were drilled by a French company called Société Française de Petrole, between 1909 and 1913 (SFP-1, 2, 3, 4, 5, & 6). **SFP-1 struck oil at 10 – 17 metres depth and produced 7 BOPD. SFP-3, 4, 5 & 6 all**

had very good oil indications and/or flows at relatively shallow horizons, according to available records.

African and Eastern Trade Corporation (UAC) drilled two wells in onshore Tano between 1923 and 1925. These are AETC – 1 & 2. Progressively, heavy oil, light oil and gas were encountered at various depths.

Gulf Oil Company acquired the onshore Tano license and drilled four (4) wells.

Two (2) onshore Gulf Oil wells were drilled during this period as indicated below.

WELL NAME	SPUD DATE	WELL TYPE	OPERATOR	LOCATION	BASIN	TD (FT)
Kobnaswaso-1	29/06/56	Exploration	Gulf Petroleum	Onshore	Tano	10660
Epunsa-1	26/12/56	Exploration	Gulf Petroleum	Onshore	Tano	6791

2. Under The First Republic 1957 – 1966

During the First Republic, onshore exploration activities continued. Acting under the auspices of a Ghana – Soviet Union friendship pact, Soviet and Romanian Geoscientists explored for oil and gas in the Accra/Keta and Voltaian basins.

Two wells were drilled in the Onshore Tano basin by Gulf Petroleum as a continuation of its Exploration Programme carried over from pre-1957.

Apart from well logs, there is very little information on these wells.

Similarly, these Gulf Oil wells were drilled without the help of seismic data.

In the 1990's, GNPC personnel undertook verification trips and located many of these wells and others drilled in the onshore Tano basin.

WELL NAME	SPUD DATE	WELL TYPE	OPERATOR	LOCATION	BASIN	TD (FT)
Bonyere-1	02/05/57	Exploration	Gulf Petroleum	Onshore	Tano	8190
Kobnaswaso-2	27/09/57	Exploration	Gulf Petroleum	Onshore	Tano	4513

During the period also, the Soviet team drilling for water in the onshore Voltaian basin encountered traces of oil and gas in some of the boreholes in some areas in the Northern and Upper East regions.

Also, calcic waters associated with hydrocarbons were encountered in some of the boreholes. Furthermore, in his book "*Rocks and Mineral Resources of Ghana*", renowned Ghana geologist and past Director of the Geological Survey of Ghana, Mr. G. O. Kesse, reports that salt used to be mined at Daboya along the White Volta northwest of Tamale in the Northern region.

The association of salt deposits with hydrocarbons in sedimentary basins worldwide is well documented. These are all indicative pointers to the possibility of commercial accumulation of hydrocarbons in the Voltaian basin.

No major oil or gas discoveries had been made up to this time.

3. Under The National Liberation Council and the Second Republic (1966 - 1972)

During this period, the first offshore well was drilled in the Saltpond basin and attention began to focus on prospectivity of the offshore sedimentary basins, namely, the Tano/Cape Three Points, the Saltpond and Accra/Keta basins. Fifteen (16) wells were drilled, two (2) onshore and fourteen (14) offshore.

Two milestone discoveries were made during this period:

The Seago 10-1 well, spudded on May 13 1970, by a consortium led by Amoco Petroleum was the discovery well for the Saltpond Oil Field.

The Tano 1-1 (Volta Tano 1-1) well was spudded on July 29, 1970 by Volta Petroleum Company and was the discovery well for the North Tano Oil and Gas Field in the Tano basin.

Many of the wells had encouraging oil and gas shows. For example, the Takoradi 1-11 well had encouraging gas shows. Subsequent re-mapping suggested strongly that the well was drilled off structure and could possibly have been a gas discovery if it had been located on the structure. Mobil Oil's wells GH-5-A1 and GH-5-B1 offshore Cape Three Points had encouraging oil shows. In the Accra/Keta basin, there were oil shows in the Keta-1 well. The onshore Keta basin Dzita-1 well had some gas shows. Results such as these spurred the search for oil and gas further on.

Below Is The List Of Wells Drilled In The Period (1966 - 1972).

WELL NAME	SPUD DATE	WELL TYPE	OPERATOR	LOCATION	BASIN	WD (FT)	TD (FT)
Atiavi-1	25/10/66	Exploration	Min. of Fuel, Ghana	Onshore	Keta		5152
Anloga-2	24/06/67	Exploration	Min of Fuel	Onshore	Keta		6995
G13-1	11/1/1970	Exploration	Signal Companies	Offshore	Saltpond		13458
Tex as Gas 17-1	25/01/70	Exploration	Oceanic Expl. Co	Offshore	Saltpond		12201
UC 19-1A	2/4/1970	Exploration	Union Carbide	Offshore	Keta		7075
GH-5-A1	29/04/70	Exploration	Mobil	Offshore	Cape Three Points	164	9605
Seago 10-1	13/05/70	Exploration	Signal	Offshore	Saltpond		9735
Keta 1	17/05/70	Exploration	Volta Petroleum	Offshore	Keta		9143
Takoradi 11-1	3/6/1970	Exploration	Texaco	Offshore	Saltpond		12969
GH-5-B1	18/06/70	Exploration	Mobil	Offshore	Cape Three Points	141	4972
Tano 1-1	29/07/70	Exploration	Volta Petroleum	Offshore	Tano	150	13513
Chaos 13-2	31/07/70	Exploration	Signal Companies	Offshore	Saltpond		9002
GH 19-2A	14/09/70	Exploration	Union Carbide	Offshore	Keta		9079
Seago 10-2	02/04/71	Exploration	Signal	Offshore	Saltpond		9550
Seago 10-3	01/07/71	Exploration	Signal	Offshore	Saltpond		9881
Shama 9-1	10/10/71	Exploration	Texaco	Offshore	Saltpond		8966

4. Under The Supreme Military Council (SMC) 1 & 2

(1972 - 1979)

The exploration for commercial oil, both onshore and offshore, continued and intensified during this era. Seventeen wells were drilled. Two of the wells were onshore, one in the Accra/Keta basin and the other in the Voltaian basin.

The Premuase -1 well in the Voltaian basin, incidentally, is the only exploratory well in this vast frontier region to date.

Although the onshore wells were unsuccessful, the stage was now set for more discoveries offshore in the Tano/Cape Three Points basin.

More milestones were attained during this time:

A significant gas discovery was made offshore Cape Three Points by operator Zapata and partner Mobil Oil with the CTP – 1 well which was spudded on November 1, 1973.

The Saltpond Field came on stream and started producing oil during this time (1978). It was operated by AgriPetco.

The South Tano Oil and Gas Field was discovered by Phillips Petroleum with the 1S – 1X well which was spudded on July 6, 1978.

Later in the same year, i.e. on November 15 1978, the first deepwater well, the South Dixcove -1X (SD -1X) was drilled during this period by Phillips Petroleum offshore Cape Three Points in 2927 feet of water.

Other encouraging results came from the Takoradi 6-1 well which encountered good oil and gas shows in the Saltpond basin.

2D seismic data was used to map all the offshore prospects as well as onshore prospects. Gravity data also played some part as with the Dzita-1 well in onshore Keta-basin.

List Of Wells Drilled In The Period: (1972 - 1979).

WELL NAME	SPUD DATE	WELL TYPE	OPERATOR	LOCATION	BASIN	WD (FT)	TD (FT)
Dzita 1	24/05/73	Exploration	Diamond Shamrock	Onshore	Keta		13448
CTP 1	1/11/73	Exploration	Mobil/Zapata Expl	Offshore	Cape Three Points	338	13820
Amoco 10-4	23/10/74	Exploration	Amoco	Offshore	Saltpond		9020
Takoradi 6-1	12/2/75	Exploration	Amoco	Offshore	Cape Three Points	216	11544
Dixcove 4-2X	6/5/75	Exploration	Phillips Petroleum	Offshore	Cape Three Points	358	12491
Amoco 16-1	7/5/75	Exploration	Amoco	Offshore	Keta		11527
Komenda 12-1X	25/08/75	Exploration	Phillips	Offshore	Saltpond		9758
Premuase 1	02/07/77	Exploration	Shell	Onshore	Voltaian		1167.5 m
APG 10-1A	10/05/77	Development	AgriPetco	Offshore	Saltpond	86	8800
APG 10-A2	28/07/77	Development	AgriPetco	Offshore	Saltpond	86	9050
APG 10-A3	16/11/77	Development	AgriPetco	Offshore	Saltpond	86	9009
APG 10-A4		Development	AgriPetco	Offshore	Saltpond	86	9527
APG 10-A5	08/02/78	Development	AgriPetco	Offshore	Saltpond	86	9963
APG 10-A6	17/04/78	Development	AgriPetco	Offshore	Saltpond	86	9070
1S-1X	06/07/78	Exploration	Phillips Petroleum	Offshore	Tano	313	12000
South Dixcove 1X	15/11/78	Exploration	Phillips Petroleum	Offshore	Cape Three Points	2927	16000
1S-2X	22/12/78	Exploration	Phillips Petroleum	Offshore	Tano	366	10901

5. Under The Armed Forces Revolutionary Council (AFRC), The Third Republic, The Provisional National Defence Council (PNDC) and the First & Second Estates of the Fourth Republic – the National Democratic Congress (NDC) (1979 – 2001)

Oil and gas exploration continued both onshore and offshore.

In 1979, Phillips Petroleum appraised the South Tano discovery and made gas and condensate find on the satellite 1S-3AX structure down dip of the main field.

Phillips Petroleum went ahead to further appraise the South Tano find by drilling 1S-4X in 1981. It declared the South Tano discovery sub-commercial and relinquished the block.

About the same time, Phillips Petroleum also appraised the North Tano find discovered earlier by Volta Petroleum.

Phillips drilled the 1N-1X in 1980 and 1N-2X in 1981. The wells encountered both oil and gas. Phillips Petroleum, however, declared the field non-commercial and relinquished the block as stated above.

The Provisional National Defence Council (PNDC) government then decided to establish an institutional capacity, as well as the statutory and legal framework that would accelerate the country's Exploration and Production (E & P) efforts. Subsequently, the current petroleum laws (PNDC Laws 64 and 84) were enacted.

PNDC Law 64 established the Ghana National Petroleum Corporation (GNPC) as a statutory body from the then Petroleum Department under the Ministry of Mines and Energy. This was to provide the requisite institutional framework to handle the country's E & P activities. GNPC started operations in 1985.

PNDCL 84 established the legal and fiscal framework for the conduct of petroleum Exploration and Production activities in Ghana. GNPC was to become a virtual one-stop shop for investors in the upstream petroleum industry in Ghana.

Similarly, the Petroleum Income Tax Law, PNDCL 188 was enacted. It provides for a separate tax regime for petroleum exploration and production in Ghana.

As the sole statutory body to spearhead the search for commercial oil and gas to meet the country's needs and let her be a net exporter of hydrocarbons, GNPC pioneered E & P activities. It sought for fund through various means to finance its activities.

One achievement of the fund raising efforts was that in the Mid 80's, the Canadian government, acting through Petro Canada International Assistance Corporation (PCIAC), expended considerable funds to support the infant GNPC. In addition to helping to establish, equip and train personnel for GNPC's research Laboratory, they also acquired extensive 2D seismic data in the offshore Tano/Cape Three Points basin in 1984. (PCIAC – 84 -97, 98 &99 vintages). These datasets are still some of the best in the basin. PCIAC also drilled 13 wells in the Tano basin – two (2) South Tano appraisal wells (ST-5 and ST-6), and eleven (11) shallow depth onshore Ghancan wells

In 1989, GNPC funded the acquisition, processing and interpretation of first 3D seismic over the South Tano Field with the firm conviction that the field is viable for national development.

Following interpretation of the 3D seismic data and subsequent commissioned studies to determine the viability of the Integrated Tano Fields Development Project to use the gas for power generation, GNPC drilled three wells over the South Tano field – one (1) exploratory well ST-8 (1991), and two (2) appraisal wells ST-7H (1992) and ST-9H (1994). Both appraisal wells were horizontal wells.

GNPC had by this time (1994) acquired one drillship and at least three other rigs in addition to other infrastructure to help facilitate rapid development of the Tano fields.

As part of the integrated Tano Fields development project, GNPC ordered a power barge to utilise the anticipated gas from the Tano fields. The infrastructure for the power barge and power transmission lines to link to the national grid was built at Effasu-Mangyea in the Jomoro district in the Western region with funds that GNPC had secured.

GNPC also funded other seismic operations from 1989 to 1991. These included the following; shallow marine 2D seismic surveys in the Tano, Saltpond and Accra/Keta basins, 2D land seismic in onshore Tano and Accra/Keta basins and 2D seismic data over the Saltpond field & 2D seismic (GNCT-88 vintage) in the Tano/Cape Three Points area. .

The Saltpond Field, which had been in production since 1978 was later shut in the mid eighties by Primary Fuels Incorporated (PFI). PFI had acquired AgriPetco's interest in the Saltpond Field. The latter had pulled out due to low, uneconomic production rates. Finally, PFI pulled out after drilling three wells; one gas well and two dry wells that did not meet their expectations.

Other companies operated in Ghana at various times during this period and made some finds:

In 1989, a consortium led by **Atlantic Richfield Company Limited (ARCO) found gas with their Central Tano – 1 (CTS-1) well. Then they found heavy oil in the same year with their North West Tano – 1 (NWT-1) well.**

The CTS-1 find was declared sub-commercial while the exact accumulation of the NWT-1 was not determined because it was not mapped either before or after the well. However, recent mapping by GNPC personnel suggested that it could be worth looking at again.

In 1999, Hunt Oil Company found oil with their WCTP-2X well in deepwater. Hunt Oil declared the find non-commercial. Hunt subsequently pulled out in 2002.

Dana Petroleum Plc also found heavy oil with their WT-1X well.

Other companies such as Nuevo Energy Resources, AGIP, Diamond Shamrock, Devon Energy and Fusion Oil (West Oil) all undertook exploration activities in Ghana's coastal and offshore sedimentary basins during this period. All these activities resulted in much data being gathered and much experience gained by GNPC staff in dealing with operations of international Oil Companies.

Presented below is the list of wells drilled in the period.

List Of Wells Drilled In The Period (1979 – 2001).

WELL NAME	SPUD DATE	WELL TYPE	OPERATOR	LOCATION	BASIN	WD (FT)	TD (FT)
1S-3AX	01/12/79	Exploration	Phillips Petroleum	Offshore	Tano	408	9027
1N-1X	23/09/80	Exploration	Phillips Petroleum	Offshore	Tano	170	14000
1S-4X	15/04/81	Appraisal	Phillips Petroleum	Offshore	Tano	327	8646
1N-2X	24/07/81	Appraisal	Phillips Petroleum	Offshore	Tano	180	9510
Axim 4_3X	13/11/81	Exploration	Agip	Offshore	Cape Three Points	307	13177
ST-5	08/03/84	Appraisal	PCIAC	Offshore	Tano	95m	2111m
ST-6	18/05/84	Appraisal	PCIAC	Offshore	Tano	96m	1990m
13-B1	02/03/85	Appraisal	PFI	Offshore	Saltpond	75	8762
13-A7	08/04/85	Appraisal	PFI	Offshore	Saltpond	87	8589
13-C1	12/06/85	Appraisal	PFI	Offshore	Saltpond	87	5942
Seville_1	05/12/86	Exploration	Diamond Shamrock	Onshore	Keta		6130
GC 7	19/12/86	Exploration	PCIAC	Onshore	Tano		611m
GC 12	30/12/86	Exploration	PCIAC	Onshore	Tano		610m
GC 3	08/01/87	Exploration	PCIAC	Onshore	Tano		610m
GC 4	16/01/87	Exploration	PCIAC	Onshore	Tano		610m
GC 11	22/01/87	Exploration	PCIAC	Onshore	Tano		620m
GC 14	30/01/87	Exploration	PCIAC	Onshore	Tano		610m
GC 15	07/02/87	Exploration	PCIAC	Onshore	Tano		595.36m
GC 13	23/02/87	Exploration	PCIAC	Onshore	Tano		610m
GC 2	21/03/87	Exploration	PCIAC	Onshore	Tano		620m
GC 19	23/03/87	Exploration	PCIAC	Onshore	Tano		122m
GC 8	25/03/87	Exploration	PCIAC	Onshore	Tano		655m
CTS-1	23/03/89	Exploration	Arco	Offshore	Tano	203	14986
TP-1	28/07/89	Exploration	Arco	Offshore	Tano	312	11547
NWT-1	08/10/89	Exploration	Arco	Offshore	Tano	243	12021
Tema-1	03/01/90	Exploration	Amoco	Offshore	Accra	180	11855
ST-8	01/09/91	Exploration	GNPC	Offshore	Tano	431	8281
ST-7H	08/02/92	Appraisal	GNPC	Offshore	Tano	314	9050
ST-9H	16/04/94	Appraisal	GNPC	Offshore	Tano	372	
WCTP-1X	28/09/97	Exploration	Hunt Oil Co	Offshore	Cape Three Points	252	11116
NECTP-1X	09/08/98	Exploration	Nuevo Energy Resources	Offshore	Cape Three Points	170	8350
WCTP-2X	01/12/99	Exploration	Hunt Oil Co	Offshore	Cape Three Points	2934	10785
WT-1X	13/12/99	Exploration	Dana Petroleum	Offshore	Tano	380	10414
Dolphin-1	26/12/00	Exploration	Santa Energy Resources	Offshore	Keta	287	9010

6. Under The Third and Fourth Estates of the Fourth Republic – The New Patriotic Party (NPP) (2001 – 2007)

Over the past six years, exploration for commercial hydrocarbons has intensified. Soon after taking the reins of power, the new government decided to refocus GNPC to keep to its core function – that of facilitating the search for commercial hydrocarbons for Ghana.

A deliberate and concerted training of the staff of GNPC to meet the challenges of dealing with the international E & P companies was progressively undertaken by GNPC management. These training programmes involve staff secondment or attachment to the E & P companies in the areas of seismic data interpretation and field evaluation and development as well as to some service companies in seismic data acquisition and processing. Academic training to upgrade staff as required was also pursued. This resulted in a competent core staff which has become a solid human resource base for the corporation.

Subsequently, GNPC was restructured downsized given the directive to focus on its core function of facilitating the activities of the E & P companies in Ghana to find commercial hydrocarbons for Ghana. The refocused GNPC was retooled with new state of the art workstations for the Operations Division and other computer paraphernalia for some other staff in order to facilitate work.

The new dispensation required that GNPC become more investor friendly in issues such as data licensing in order to facilitate exploratory work. In addition, there was an intensification of a campaign to attract investors at international oil and gas fora, such as at the American Association of Petroleum Geologists (AAPG)

annual conventions, Society of Exploration Geophysicists (SEG) conferences, African Petroleum Forum (APF) meetings, UPSTREAM conferences etc.

Some reputable Independent Oil Companies such as Kosmos Energy, Hess Corporation, Tullow Energy, Norsk Hydro Oil and Gas etc. began to take note of the potential hydrocarbon prospectivity of Ghana as an investment destination.

The GNPC and The Ministry of Energy also initiated a review of the fiscal and regulatory regime of the petroleum agreement to improve areas that had been a source of disincentive to potential investors who felt that Ghana's royalty and tax regime, among others needed a downward revision. The review process is in a very advanced stage now.

Dana Petroleum plc again found oil with their second well WT-2X, in 2002.

Though other wells did not find commercial hydrocarbons, their results were very encouraging and provided solid technical basis for defining the future direction of petroleum exploration in the country.

The E & P companies, together with GNPC, also conducted a number of geological studies to support the current models and concepts in use offshore Ghana.

Analyses of acreage positions of the companies and their respective approved work programmes for these acreages revealed that there was a gradual and systematic shift of focus from the shallow water areas to the deepwater areas of the offshore basins. Devon, for instance, relinquished portions of their shallow water acreages and sought amendments to their Petroleum Agreements to enable them concentrate on deepwater exploration.

The increased spate of activity in the deepwater areas was occasioned by other deepwater discoveries made in the region and more importantly, by the results of the four deepwater wells

drilled in Ghana between 1999 and 2003. These wells proved the existence of an active petroleum system in the deepwater a fact, which hitherto is unknown, with Hunt Oil's WCTP-2X well encountering 14ft of light oil column. This effectively reduced the risk of petroleum generation in the deepwater area of Ghana.

It is worth noting that though this gradual shift of focus to the deepwater began only less than a decade ago, enough evidence had been gathered to suggest that this area would play a vital role in oil and gas exploration in the country.

It therefore came as no surprise when block operator Kosmos Energy, technical operator Anadarko, Tullow Oil and E. O. Group struck a significant (about 312ft net) column of high grade oil in the Mahogany prospect with the Mahogany-1 well in the West Cape Three Points Licence. This is the most significant discovery crowning years of concerted effort by all concerned. Appraisal of this find will be conducted very soon.

Current List Of Wells Drilled(2001 – 2007).

WELL NAME	SPUD DATE	WELL TYPE	OPERATOR	LOCATION	BASIN	WD (FT)	TD (FT)
NAK-1X	09/01/01	Exploration	Nuevo Energy Resources	Offshore	Accra	1021	10100
WCTP-3X	10/04/01	Exploration	Hunt Oil Co	Offshore	Cape Three Points	2652	8470
Fusion-1X	10/05/01	Exploration	Fusion (West Oil)	Onshore	Tano		590m
WT-2X	09/08/02	Exploration	Dana Petroleum	Offshore	Tano	356	11000
Tarpon-1	12/05/03	Exploration	Devon Energy Corp	Offshore	Keta	6322	13351
Mahogany-1	31/05/07	Exploration	Kosmos, E.O. Group, Anadarko, &Tullow Oil	Offshore	Cape Three Points	1322m	

Currently, there are nine (9) offshore Licences with various companies operating them.

- Tullow Oil holds two (2) Licences in partnership with others;
- Kosmos and co. hold one (1).
- Hess Corporation (1),
- Heliconia (1),
- Vanco Energy (1),
- Gasop Oil (1),
- Lushann Eternett and partner (1)
- Devon Energy (1).

COMPANY	AREA OF OPERATIONS
Kosmos Energy, Anadarko and Tullow Oil	West Cape Three Points
Vanco Ghana Ltd.	Deep Water Tano/Cape Three Points Basin
Tullow Oil	Tano Shallow & Tano Fields Development
Tullow and Kosmos Energy	Tano Deep
Hess Corporation	West Cape Three Points Deep
Heliconia Energy	Cape Three Points Basin
Gasop Oil	Saltpond Area
Devon Energy	Deep Water Keta Basin
Saltpond Offshore Producing Company	Saltpond Fields Redevelopment

Others have put in application to operate some open blocks and these are under consideration.

The Mahogany success story is hopefully the beginning of the string of success stories that will be told over the coming months and years as other high-grade prospects within the same petroleum fairway (trend) are also drilled.