

Update of Methane capture in light of Oil & Gas production in Ghana

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Ghana

more information available at

www.ghanaweb.com



- Location: **West Africa**
- Climate: **Tropic-2 seasons;**
 - Dry and rainy
- Official language: **English**
- Population: ~**28 million** (24.2 million in 2010 census)
- Total area: **92,500 square miles/ 237,000 square km**
- Nominal GDP per capita (US\$, PPP): **4,680** (3,100 in 2010)
[IMF World Economic Outlook \(WEO\)](#)
Major primary economic resources: **Gold, cocoa, oil (?)**
- Favorite Sport: **soccer**

Ghana's commitment under **PARIS AGREEMENT**

- 1) Ghana's emission reduction goal is to **unconditionally lower its GHG emissions by 15 percent** relative to a *business-as-usual (BAU) scenario emission of 73.95MtCO₂e by 2030.*
- 2) An **additional 30 percent** emission reduction is attainable on **condition** that **external support** is made available to Ghana to cover the **full cost of implementing** the mitigation action (finance, technology transfer, capacity building).
- 3) With this external/international support, a total emission reduction of **45%** *below the business-as-usual (BAU) emission levels* can be achieved by **2030.**

ENVIRONMENTAL REGULATIONS focus

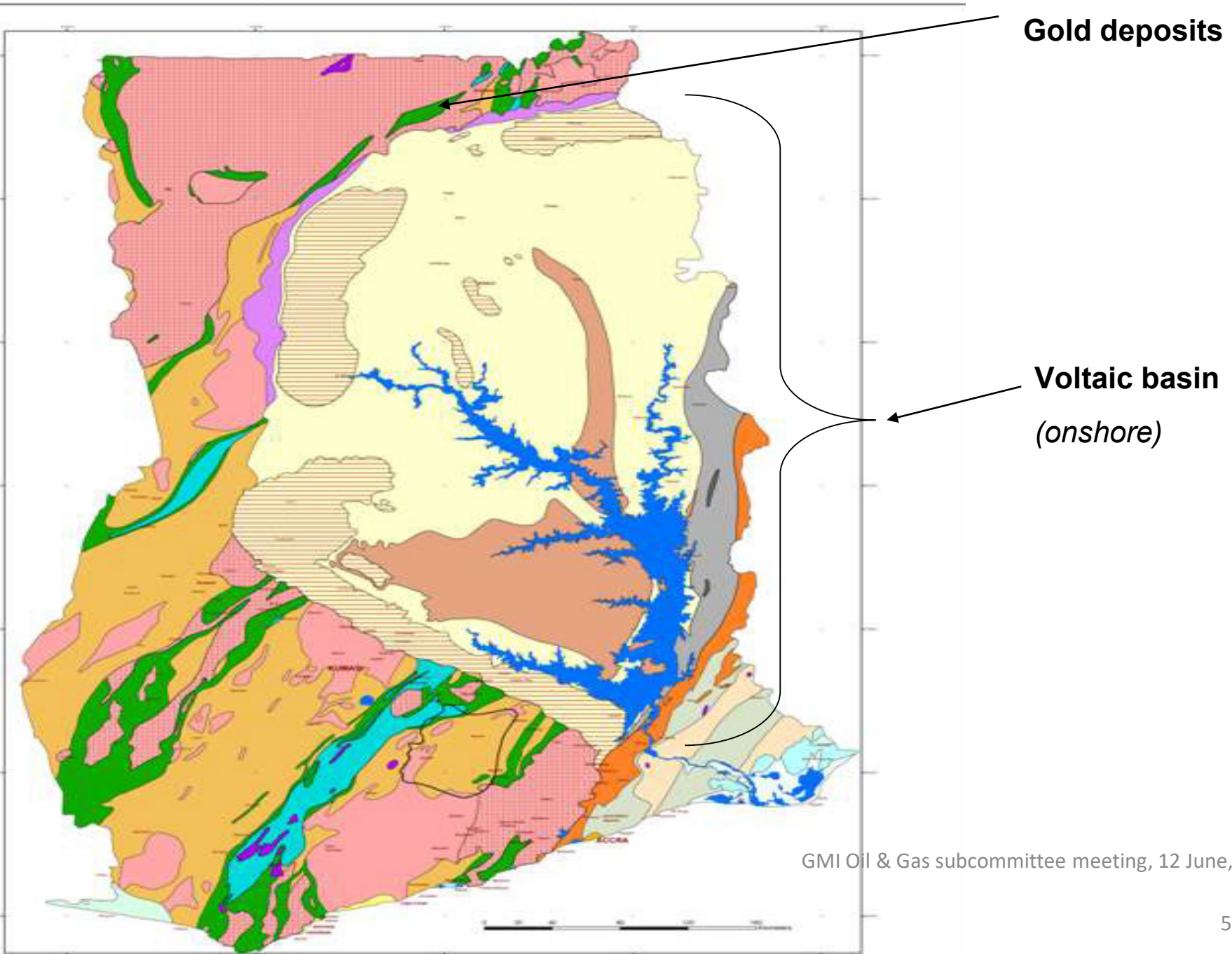
Not very strict on invisible, gaseous emissions as result of company/project operations such as

- *Fugitive emissions*
- *Venting*
- *Pneumatic devices*
- *Compressors*
- *Well completions*

Technical assistance from partners countries and companies are thus most welcome.

Focusing on the following Core Interest areas:

- **Cooperate Social Responsibilities (CSR)**
- Reducing potential accidents as much as possible
- Mitigation effluent discharges into immediate environment.
- Long-lived pollutants: *Reducing general GHG (not necessarily methane) emissions into the atmosphere.*
- Short-lived pollutants: *Mitigating other pollutants like particulate matter and black carbon into the atmosphere.*

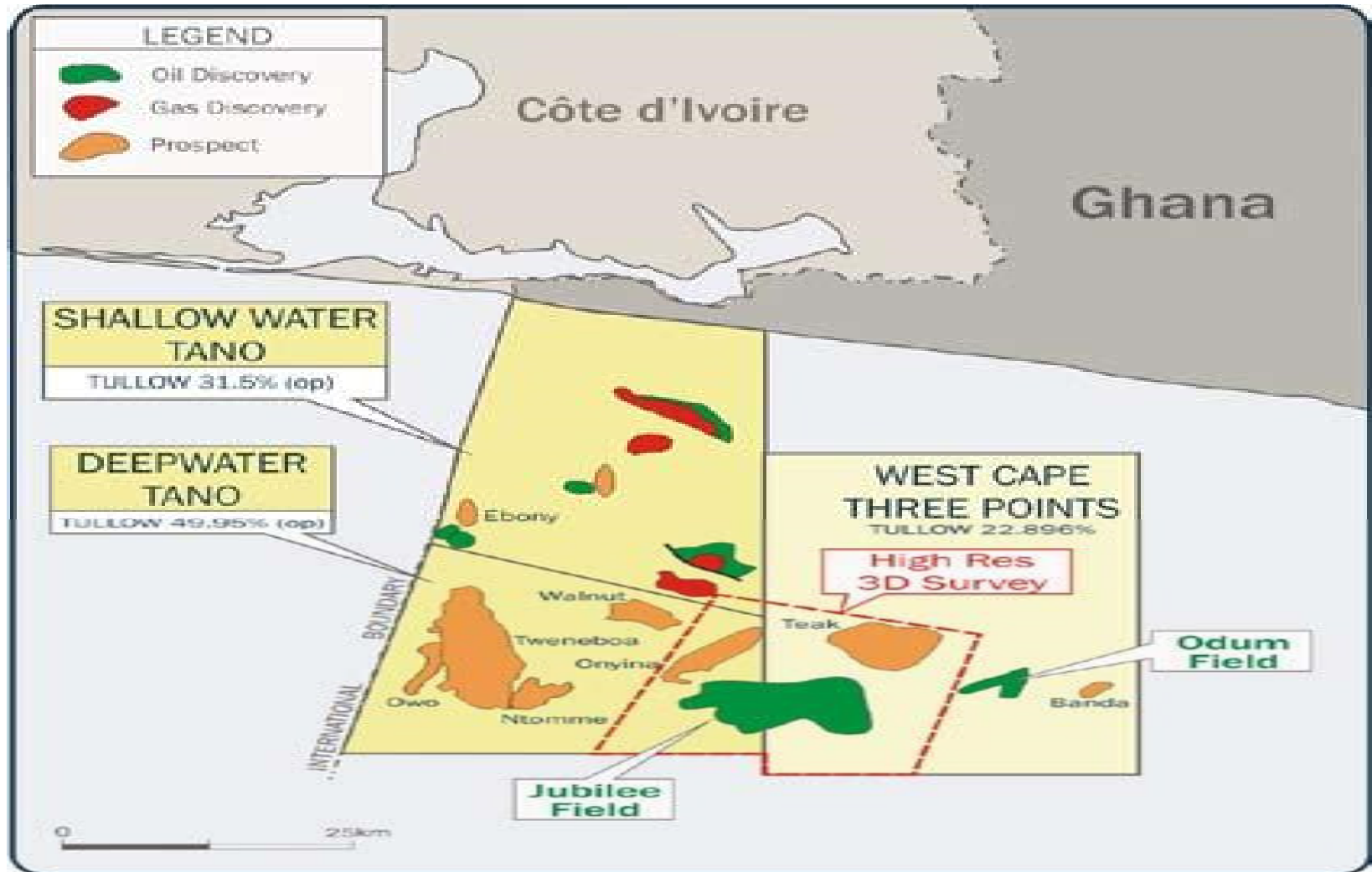


Gold deposits

Voltaic basin
(onshore)

GMI Oil & Gas subcommittee meeting, 12 June, 2017

DeepWater Tano and West Cape Three Points offshore



Jubilee Field production and partners

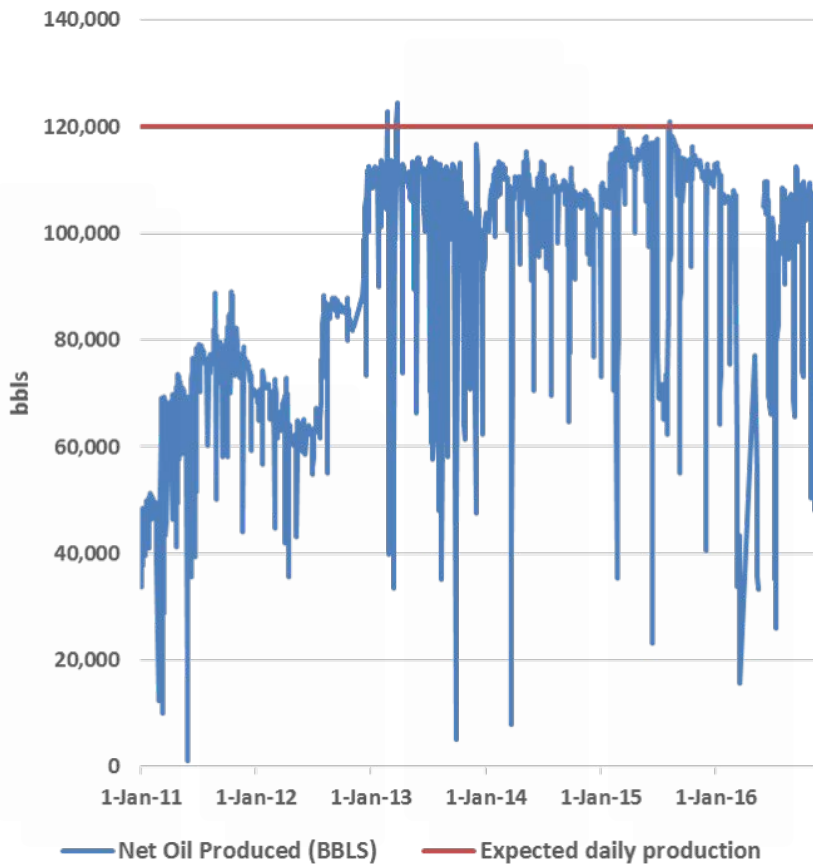
- The **Jubilee field** was discovered in **June 2007**. It is located at **1,100 m** depth between **DeepWater Tano** and **West Cape Three Points** blocks.
- Recoverable reserves are estimated to be over 370 million barrels.
- Ghana officially commissioned her **first commercial oil** from the **Jubilee Fields** on 15th Dec, 2010. *Initial oil production really began on 28th November, 2010 with a production of **1,792 barrels per day** ramping up to **45,148 bbls/day** on 30th.*
- Average daily production since had ranged from **80,000 – 100,000 bbls**
- **Associated gas** flared reduced from ~ **96%** at the beginning of production to **< 5%** daily production by close of **2011**
- **NO GAS FLARING policy from the start.**

<u>Partners</u>	<u>DeepWater Tano</u>	<u>West Cape Three Points</u>
Tullow	49.95 %	22.9%
Kosmos	18%	30.88%
Anardarko	18%	30.88%
GNPC (NOC)	10%	10%
Others	-	5.35%

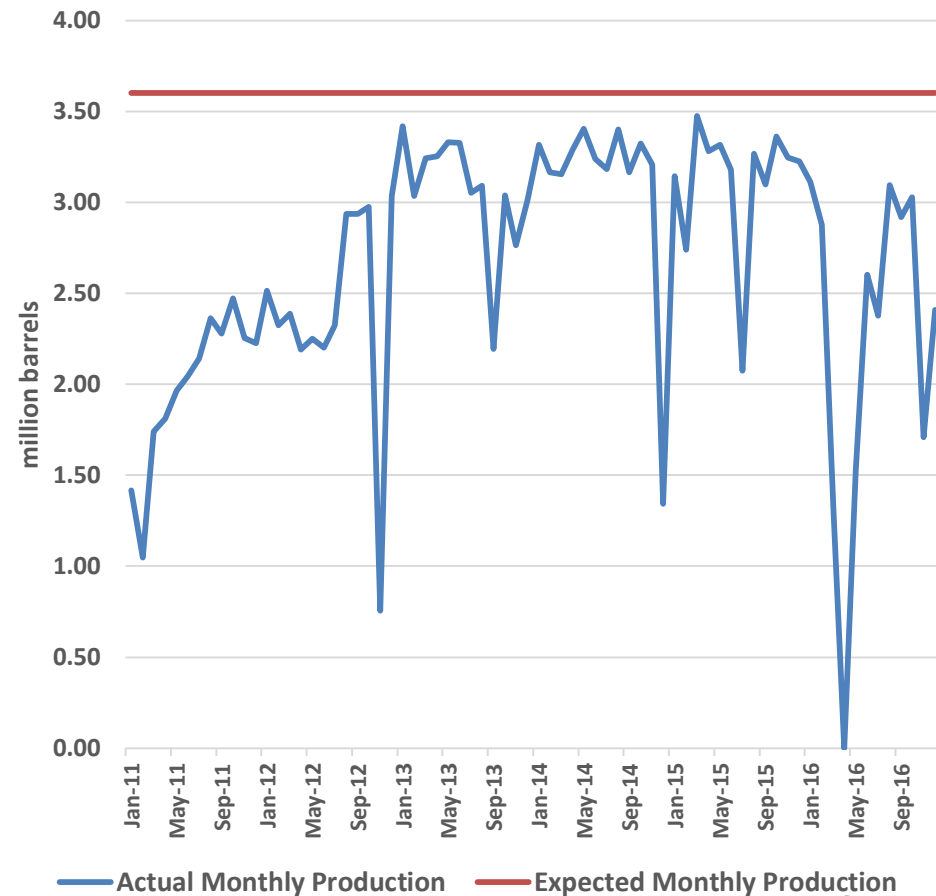
Jubilee field Oil Production

2011-2016

Daily Production



Monthly Production



CDM initiatives earlier reported *did not materialise*

Saltpond Oil Field Associated Gas Recovery and Utilization Project as CDM activity; *the first commercial oil field has been shut down*

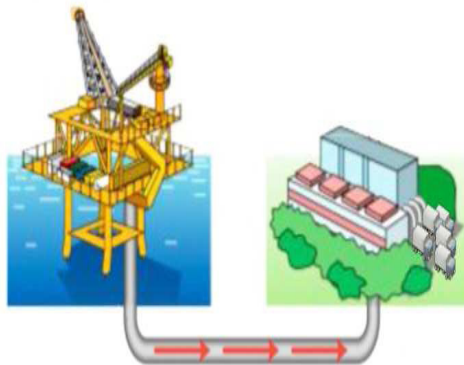
Jubilee Oil Field Associated Gas Recovery and Utilization Project as CDM activity

Current Practice



Associated gas is flared at Saltpond oil field and will continue to do so in absence of the proposed project activity.

After CDM Project Activity



Associated gas is recovered offshore, transported via a dense phase pipeline to a new separation plant to be located in the vicinity of Saltpond Town, where it is processed into useful energy products and delivered to the domestic market for productive use.

Current Practice



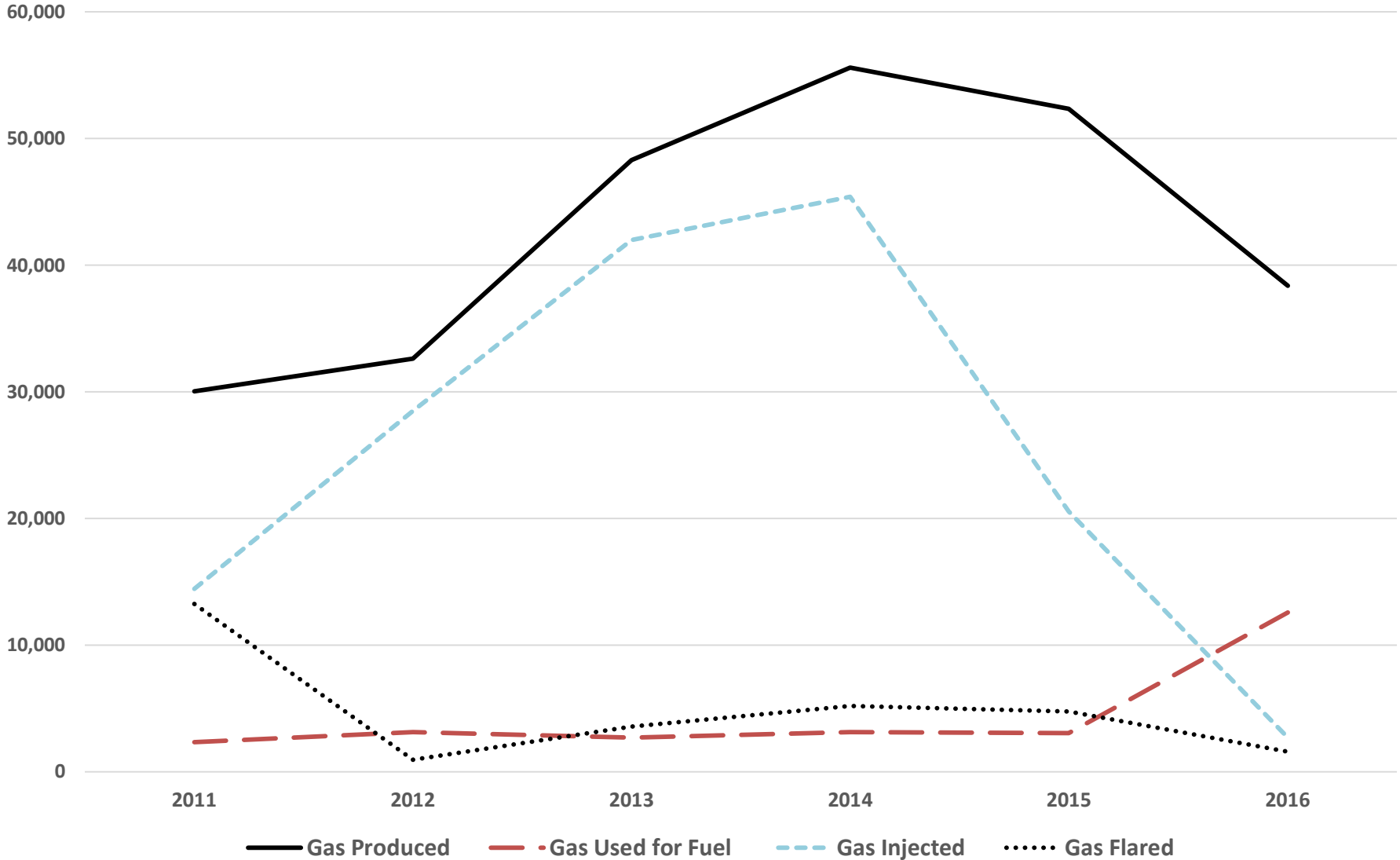
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Associated Gas from Jubilee field from 2011-2016 mmscf



GhanaGas (Atuabo) Gas Processing Plant

150 mmscfd capacity Plant commissioned in 2016 *processes associated gas from Jubilee field to power plants (Aboadze)*

built by a consortium led by Sinopec Inc. of China.



Atuabo Gas Processing Plant

The Atuabo Gas Processing Plant (*operated by GhanaGas Company*).

The 150 mmscfd facility also produces about

- ❖ 180,000 tonnes of liquefied petroleum gas (LPG) largely for domestic use
- ❖ 46,000 tonnes of NGLs (condensate) and;
- ❖ 15,000 tonnes of iso-pentane *which is currently flared*.

The gas processing and transportation infrastructure *includes*

- ❖ 45-km shallow water extension of a pipeline from the FPSO to the onshore processing plant at Atuabo.
- ❖ 111-kilometre transmission pipelines from Atuabo to the *Aboadze Power Plants Enclave in the Western Region of Ghana*.
- ❖ A metering station.

Facility cost almost \$1 billion. *loan contracted from China*.

West Africa Gas Pipeline Overview

Bringing Gas Supplies from Nigeria to in West African Markets

West African Gas Pipeline (WAGP)

Completed: 2006.

First Gas flow: 2010

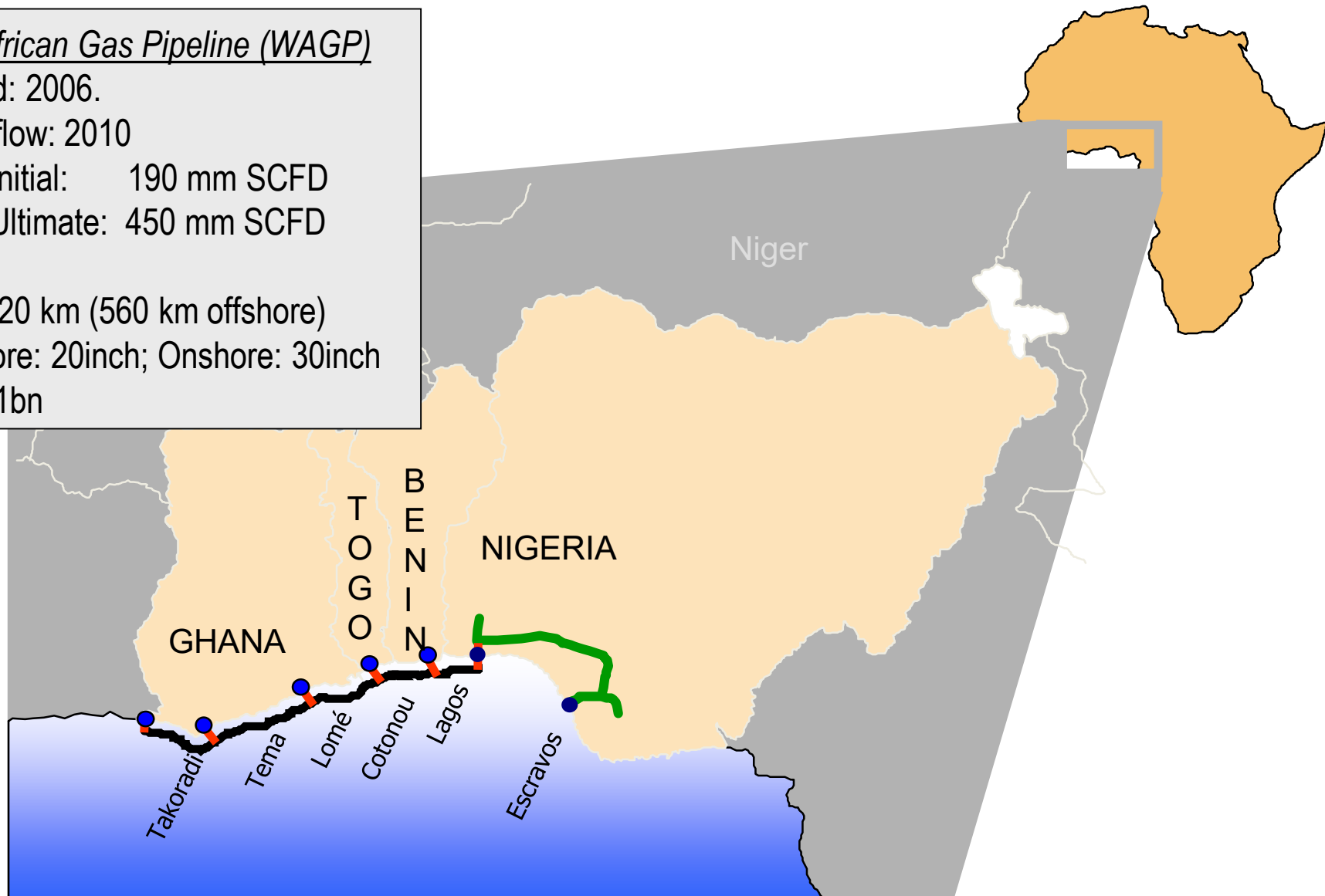
Capacity Initial: 190 mm SCFD

Capacity Ultimate: 450 mm SCFD

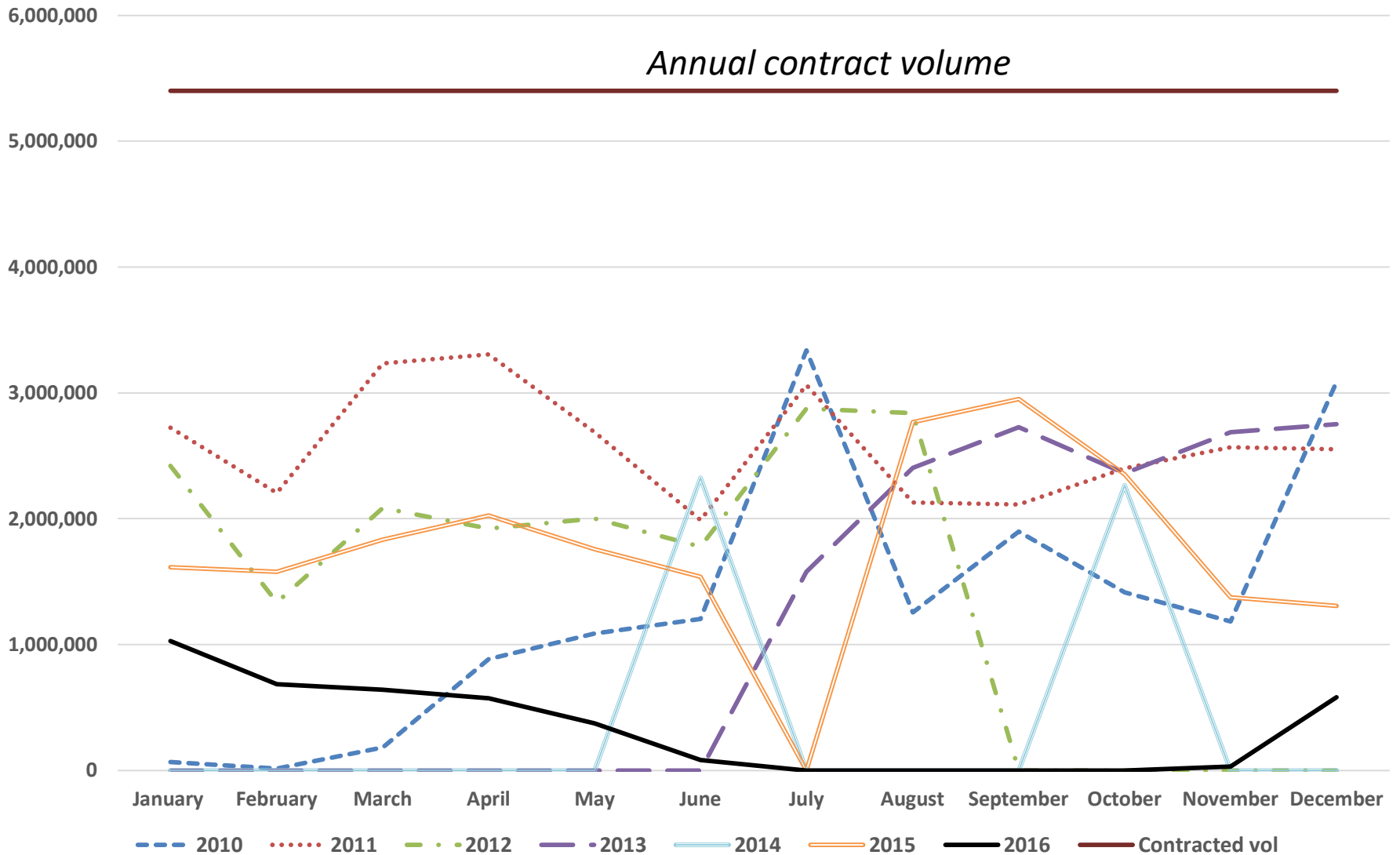
Length: 620 km (560 km offshore)

Dia-Offshore: 20inch; Onshore: 30inch

Cost: ~\$ 1bn



WAGP gas Supply inadequate and not reliable



Gas Supply challenges in Nigeria

- Adequate supply levels from Nigeria would depend upon **demand** and **political developments** due to demand constraints in Nigeria itself.
- Installed capacity in Nigeria currently (2016) ~**12,000 MW**. However, only about **half** is available due to lack of gas owing to multiple of challenges including **limited pipelines**, **sabotage of existing pipelines** by **rebel groups**.
- Available (2017) generation capacity ranges from **3,000-5,000 MW** .
- Nigeria resolves to increase installed capacity to ~**13,000 MW** by close of 2017. Thus, there would be a greater strain on the existing gas supply situation.
- Total gas supply requirement is about **10 bcf/d** to cover **domestic consumption**, **LNG contractual shipments** and **WAGP commitments**. But just about half is available (produced) and of **which 70-80%** goes into LNG production. Just **1-2 bcf/d** is made available for local and pipeline export.
- Nigeria gas **recoverable reserves** estimated at **150-200 TCF**.
- The current policy of Nigeria therefore is to use **more gas** in **local thermal generation**, hence the likely hood of **reducing gas supply** to neighbours since **new gas fields** are yet to be developed.

WHERE WE ARE in Ghana

Jubilee Field

- 199.2 MMbbls produced over 6 years with average daily production above 100,000bopd since 2013 (exception of 2016 due to turret bearing issues on FPSO)
- Ghana group has lifted 44.6 MMbbls (inception to April 2017) sold at an average price of US\$81.72/bbls over the same period
- Total volume of Gas delivered to Ghana Gas is 54,192.97 MMScf (Nov 2014 - April 2017)

TEN Field

- TEN field production commenced in August 2016. Total production as at April 2017 was 11.1 MMbbls.

Reserves

- Total proven oil and gas reserves as at December 31st 2016 of 1,253MMboe
- Ghana has over 36,000 km² and 103,600 km² of open offshore and onshore acreages

Development

SANKOFA-Gye-Nyame fields is at the development phase with 388.7 MMboe and achieved 1st Oil 20th May, 2017

E & A

- 23 more discoveries since Jubilee
- Several fields at different levels of exploration and appraisal (HESS fields, Mahogany, Teak, ENI Block 4 field etc.)

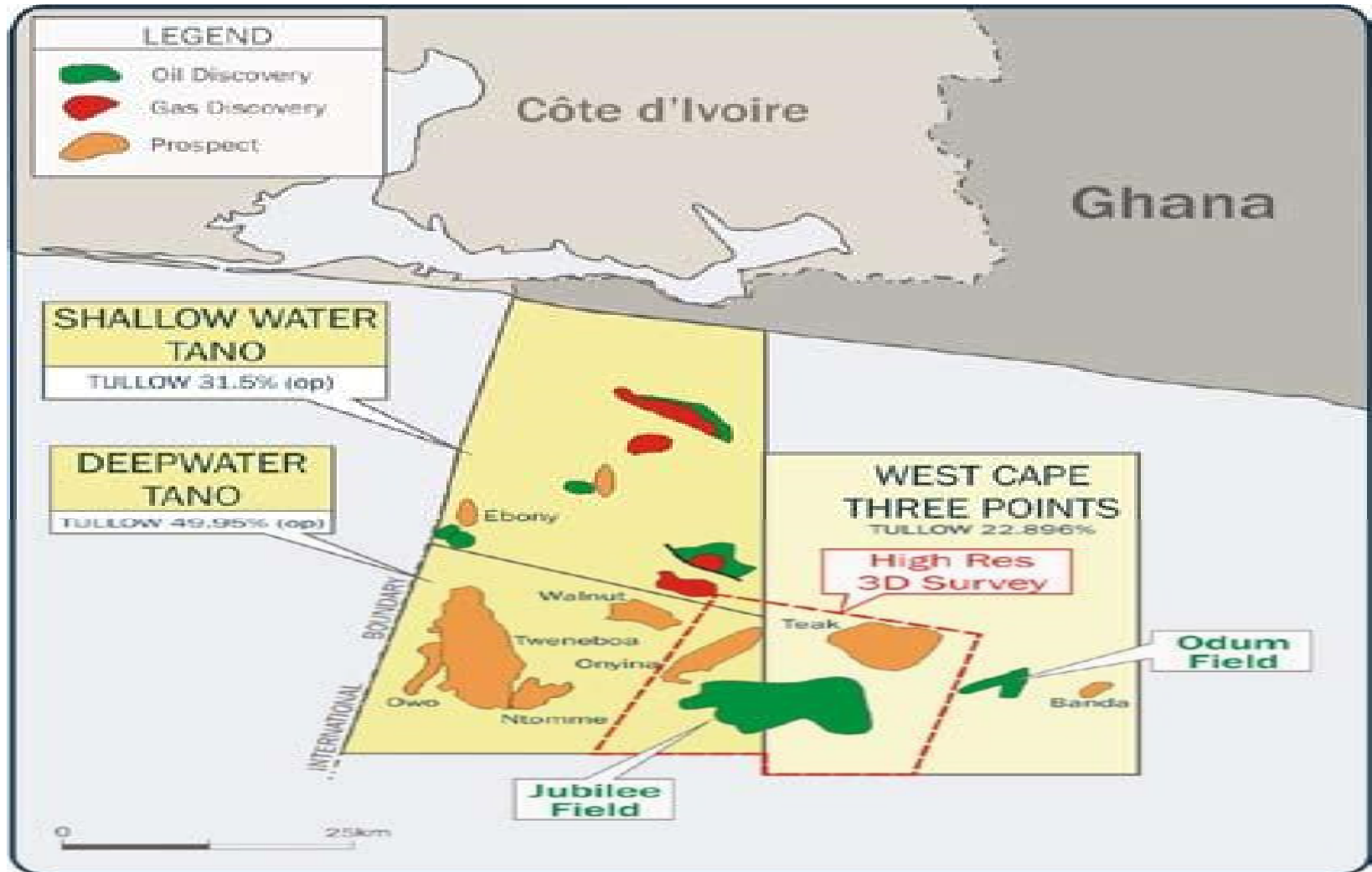
Gas

- Gas transportation infrastructure and processing plant in place for Jubilee gas
- SANKOFA gas has over 1 TCF of recoverable natural gas

Agreements

18 Petroleum Agreements in operation including 3 Agreements ratified in 2016

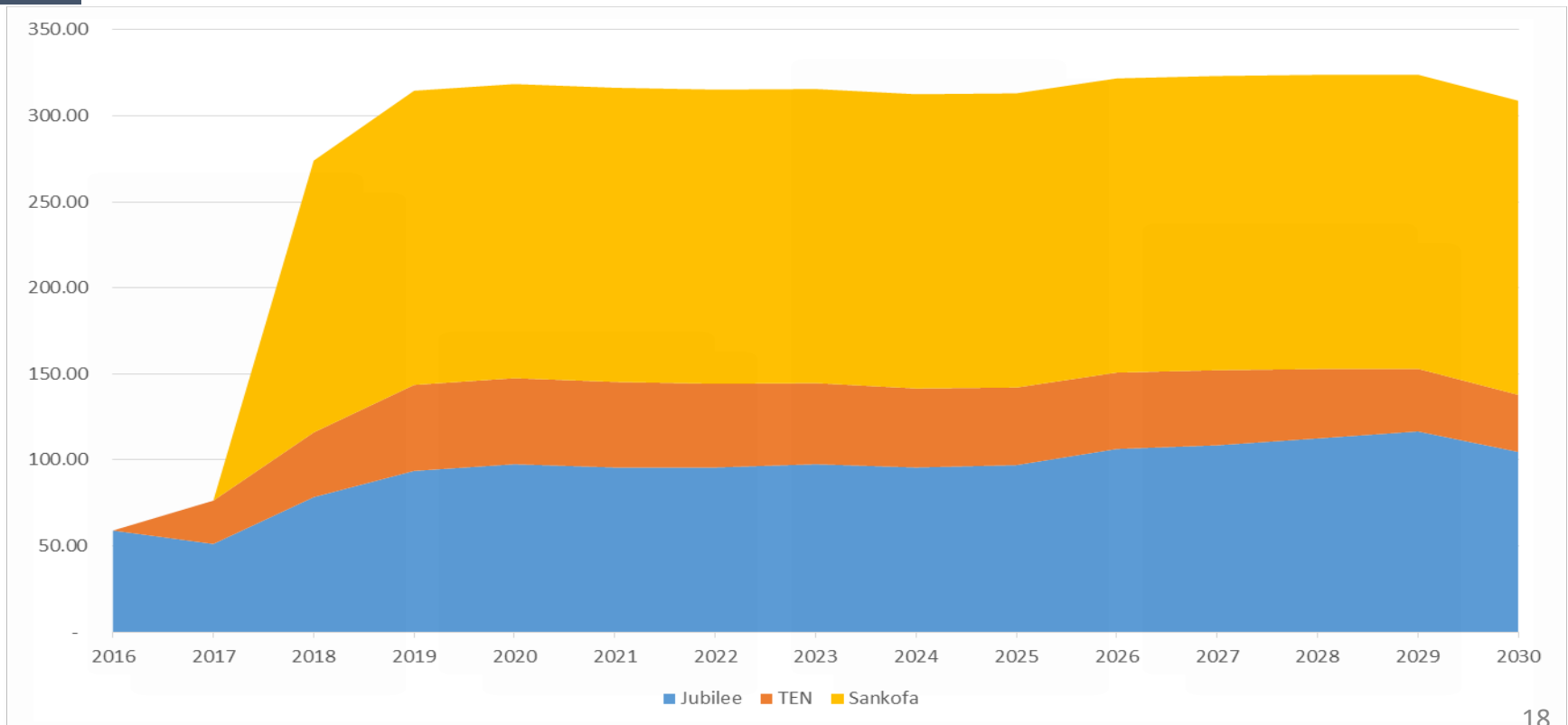
DeepWater Tano and West Cape Three Points offshore



Ghana relying more on domestic fields

Gas Production Volumes (mmscf) & Timing

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Jubilee	51	78	94	98	96	96	97	96	97	106	109	113	117	105
TEN	25	38	50	50	50	49	47	46	45	44	44	40	36	33
Sankofa	-	158	171	171	171	171	171	171	171	171	171	171	171	171
Total	76	274	315	318	316	315	316	313	313	322	323	324	324	309



Laws passed to guide the new oil and gas industry *(since 2011)*

- 1. Petroleum Commission law**
 - *To regulate upstream activities.*
- 2. Exploration and Production law**
- 3. Petroleum Revenue Management law**
- 4. Local Content law**

Regulations Passed

1. Natural gas **Distribution and sale** (**technical and operational**) Regulations, 2007,LI-1912;
2. Natural gas **Distribution and sale** (**standards of performance**) Regulations, 2007,LI-1912;
3. Natural gas **Transmission Utility** (**technical and operational**) Rules, 2007,LI-1913.
4. Natural gas **Transmission Utility** (**standards of performance**) Regulations, 2008, LI 1936;
5. **A Natural Gas Transmission Access Code**, 2016;
6. **Natural gas pipeline safety** (**construction, operational and maintenance**) *expected completion and approval this year (2017)*

Still in daft

Natural gas occupational, health and safety (*standards and procedure for construction, operation and maintenance facilities and installations*)



Government/legislative sector

- **Ministry of Energy**

www.energymin.gov.gh

– Government mouthpiece for the energy sector

- **Parliamentary select committee on energy and mines.**



The Regulators

- **Petroleum Commission** (*latest*)
 - Act 821, 2011 monitor and regulate **upstream petroleum** activities.
 - Advise the Minister of Energy on national policies for the efficient economical and safe supply of electricity, natural gas and petroleum products having due regard to the national economy. **This role** used to be played by **Ghana National Petroleum Corporation (GNPC)** on behalf of the **sector Ministry**.

National Petroleum Authority (NPA) www.npa.gov.gh

*"Regulate, Oversee And Monitor the **Petroleum Downstream** activities (Industry) In Ghana"*

- The Objects & Functions of the NPA:
 - Monitor and regulate petroleum price in accordance with the prescribed pricing formula
 - Grant licenses to service providers and oil marketing companies (OMCs)
 - Protect Consumers interests and maintain the highest standards of petroleum products offered to them



The Regulators

Public Utilities Regulatory Commission (PURC) website:

www.purc.com.gh

Established under PURC Act 538, 1997 to regulate and oversee the provision of utility services by public utilities to consumers.

It is an independent body, i.e. not under Ministry of Energy but under Office of the President. It is the financial/fiscal/economic regulator for electricity, water and natural gas.

Energy Commission (EC) website: www.energycom.gov.gh

- Established under Act 541, 1997
- To plan, regulate, manage and develop energy supply and utilisation in Ghana.
- Technical regulator for electricity and natural gas transport and distribution.
- Advise the Minister of Energy on national policies for the efficient economical and safe supply of electricity, **natural gas** and petroleum products having due regard to the national economy.



Implementing Agencies



Ghana National Petroleum Corporation (GNPC)

www.gnpcghana.com

- Established in 1983, GNPC strives to become a world class **NOC** that partners with the international petroleum industry to enable Ghana find and develop oil and gas resources for the benefit of the people of Ghana.

Ghana National Gas Company Ltd (GGCL). <http://ghanagas.com.gh/>

- The Company has the responsibility to **build, own and operate infrastructure required for the gathering, processing, transporting** and marketing of natural gas resources in the country. Incorporated in 2011.

Bulk Oil Storage and Transportation Company Ltd (BOST)

www.bost.com.gh

- BOST was incorporated in 1993. Mandate is to develop a network of storage tanks, pipelines and other bulk transportation infrastructure throughout the country and to keep Strategic Reserve Stocks for Ghana. *BOST has been given an additional mandate as the **Natural Gas Transmission Utility (NGTU)** to develop the **Natural Gas infrastructure throughout the country***

Regional Implementing agencies in Ghana

- **The WAPP Secretariat (www.ecowapp.org)**

The **West African Power Pool (WAPP)** was created by Decision A/DEC.5/12/99 during the 22nd Summit of the Authority of ECOWAS Heads of State and Government in order to address the issue of power supply deficiency within West Africa.

- **WAPCo (www.wagpco.com)**

The **West African Gas Pipeline Company limited (WAPCo)** is a limited liability company that owns and operates the [West African Gas Pipeline](#).

The company has its headquarters in Accra, Ghana, with an office in Badagry, Nigeria, and field offices in Cotonou - Benin, Lome - Togo, Tema and Takoradi, both in Ghana.

**Thank you for your attention
website:**

www.energycom.gov.gh

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