

Capital Markets Event - Ghana  
1 July 2010



Welcome to Ghana



**Dai Jones**  
President and General Manager of Tullow Ghana

# Agenda

Section	Presenters	Page
1. Welcome to Ghana	Dai Jones	2
2. Ghana in context	Gayheart Mensah	5
3. Investing in Ghana	George Aboagye	12
4. Ghana Exploration and Appraisal	Robin Sutherland/Appia Kyei	13
5. Jubilee Progress Report	Stuart Wheaton/Dave Hanley/Alan Dowokpor	29
- Introduction		30
- Subsurface		34
- EHS		48
- Well Engineering		51
- Facilities		71
- In-country infrastructure		84
- Cost and schedule summary		93
6. EHS in Ghana	Dai Jones	97
7. Commercial Update	Ted Harrigan	107
8. Unleashing the potential of our people	Festus Anagblah	126
9. Social Enterprise in Ghana	Ken McGhee	139
10. Beyond Ghana	Robin Sutherland	151
11. Conclusions	Dai Jones	161

## Our Success in Ghana

- Environment, Health and Safety
  - Excellent record
  - It will not be compromised, we are ever vigilant
- Fast track world class project – from sceptics to believers
  - Performance, delivery, excellent people
- Transformation
  - Takoradi
  - Jubilee Field
  - Accra
  - London
- Relationships
  - Government of Ghana
  - GNPC
  - Partners
  - Industry leader
  - Local communities
- Culture
  - Preserving the Tullow sense of family

# Ghana in context



**Gayheart Mensah**  
Ghana Communications Manager

# Overview

## Geography

- Republic of Ghana (formerly Gold Coast) is located in West Africa - Accra is the Capital
- Bordered by Togo (east), Cote d'Ivoire (west), Burkina Faso (north) and the Gulf of Guinea (south)
- 10 regions: Ashanti, Brong-Ahafo, Central, Eastern, Greater Accra, Northern, Upper East, Upper West, Volta, Western
- Land area is 238,500 square kilometres

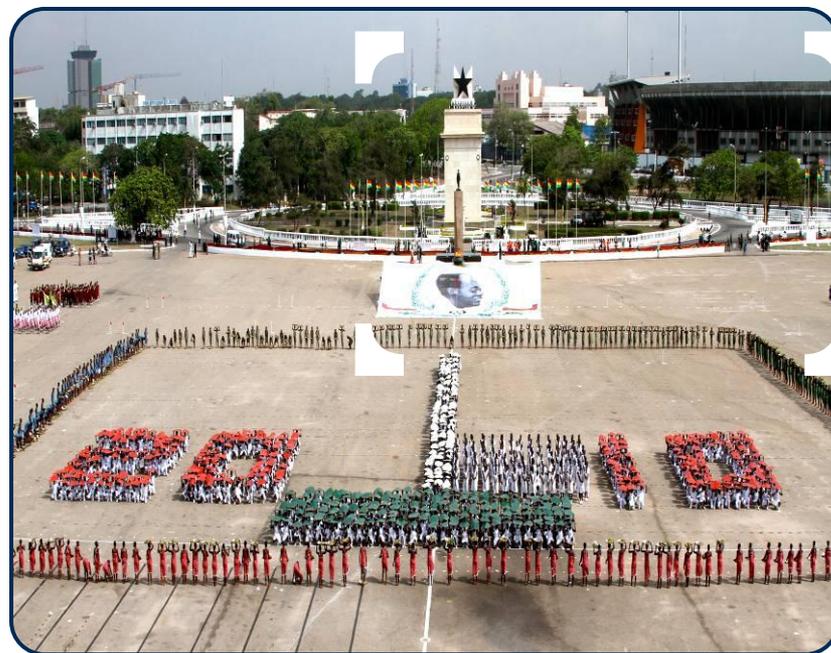
## Population

- Population: 24.3 million
- Population growth rate: 1.8%
- Population below the poverty line: 28.5%
- Literacy Rate: 57.9%



# History

- Ghana gained independence on 6 March 1957
- Ghana was originally located about 500 miles northwest of the modern state Ghana
- First interaction between the Gold Coast and Europeans was with Portuguese traders in 1470
- This was followed by the English (1553), the Dutch (1595) and the Swedes (1640)
- British rule over Gold Coast officially began on 6 March 1844 with the signing of the Bond of 1844
- British Togoland, a former colony of Germany, was incorporated into Ghana by referendum in 1956



Independence Day Celebrations in Accra

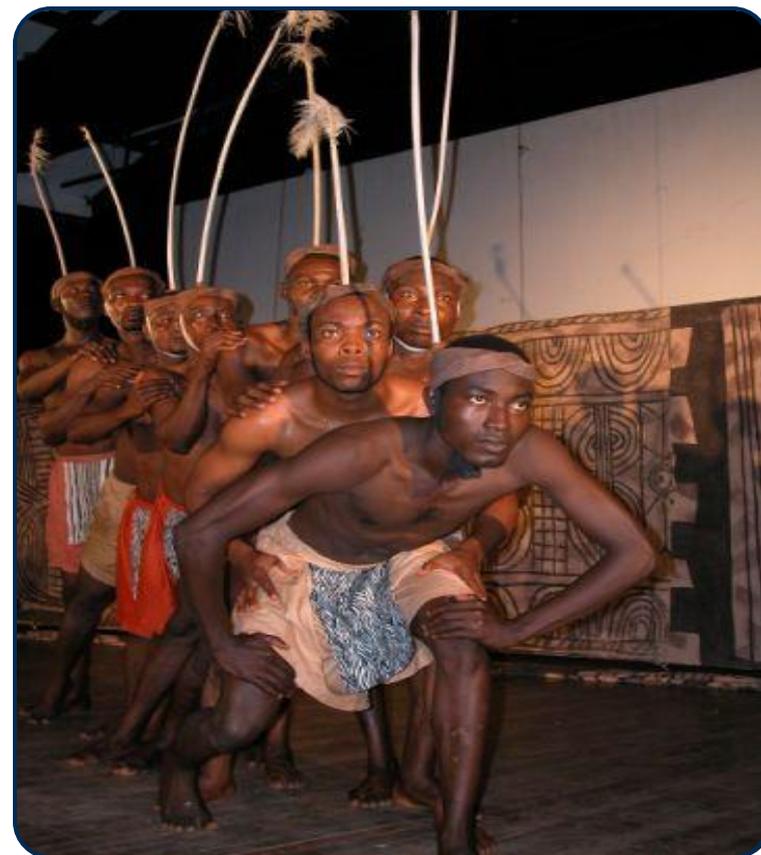
# Culture

## Religion

- Ghana has six main ethnic groups (Akan, Ewe, Ga-Adangbe, Mole-Dagbani, Guan and Gurma) from which nearly 100 sub-ethnic groups emerge
- 63% Christian, 21% Muslim, 16% traditional African religions. Ghana has the highest percentage of Christians in West Africa, but belief in traditional animist religions is still extremely common

## Languages

- Major languages are Twi, Fante, Ga, Hausa, Dagbani, Ewe and Nzema
- English is the official language of Ghana



A dance piece from Northern Ghana

# Politics

## Background

- Dr. Kwame Nkrumah led Ghana to independence and was the first President of the country
- Series of military Governments and short term democratic regimes between 1966 and 1994
- Ghana adopted a new constitution in 1992

## Political Parties and Leaders

- The President of the Republic of Ghana is Professor John Evans Atta Mills - NDC (National Democratic Congress)
- Parliament has 230 seats
- Opposition parties include: New Patriotic Party and Convention People's Party

## Elections

- January 2009 - Ghana emerged from fifth set of multiparty elections, resulting in a second peaceful transfer of power from incumbent to opposition since 1994
- Next election to be held on 7 December 2012



President John Evans Atta Mills at Independence Day celebrations

# Economy

- Currency is the new Ghana Cedi
- Real GDP Growth
  - 2009 (5.1%)
  - 2010 (6.0% forecast)
  - 2011 (22.0% forecast)
- Foreign Direct Investment
  - 2007 (\$855,000,000)
  - 2008 (\$2,111,590,000)
- Domestic economy continues to revolve around fishing and agriculture, which accounts for more than a third of GDP and employs more than half of the work force, mainly small landholders - cocoa, rice, cassava (tapioca), peanuts, corn, shea nuts, bananas, timber
- Gold and cocoa production and individual remittances are major sources of foreign exchange



Local Fishermen in Takoradi,  
Western Ghana

## Conclusion

- Ghana celebrated its fiftieth anniversary of independence in 2007 with strong growth, continued poverty reduction, and renewed optimism about its future
- Ghana remains a shining example in Africa in the area of multi-party democracy and good governance
- Ghana remains determined to reach middle-income status within the shortest possible time (2020)
- Ghana is an oasis of peace in a region with a number of social challenges
- Rule of law and media freedom is beyond compare in the sub-region
- Akwaaba!!!



Independence square in Accra,  
the capital city

# Investing in Ghana



SEE SEPARATE  
PRESENTATION

**George Aboagye**  
CEO, Ghana Investment Promotion Centre

# Ghana Exploration & Appraisal



**Robin Sutherland**  
Exploration Manager – Gulf of Guinea

**Appia Kyei**  
Principal Jubilee Field Development Geophysicist

# Ghana: Material stratigraphic traps in a new oil basin



## The History:

- West Africa has long been a core area
- Stratigraphic traps are a core play
  - Southern North Sea
  - Equatorial Guinea
- Extensive geological review highlighted Ghana

## Ghana - several advantages:

- A proven petroleum system – discoveries on the shelf
- Evidence for Cretaceous reservoirs
- Excellent sealing shales enabling large columns
- Basin scale structures focus charge into traps
- A chance to pioneer an unexplored deepwater basin

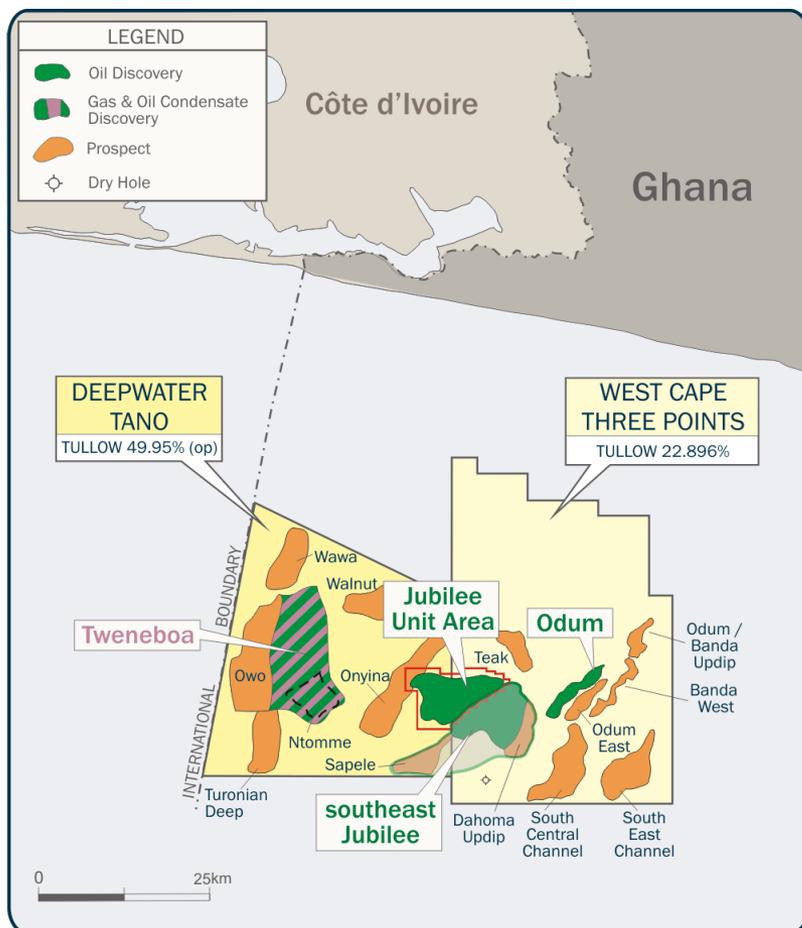
## Data Review highlighted the Tano Basin:

- Seismic data showed very significant fan development
- Detailed analysis highlighted strong AvO anomalies
- Acreage was secured, prospects ranked highly and drilling commenced

## Extending the play

- Success in Ghana opens a new regional play
- Opportunity to extend play across Equatorial Atlantic

# Ghana: Exploration & appraisal continues to deliver



## Fields discovered since 2007

- Jubilee, Odum & Tweneboa

## Deepwater E&A – 13 successes out of 14 wells

- Jubilee – World-class oil discovery, 95m pay in Mahogany-1
- SE Jubilee – Significant oil accumulation, 15-43m pay
- Tweneboa – Gas condensate and oil discovery
- Odum – challenging Pazflor type oil in channel sands

## Deepwater Tano – Accelerated 2010 programme

- Owo-1 high-impact exploration well drilling
- To be followed by Onyina-1
- Tweneboa-3, 4 & DST in 2010/Q1 2011

## WCTP – Significant remaining potential

- Teak prospect to be drilled Q4 2010
- Dahoma Up-dip de-risked for drilling in Q4 2010 / Q1 2011
- Further exciting campaign for 2011:
  - South Central Channel
  - South East Channel
  - Banda West
  - Odum East

# Jubilee - surrounded by prospects

## Onyina

- Large Campanian Fan prospect
- AvO supported but remains high risk/high reward

## Teak

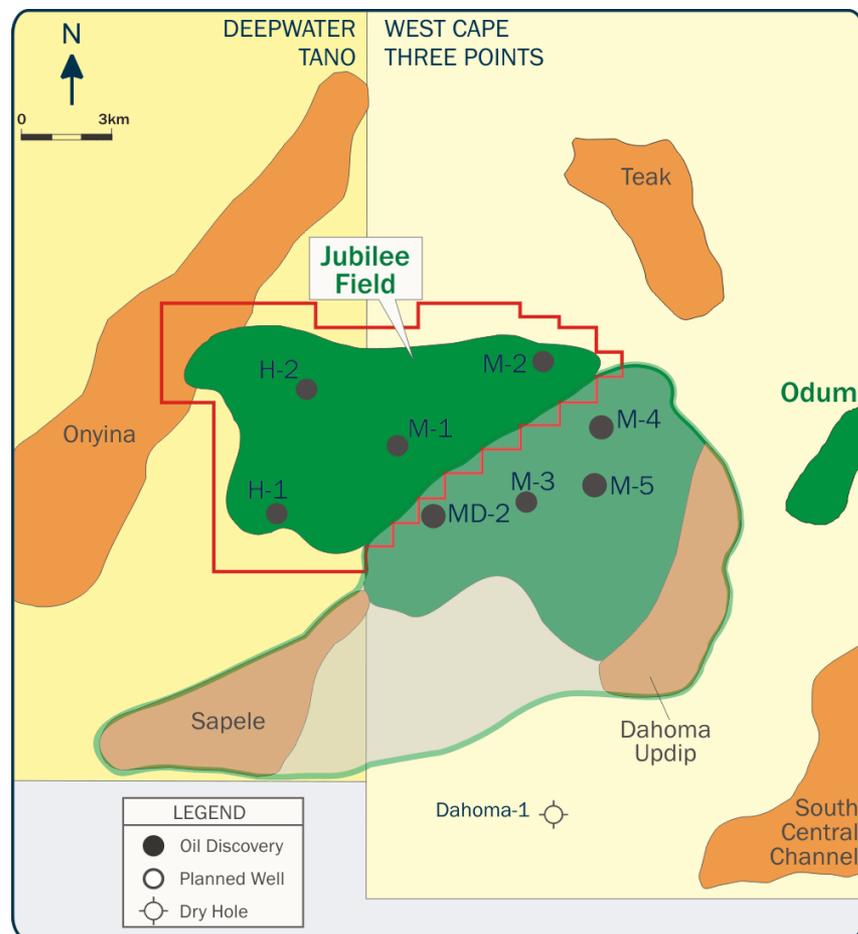
- 4-way closures at Campanian and Turonian levels
- Directly up-dip of Jubilee
- Gas chimney above prospect

## Dahoma Up-dip

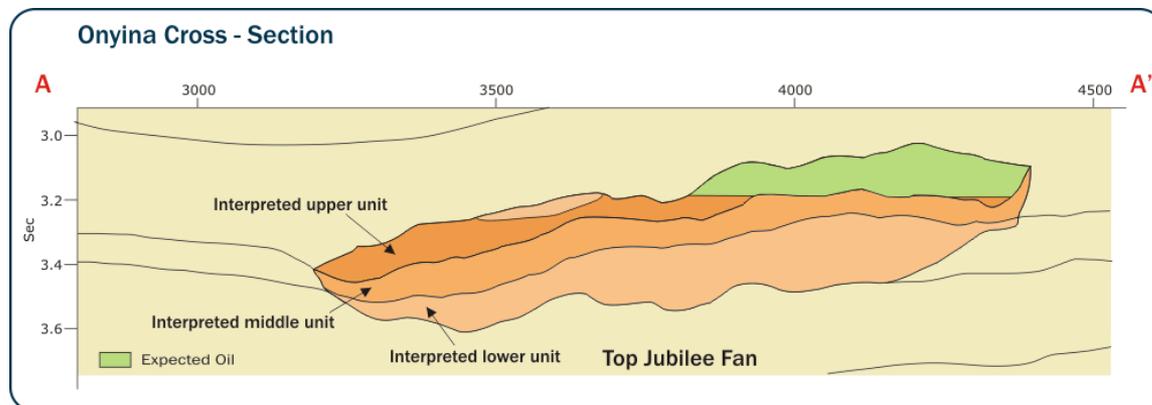
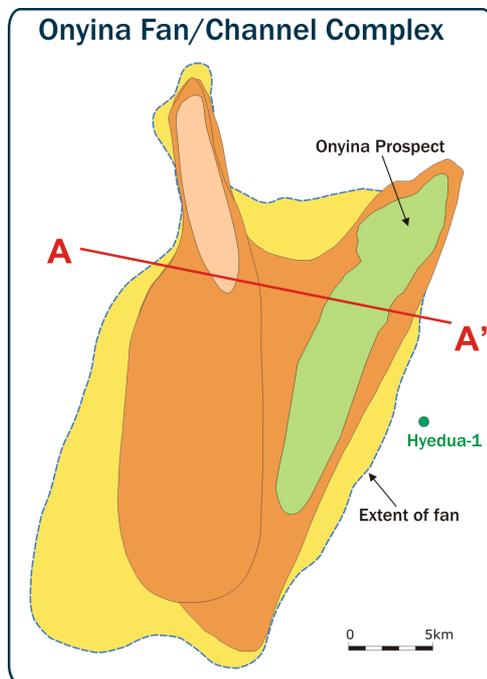
- Upper Jubilee equivalent prospect
- Reservoir de-risked by Dahoma-1 well
- Trapping geometry same as Jubilee

## Sapele

- Youngest member of Jubilee fan system
- Very strong AVO anomaly
- Clear separation from other Jubilee fan sands



# Onyina prospect



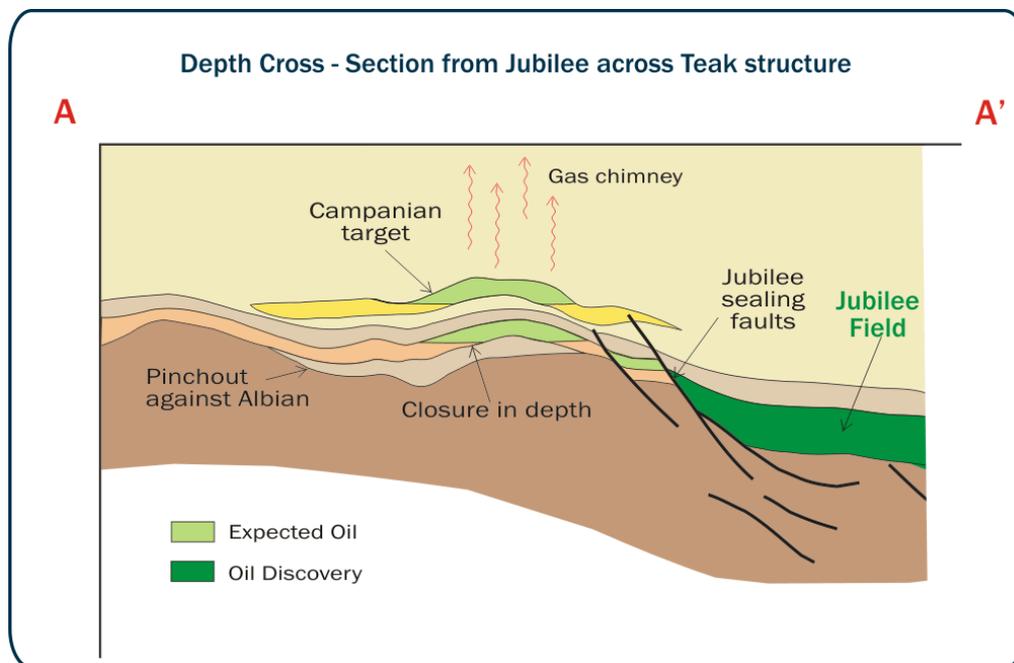
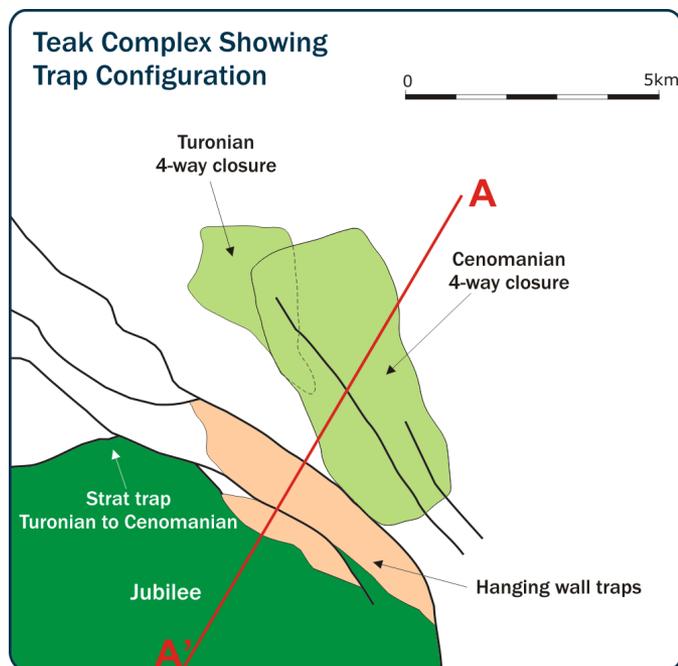
## Onyina prospect

- Large upper Campanian fan/channel system with two distinct feeders
- Only eastern feeder prospective
- Water depth 600m-1,050m
- Next well after Owo-1

## Onyina geological summary

- Stratigraphic trap
- Located on South Tano High, in good position to receive charge from same Cenomanian-Turonian source that charged the Jubilee fan
- Covered by PSDM reprocessed high resolution Jubilee 3D
- Good AvO support for up-dip eastern feeder

# Teak prospect



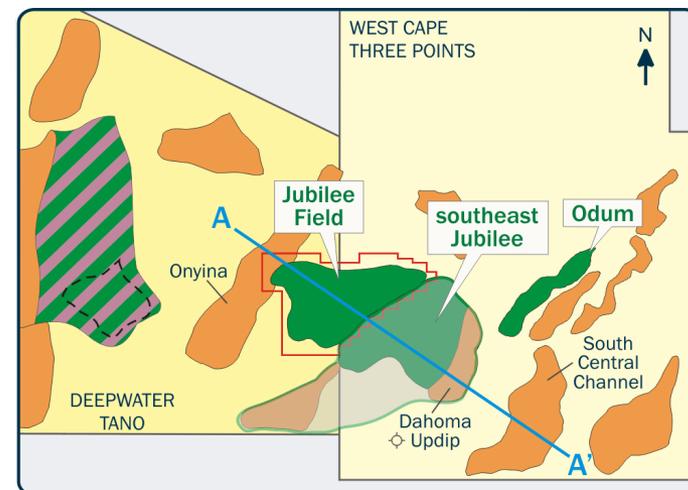
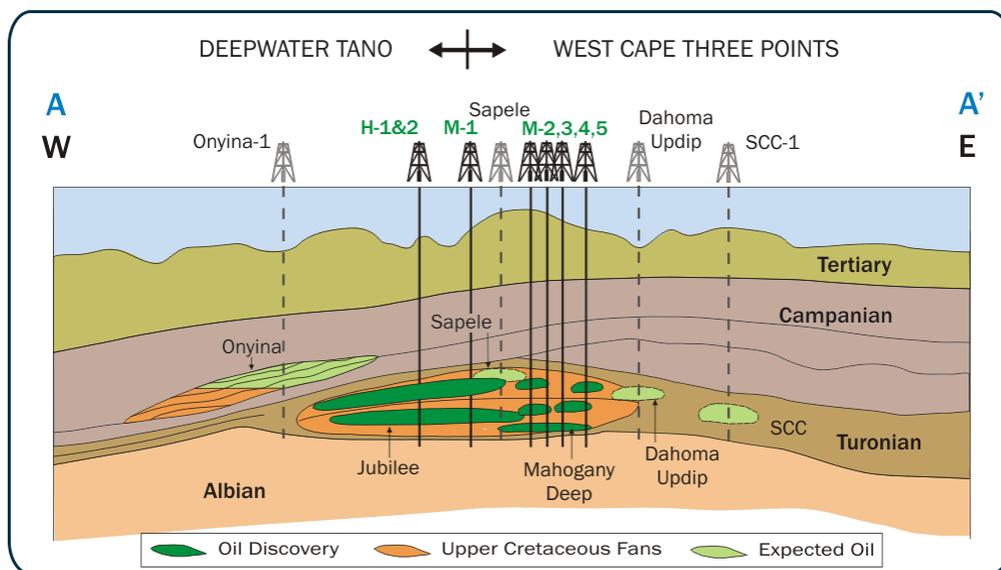
## Teak prospect

- Stacked Turonian to Mid Campanian submarine channel systems
- Significant 4-way dip closures
- Scheduled to be drilled by the Atwood Hunter in Q4 2010

## Teak geological summary

- Up-dip of both Jubilee and Odum
- Potential up-dip extension of Turonian Jubilee
- Stacked structural and stratigraphic traps
- Gas chimney - data quality improved by PSDM of high resolution Jubilee 3D

# Dahoma Up-dip and Sapele prospects



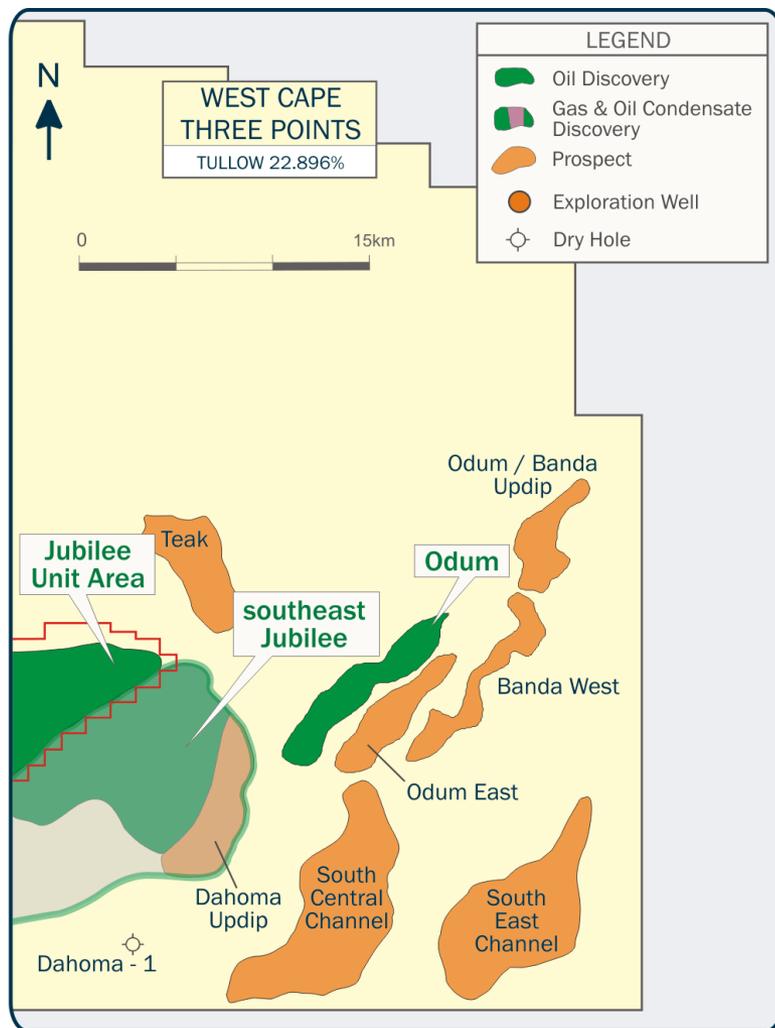
## Dahoma Up-dip

- Up-dip of excellent reservoir intersected in Dahoma-1
- Eastern flank of overall Jubilee fan
- Upper Jubilee equivalent reservoir objectives
- To be drilled Q4 2010 / Q1 2011

## Sapele

- Down-dip of Jubilee but stratigraphically younger
- Pinch-out evident on very good quality 3D seismic
- Excellent AvO support de-risks reservoir
- Scheduled for drilling in 2012 to meet well commitments

# Ghana: Realising more value in West Cape Three Points



## Stepwise 2010-2011 campaign

- Extending plays east of Jubilee
- 3D seismic processing to enhance imaging

## South Central Channel

- Next eastward step in Turonian play
- Jubilee Upper equivalent prospect
- Clear AvO anomaly

## South East Channel

- Significant further step-out to the east
- Cenomanian and Campanian prospectivity

## Odum

- Odum-2 confirms Campanian field extension
- Cluster development with future discoveries

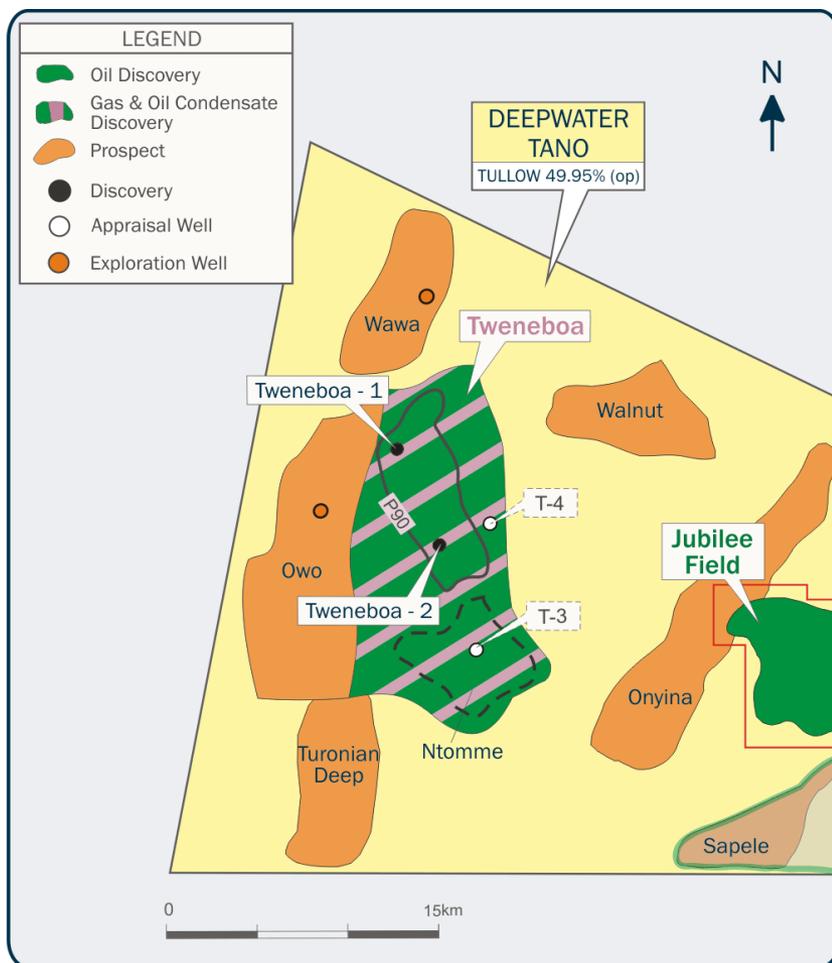
## Banda West

- Campanian prospect in greater Odum/Banda fan system
- Next step in proving commercial volumes in east WCTP

## Odum East

- Adjacent to Odum discovery
- Opportunity to increase resources for cluster development

# Deepwater Tano high-equity accelerated E&A



## Tweneboa/Owo/Ntomme

- Potentially 60% liquids (70% may be oil)
- Owo-1 will 'make or break' the P10 case: 1.4bnboe
- Important for scale of development
- Tweneboa-3 targets Ntomme anomaly
- Deeper fans in lower Turonian and Cenomanian enhance upside potential
- Additional up-dip prospectivity extends into Wawa

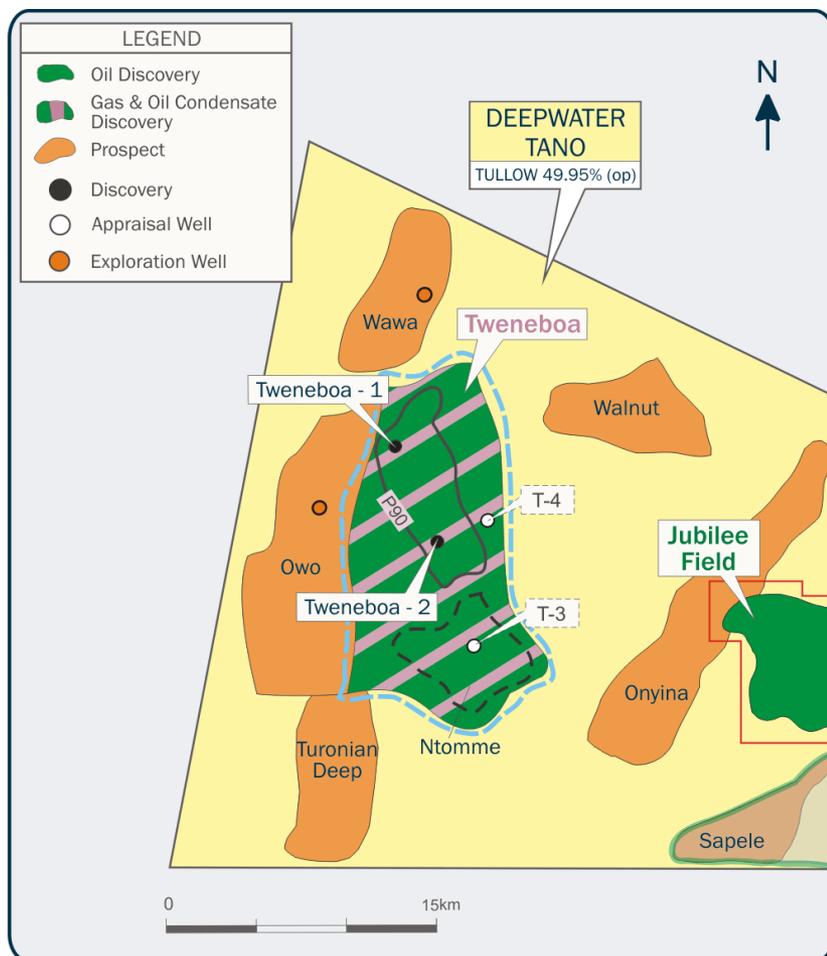
## 2010-2011 Activity

- Tweneboa-2 finds major oil & gas-condensate field
- Firm wells on Owo-1 and Tw-3 in 2H 2010 provide definition on scale of development and fluid distribution
- Tw-4 & DST completes appraisal

## 2012 Activity

- Deep Turonian and Cenomanian wells to test full upside potential of the area

# Tweneboa field



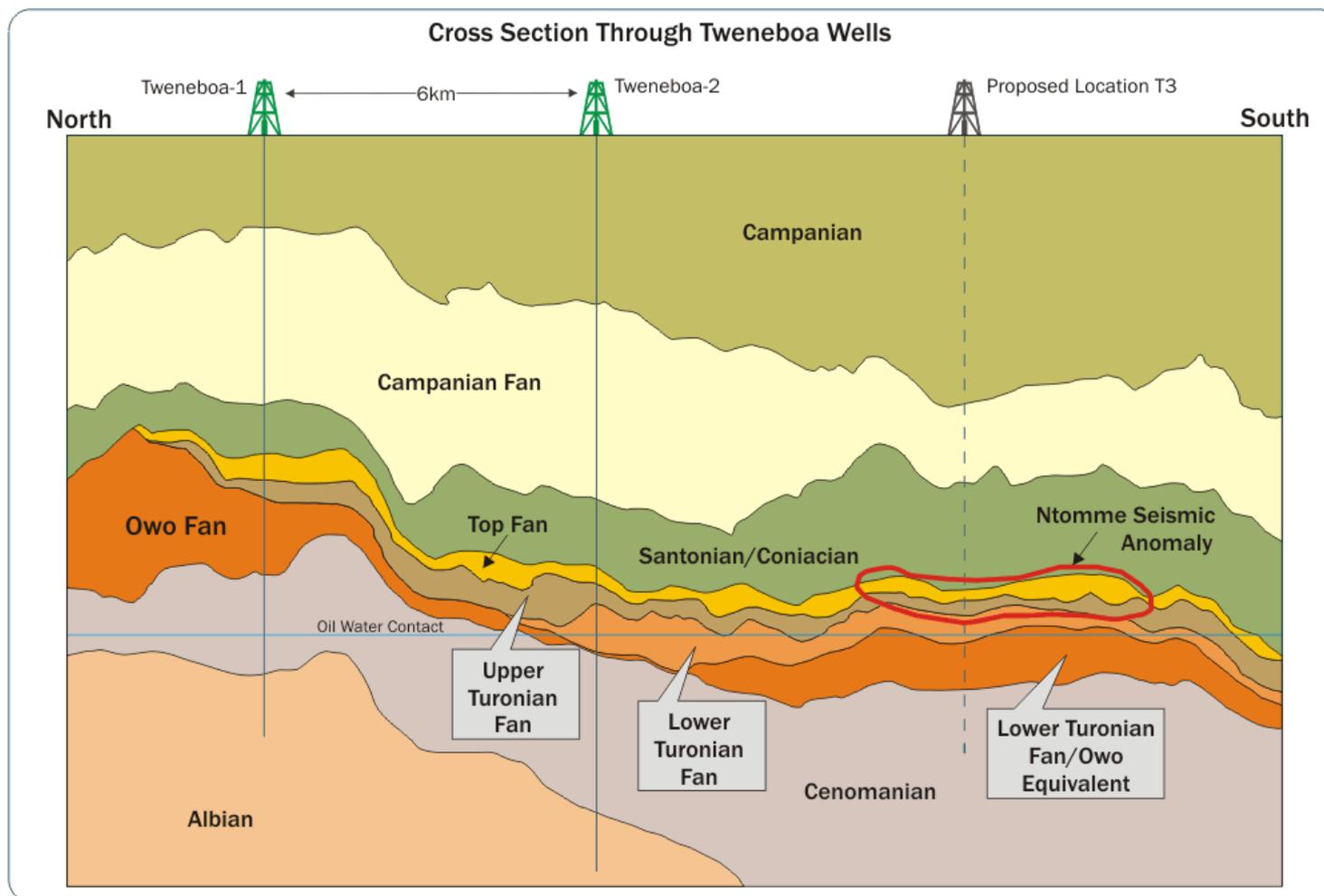
## Field characteristics

- Water depth 1,500m - 1,700m
- Tweneboa field comprises the eastern part of a bifurcating Turonian channel/fan system
- Proven gas/condensate in Upper Channel overlying oil in a Lower Channel
- Gas water contact unknown
- Oil water contact intersected by T-2

## Field appraisal

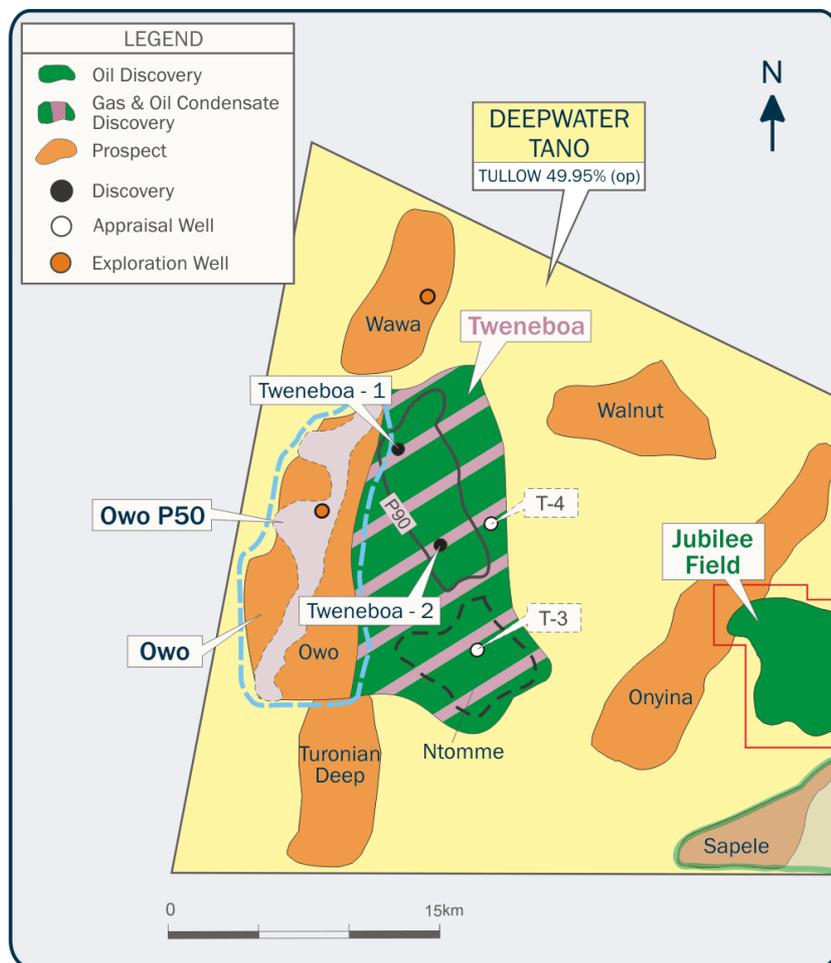
- T-3 well to test frontal splay (Ntomme lobe) of a fan complex within stratigraphic/structural trap
- Excellent AvO support, Tw-3 will calibrate bright Ntomme anomaly
- Expected spud in 2H 2010
- T-4 targets a secondary channel within the easternmost part of the fairway
- Project team is in place to evaluate field development options

# Section through Tweneboa Wells



- Stratigraphic trap potential with 360m gross column height and 6.4km down-dip extent

# Owo prospect

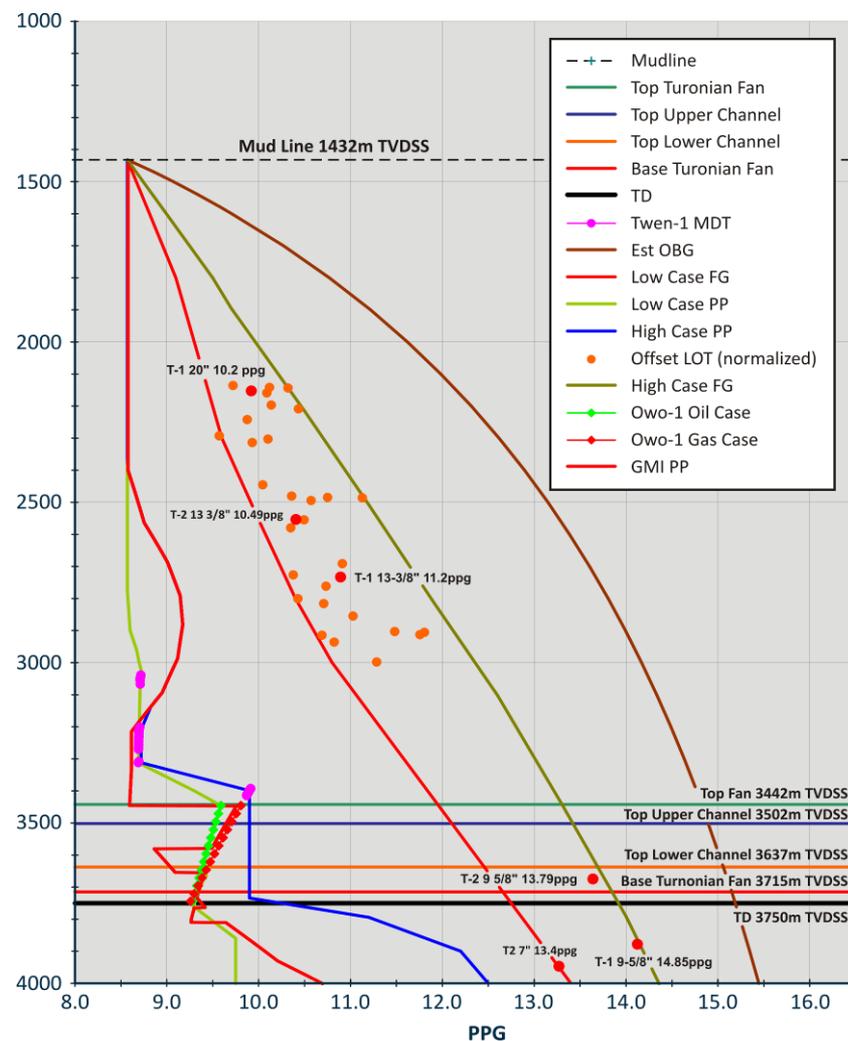


## Owo prospect characteristics

- Stratigraphically trapped turbidite channel complex forming the western part of the greater Tweneboa Turonian fan system
- On-lapped by the younger Tweneboa channel complex to the east
- The prospect comprises sinuous stacked channels that are well imaged on good quality seismic data
- Tweneboa-1 intersected a shaley part of the Owo fairway in an overbank setting
- Analogous to the Plutonia field in Angola
- Excellent AvO support

# Pore Pressure Prediction – critical to safe drilling

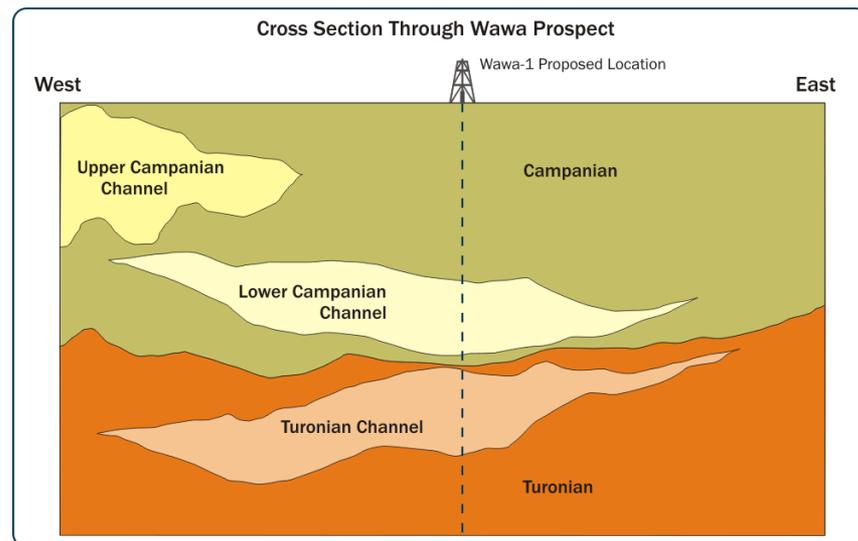
- Understanding the expected Pore Pressure is critically important for safe well design
- Predictions are made using offset well information and detailed analyses of geological and geophysical data
- A pressure plot is created for every well drilled to highlight areas of risk
- For Owo-1 the main risk is below the primary target
- Onboard Pore Pressure Engineer will monitor the well to identify increasing pressure and advise on appropriate actions



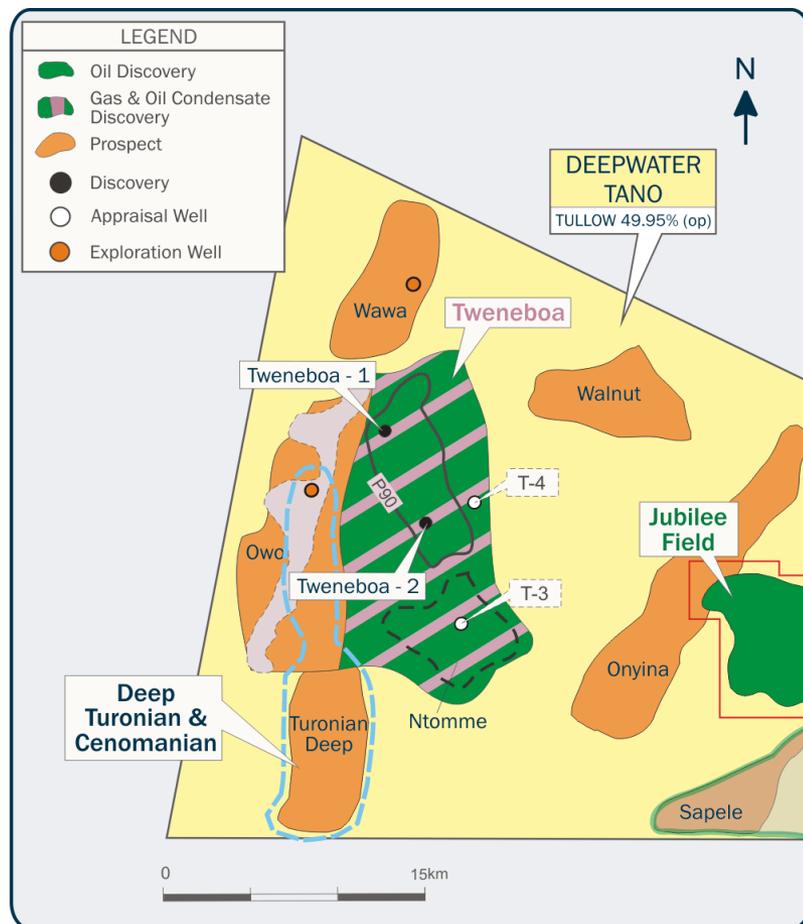
# Wawa prospect



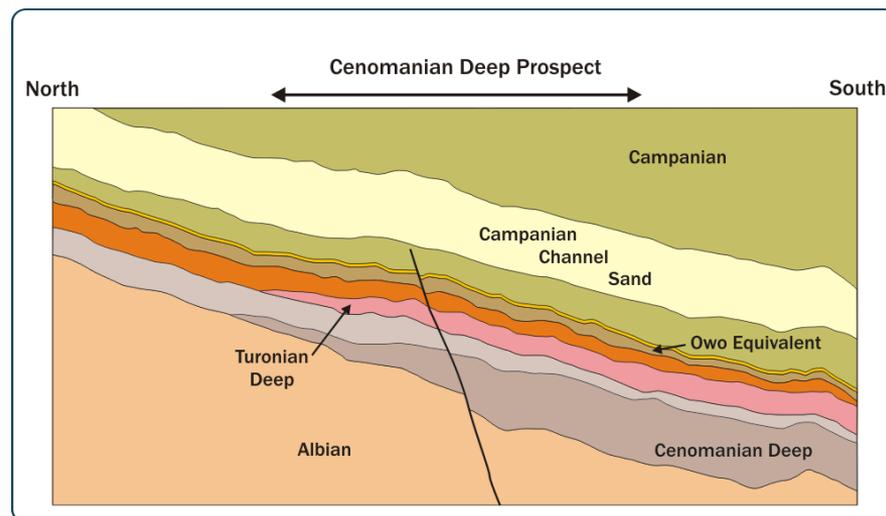
- Wawa is an up-dip test of the Upper and Lower Campanian channel reservoirs that were water bearing in T-1 and T-2 wells
- It will be deepened to penetrate up-dip Turonian channel of the Owo fairway
- Will better constrain the upside resource range within the area
- Potential tie back to Tweneboa
- Wawa-1 could be drilled in 2012



# Deep Turonian & Cenomanian prospects



- Stacked Turonian and Cenomanian stratigraphically trapped prospects
- Could be tested with one well
- Will better constrain the upside resource range within the area
- Potential tie back to Tweneboa
- Cenomanian interval is the equivalent section to Vanco's recent Dzata discovery



## Prospective Resource Summary

Greater Tweneboa Resources: 100-400-1,400 mmboe (P90-P50-P10)

- Owo-1 will *'make or break'* the upside

SE Jubilee: 100-500 mmboe (P90-P10)

- P90 to P10 range is narrowing as the uncertainty is reduced by M-5 and the P50 is pending development scenarios (Includes Sapele and Dahoma updip)

Remaining risked prospective upside in DWT + WCTP = 1,400 mmboe

- Includes Wawa, Turonian Deep, Cenomanian Deep, Onyina, Teak, South Central Channel, South East Channel and Banda/Odum Appraisal

# Jubilee Progress Report



**Stuart Wheaton**  
Ghana Development Manager

**Dave Hanley**  
Ghana Sub-Surface Manager

**Alan Dowokpor**  
Well Engineering Manager - Ghana

# Introduction – Stuart Wheaton



# Development Plan - Jubilee Unit and southeast Jubilee

- **Jubilee Unit - Phase 1**
  - FPSO in field and starting installation phase
  - Subsea equipment ~75% installed
  - Drilling of 16 development wells complete
  - Well completions under way
  - On track for 4Q 2010 first oil and delivery within 10% of budget
- **Jubilee Unit - Phase 1a**
  - Infill program potential of 5-8 wells identified to maintain plateau production
  - Detailed work underway
  - Phased sanction likely in 2010-2011
  - Timing depends on Phase 1 performance
- **Jubilee Unit - Phase 1b**
  - Further significant infill program
  - Likely requires the expansion of subsea infrastructure
  - Sanction likely in 2011/12
  - Use of existing FPSO or combined development with southeast Jubilee under review
- **Southeast Jubilee**
  - Appraisal programme complete (M3, M4, MD-2 & M5)
  - Work underway reviewing development options
  - Independent and satellite options being considered
  - Neighbouring prospects included and planned to drill 2010-2011

# Greater Jubilee Reserves & Resources Summary

	Reserves (MMbbl)		Resource (MMbbl)
	Phase 1 17 wells	Phase 1a 5-8 wells	Phase 1b 10-20 wells
Low	250	60	160
Mid	370	100	205
High	590	215	260

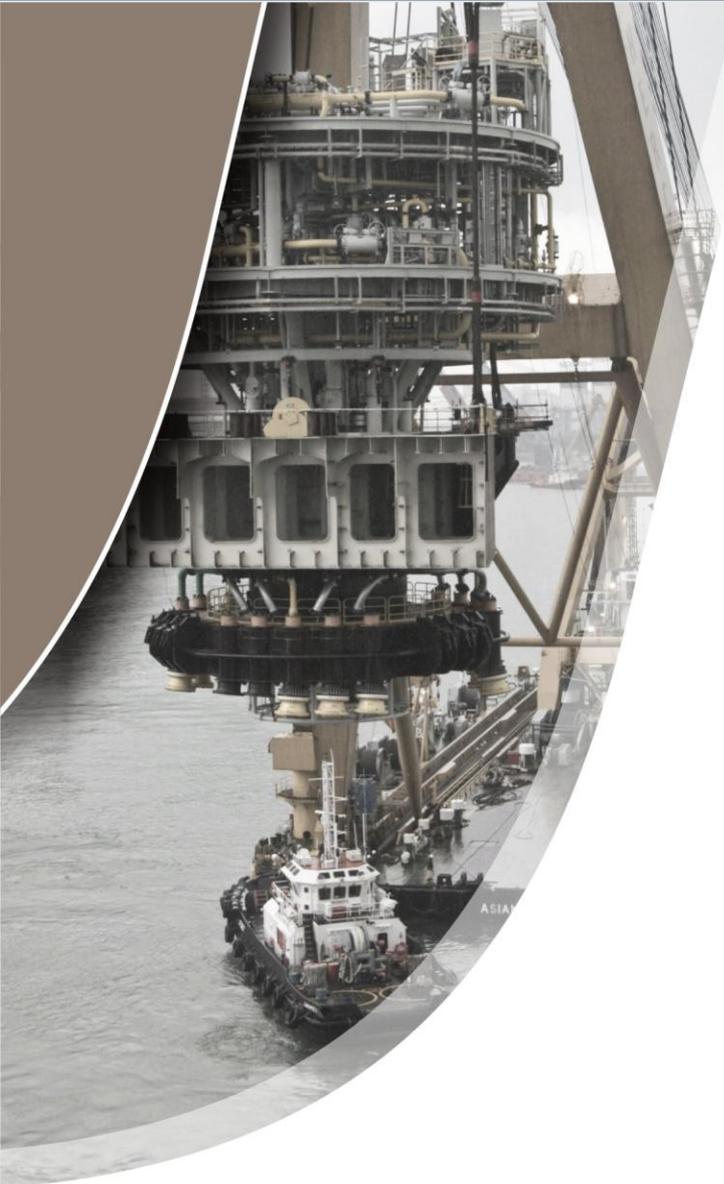
- Jubilee Unit Area Reserves & Resource range 500 – 700 – 1000 mmbbls
- Southeast Jubilee Resource range 100 to 500 mmbbls
- Southeast Jubilee development scenarios under evaluation

# Efficient delivery Jubilee Phase 1 project

July 2007	Discovery Well
August 2007	Appraisal well confirms large discovery
January 2008	JVs/GNPC agree concept, commit to develop
February 2008	Initiated Integrated Project Team (IPT) and preliminary unit agreement
May-Jun 2008	Ordered long-lead items (IPT)
July 2008	IPT completes Plan of Development (POD)
August 2008	Joint Venture sanctions project, commit LOIs
October 2008	Begin development drilling (Tullow)
July 2009	POD and UUOA approved by Ghana Government
November 2009	Sub-surface work transfers from IPT to Tullow
December 2009	Environmental Impact Assessment (EIA) permit issued
January 2010	Begin offshore subsea installation
March 2010	End Phase 1 drilling and start completions
May-June 2010	FPSO departs Singapore and arrives Ghana
July-Sept 2010	FPSO install and riser pull-in
Sept-Nov 2010	Commissioning and subsea-topsides interface
Nov-Dec 2010	First oil forecast
By January 2011	First lifting

3½ years from discovery to first oil

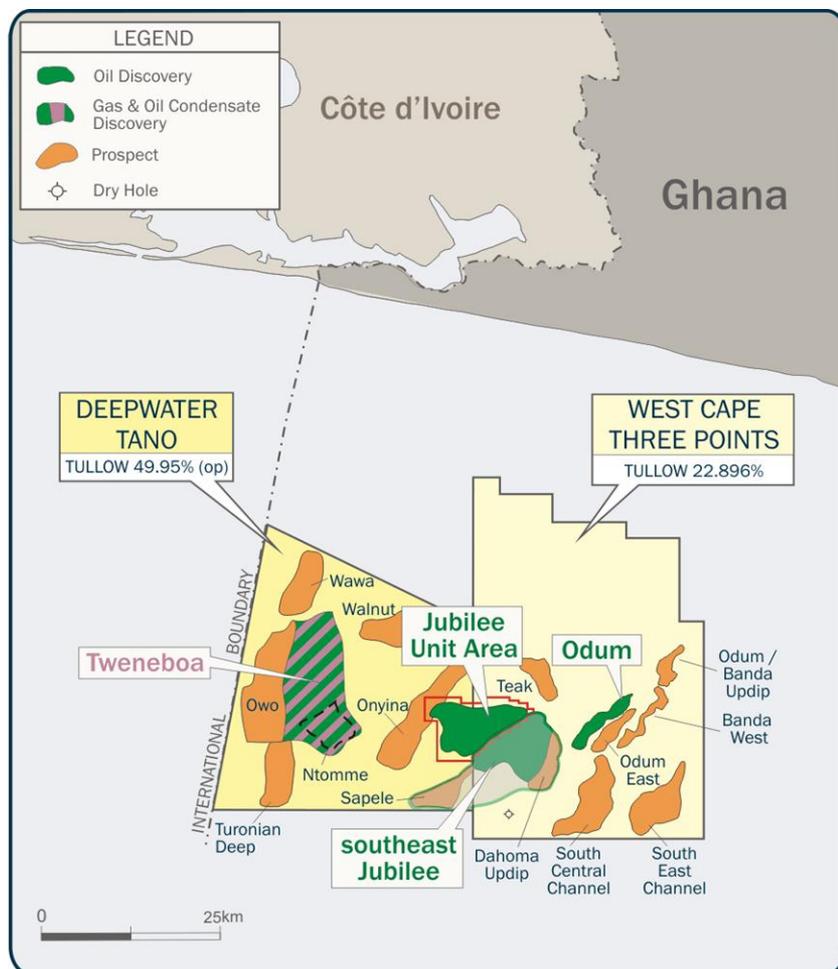
# Subsurface Update – Dave Hanley



## Subsurface Update - contents

- Subsurface overview
- Jubilee Phase 1
  - Execution & status - Unit Area drilling results
  - Advances in reservoir understanding - database
  - Reserves - production performance forecasts
- Jubilee Phase 1a
  - Infill drilling options - planning and potential
- Jubilee Phase 1b early view
- Southeast Jubilee status & forward plans

# Ghana development projects



## Jubilee field – Unit Area

- 60 km offshore in avg. 1,200m water depth
- Three appraisal wells confirm giant discovery
- Excellent reservoir and fluid properties

## Phase 1 FPSO development commences

- Early '08 decision to pursue phased development with fast tracked Phase 1
- FPSO/Subsea scheme - \$3.2bn capex
- POD scope - 17 well initial phase
- First oil Q4 2010, 40 months after discovery
- Phase 1 regulatory approvals – July 2009

## Pursuit of upside potential – SE Jubilee

- 100% success during appraisal of SE Jubilee (M-3, M-4, MD-2 & M-5 wells)
- Multiple, complex turbidite reservoirs
- Tie-back candidates later in Jubilee field life
- Continued WCTP E&A drilling programme through 2010/11

## Tullow Ghana Subsurface Team

- Organisation / expertise in-place for parallel work on:
  - Jubilee Phase 1 execution and Phase 1a infill planning
  - Jubilee Phase 1b & southeast conceptual development
- Right-sized for continued success: 20+ professionals
- Range of experience levels from graduate to 30+ years
- Partner secondees on Tullow team for seamless progress
- Facilities / Operations interfaces retained through membership of Integrated Project Team (IPT) leadership team
- Gradual / controlled move of Phase 1 team to Accra prior to first oil

Right people in-place to deliver Phase 1 & future phases

# Jubilee Unit - Phase 1 execution & status

## Jubilee Phase 1 Execution (17 wells)

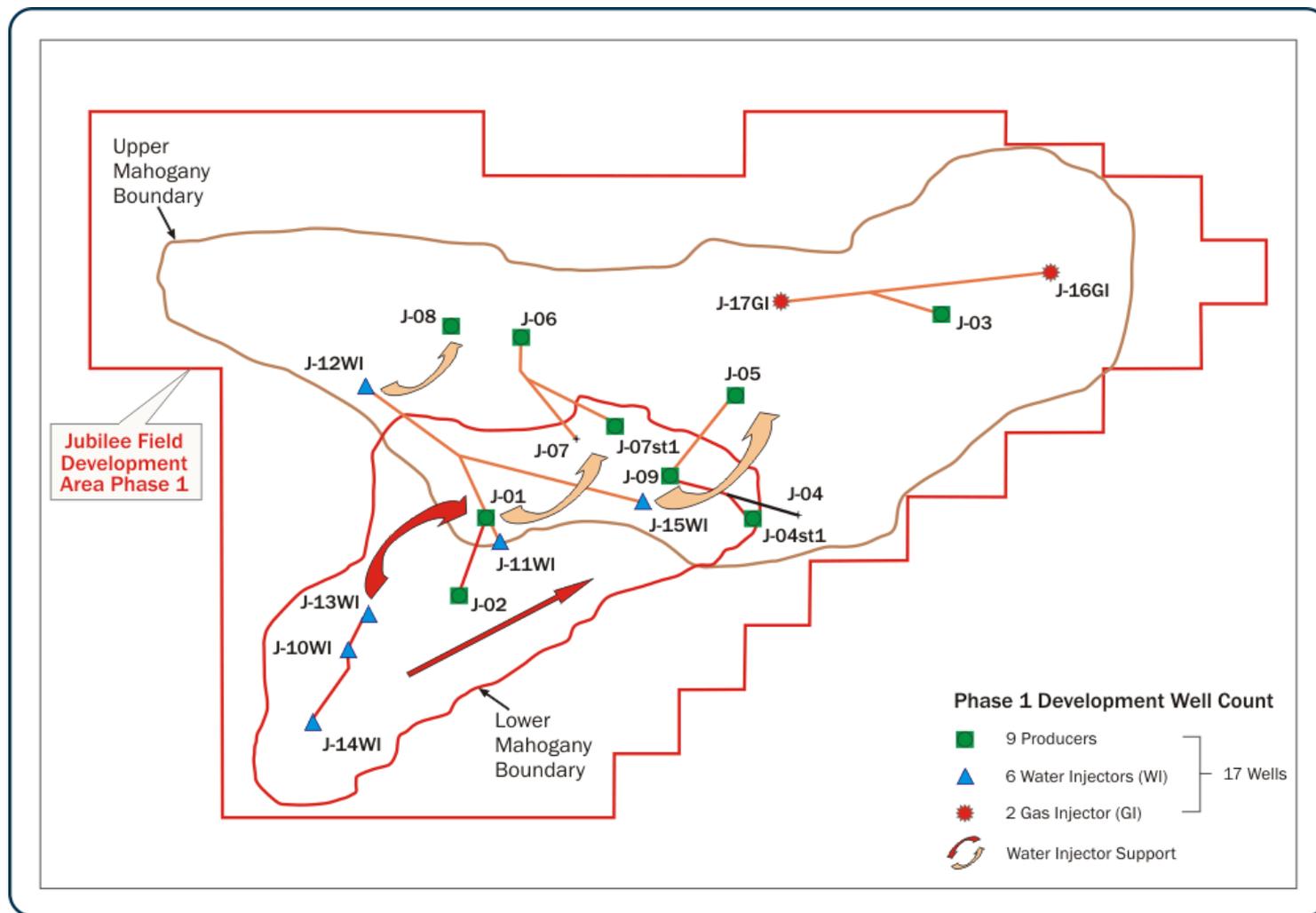
- 12 new wells drilled
  - up to 70° deviation, total drilled footage >40kms
- Re-use of 4 E&A wells
  - >\$60MM saving vs. sanction
- J-06 well held in reserve until after first oil
- 18 month completions phase underway

## Phase 1 Unit Area Summary

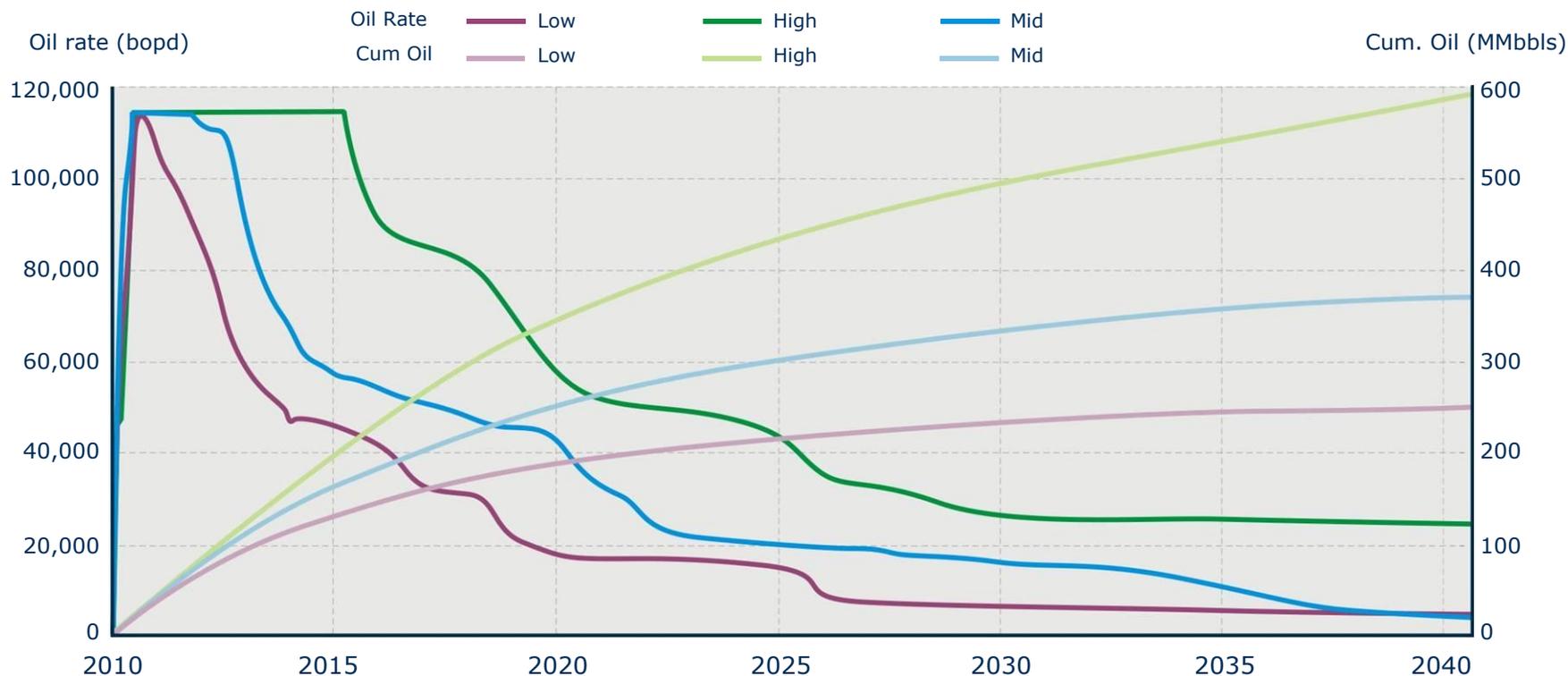
- Reservoirs much better defined by wells, well tests and improved seismic
  - Good and in some cases bold selection of well locations
  - Net sand thicknesses and reservoir quality met or exceeded estimates
- Confirmation of world-class reservoir and fluid quality
  - High rate DSTs and positive interference and water injection tests
  - Reservoir extent and fluid contacts confirmed
- Risk and uncertainty significantly reduced
- Mid-case recovery expectation is c.100 mmbbls above the POD estimate
- Results reinforce definition of Unit Area boundary
  - "World class" turbidite reservoirs inside
  - "Traditional" turbidite reservoirs outside in southeast Jubilee area



# Phase 1 development well locations

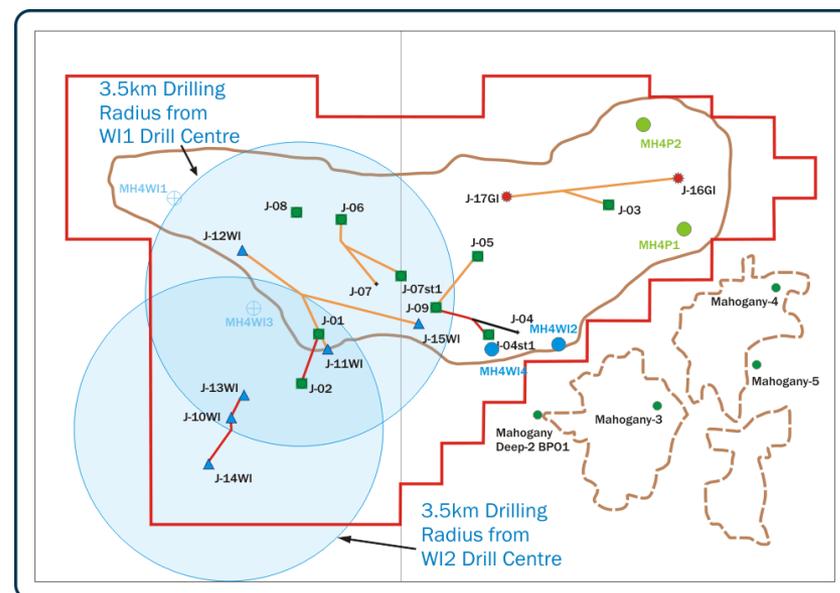
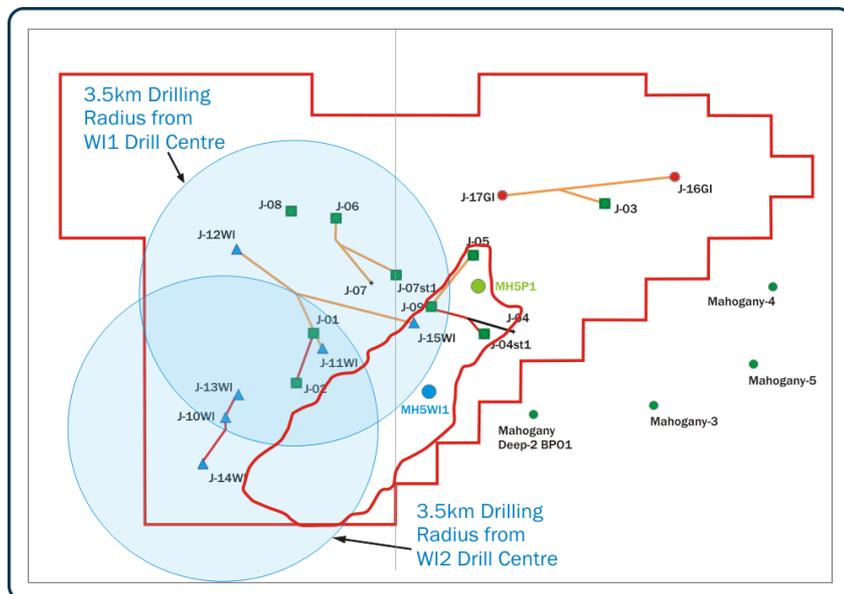


# Jubilee Unit - Phase 1 production performance



- Production performance assumes 120,000 bopd capacity with 5% downtime
- Most likely plateau is ~2 1/2 years, which guides Phase 1a start-up timing
- Simulation model update underway using new data – further modest gains expected

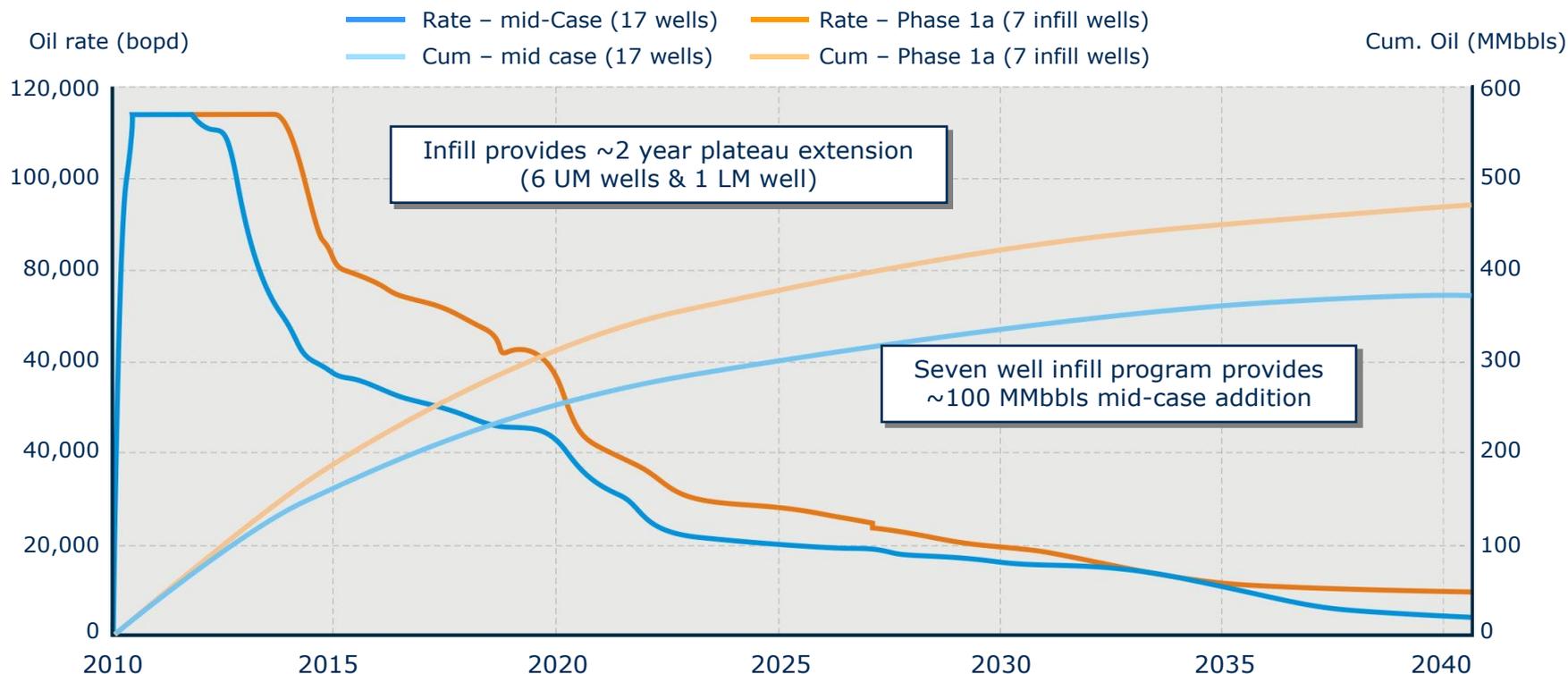
# Phase 1a example modelled infill well locations



## Example infill well locations

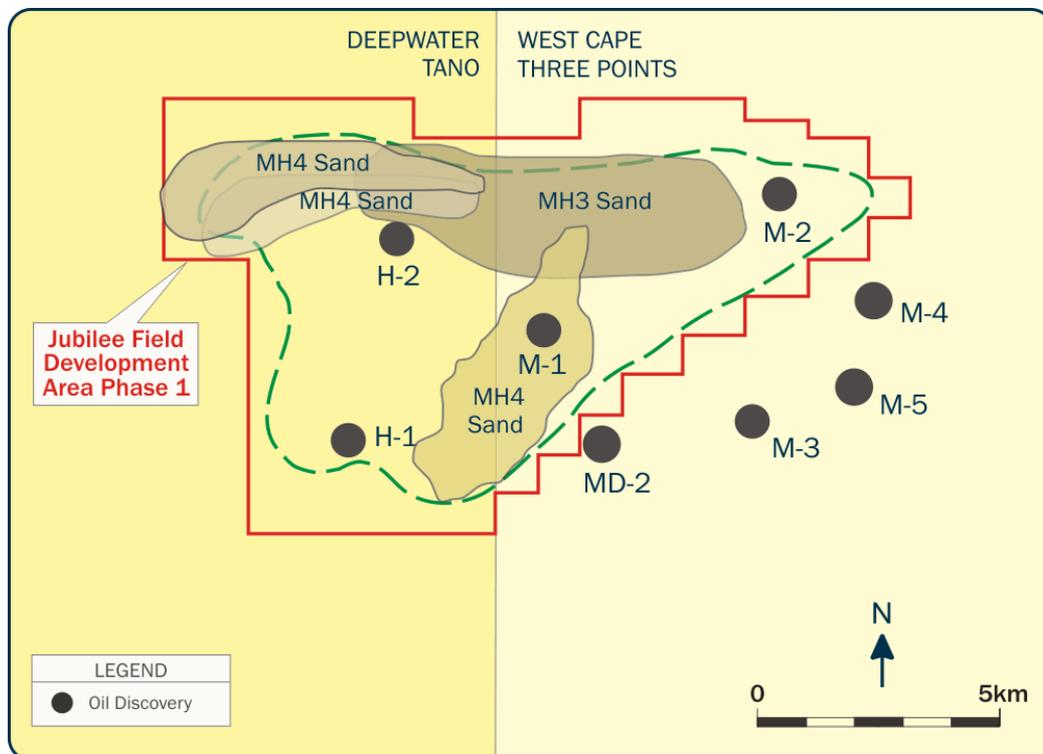
- All producers can be reached from existing manifolds
- But water injectors may require long step-outs or an additional East water injection manifold / flowlines etc

# Phase 1a infill options & planning



- Phase 1a timing based on Phase 1 performance
  - Will require around 6 months of production
  - Wells may be drilled immediately or deferred for up to 2 years
  - Early commitment to long lead items will be made

## Phase 1b – Potential infill & incremental facilities



- Targets outlying parts of existing developed reservoirs (MH4 & MH5) and thinner and as yet undeveloped reservoirs (MH3) – all inside Unit Area
- Up to 20 potential infill wells or sidetrack locations
- Additional subsea infrastructure likely required
- Extending plateau or accelerating production options dependent upon:
  - FPSO capacity
  - southeast Jubilee

# Jubilee Unit - Phase 1, 1a and 1b Reserves & Resources

	Reserves (MMbbl)		Resource (MMbbl)
	Phase 1 17 wells	Phase 1a 5-8 wells	Phase 1b 10-20 wells
Low	250	60	160
Mid	370	100	205
High	590	215	260

## Phase 1

- Well results encountered thicker sections than prognosis at sanction
- Reservoir interference tests increased confidence in reservoir communication
- Reserves picture continues to be positive
- 17-well mid-case recovery factor of ~30% supports further development phases

## Phase 1a

- Detailed work underway

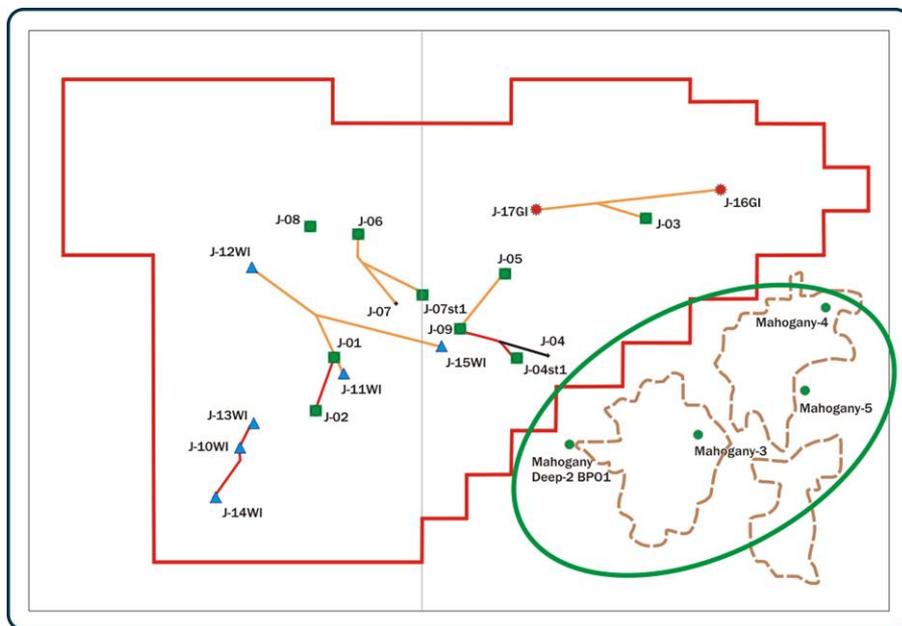
## Phase 1b

- Benchmarked to best performing published analogues (~50% RF)

Jubilee Unit Area Reserves & Resource Range 500 – 700 - 1000

# Southeast Jubilee - Dataset

- Four wells have been drilled - M-3, M-4, MD-2 & M-5



ZONE	HYDROCARBONS	WELL
MH5	Oil	MD-2
MH4	Oil	M-3 M-4
MH2	Oil	M-2 MD-2
MH1	Oil	M-4 M-5
MHDeepU	Oil and Gas	M-4
MHDeepL	Oil	M-3
PreMahog2	Oil	M-4 M-5

- Hydrocarbons in at least seven zones
- Seismic data, well results and pressure data used to delineate reservoirs

## Southeast Jubilee summary & forward plans

### Greater development challenge than Jubilee Unit Area

- Appraisal programme complete (M-3, M-4, MD-2 & M5)
- Net sand thicknesses reduced
- Reservoir quality and fluids broadly similar to Unit Area
- Multiple thin intervals and smaller compartments
- Likely higher well count than Unit Area
- Producer to injector pairings likely (e.g. re-use M4 and M5 wells?)

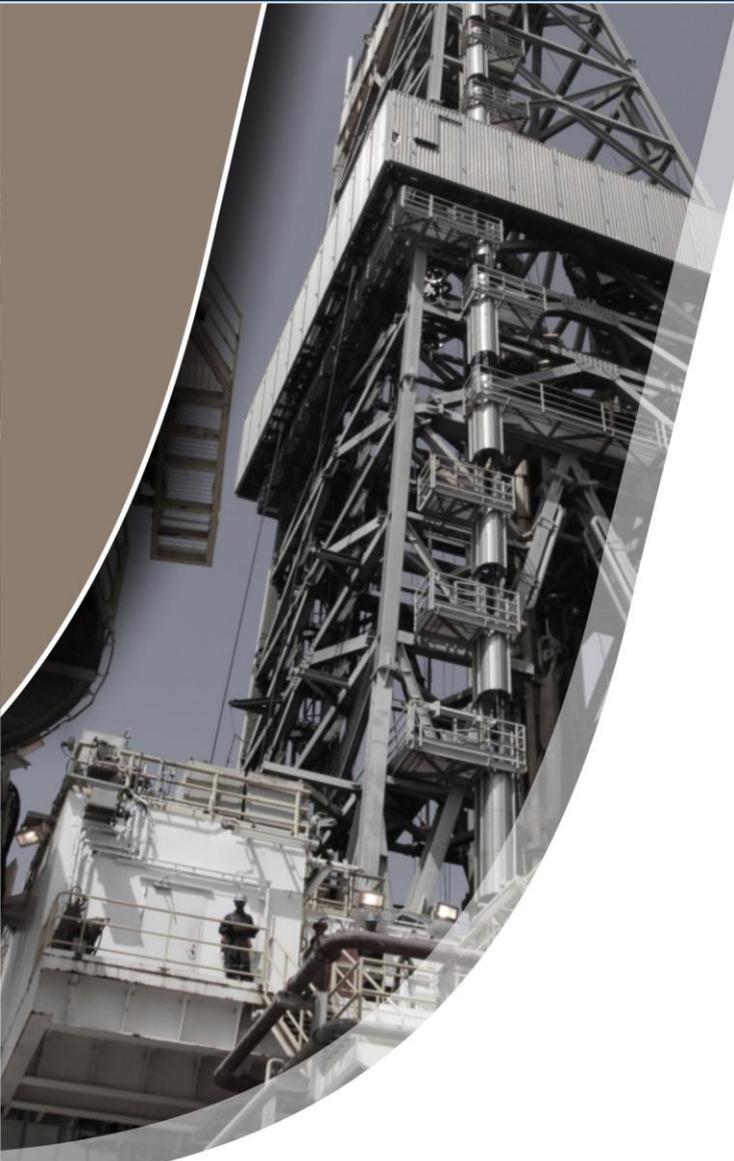
### Development options available

- Tie-back to existing Jubilee FPSO
  - Ullage in 2015+
  - additional subsea infrastructure required
- “Smaller” FPSO as standalone scheme
  - Manages downside risks
  - New & used opportunities to be evaluated

### Forward plans

- Work closely with West Cape Three Points (WCTP) Operator – (Kosmos Energy)
- Work underway reviewing development options
- Independent and satellite options being considered
- Neighbouring prospects included and planned to drill 2010-2011

# Environment, Health and Safety – Stuart Wheaton



## Project EHS performance update (since project start)

	Million Man Hours @end May 2010	LTI	LTIF /MM man-hrs	Hi Potentials
In-country (Tullow Ghana)	3.7	2	0.5	13
Project team (IPT – world-wide)	10.1	4	0.4	7

### Health

- Company doctor and 24/7 medical system for all personnel
- Full malaria control program in-place

### Emergency response planning

- Continued drills now involve FPSO

### Oil spill

- Oil spill contingency planning work continues with OSRL(UK)

### Safety Case handed over to Tullow Ghana operations dutyholder from project

- Partner decision to adopt Safety Case pro-actively
- Independent verification

## Project – Critical EHSR issues/mitigations

### Review of well control and BOP stack

- Audit of all equipment, procedures and personnel
- Remote systems all tested positively on Eirik Raude

### Recurring crane issue on subsea construction vessel

- Independent assessments and actions taken with main subsea contractor

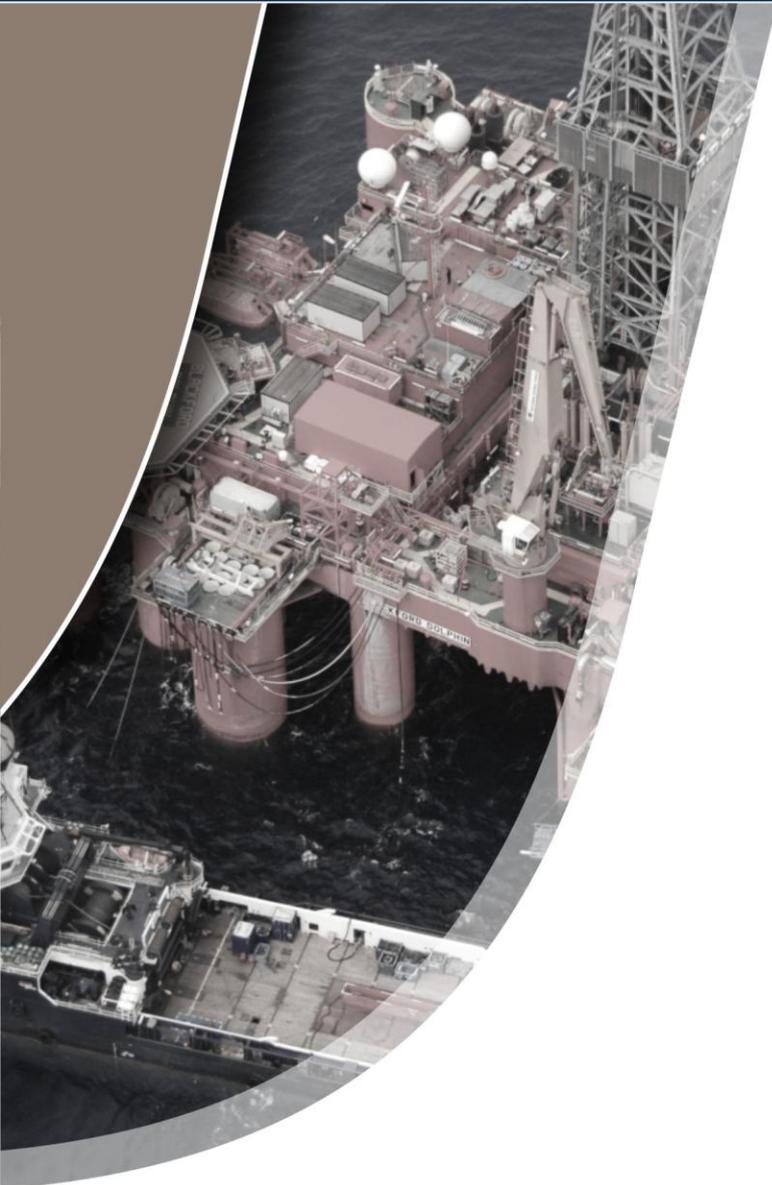
### EHS readiness for operations

- IPT/Tullow Ghana/MODEC team formed to continuously address actions required
- Planned major audit in September before hydrocarbons are flowed

### EPA Permit for operations (Phase 2 of process)

- Current permit covers installation and commissioning
- Tullow Ghana targeting submission of required plans from end June 2010

# Well Engineering – Alan Dowokpor



## Well engineering update

- Drilling phase success
  - Performance
  - Use of technology
- Completion phase challenge
  - J-01 mechanical failure
  - Impact on production ramp-up
- Campaign cost forecast update

# Phase 1 drilling – Summary of workscope

## 13 new wells drilled (re-use 3 E&A wells)

- 7 Producers
- 5 Water Injectors
- 1 Gas Injector

## 2 oil well tests

- J-08 DST following drilling of the well (16,000b/d)
- J-09 re-enter M-1, FracPac & DST (21,000b/d)

## 1 water injectivity test

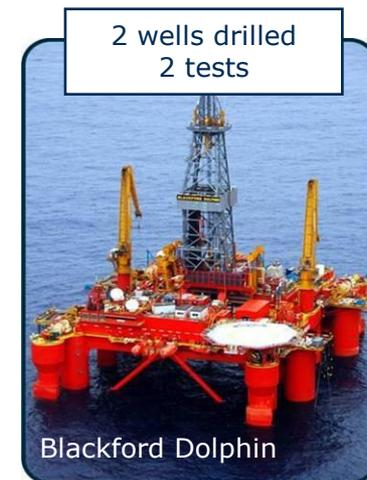
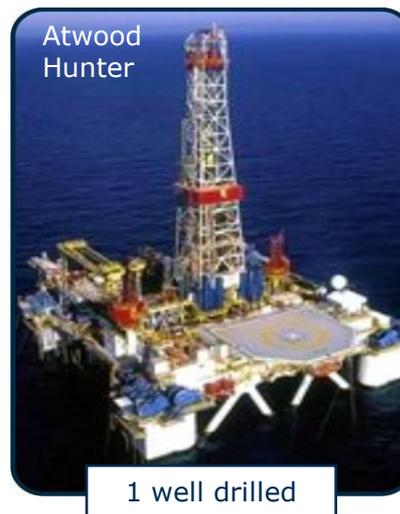
- J-10 Re-entry and injectivity test

## Performed 2 downhole pressure gauge installations

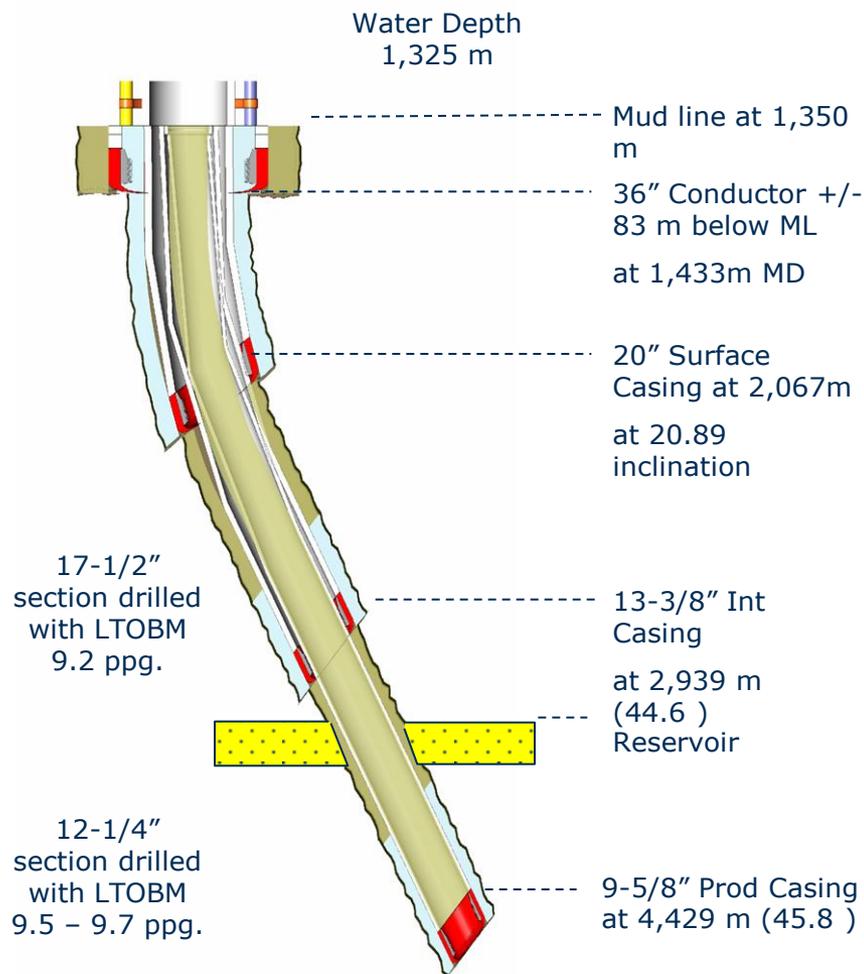
- J-02
- J-04ST1
- 6 data downloads carried out

## Phase 1 drilling – to do

- J6 well to be drilled

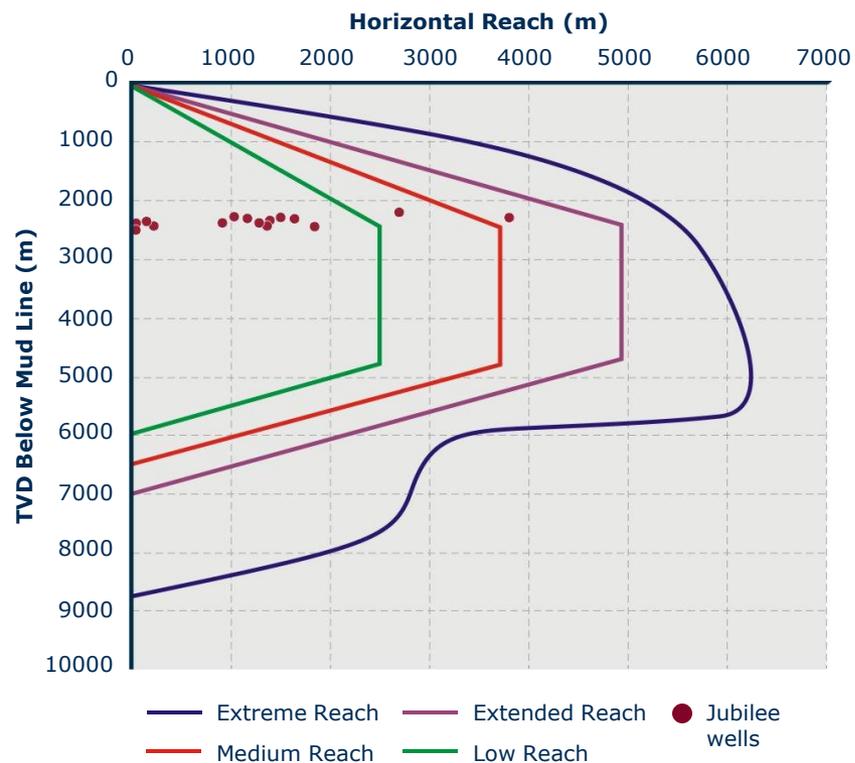


# J-12 well schematic - Typical Jubilee well



- Experienced deepwater team assembled
- Over 48 km of section drilled
- Well angle and reach increased steadily increased  
-J-17 gas injector: 72 degrees inclination, 6km long

## Jubilee wells Extended Reach Drilling (ERD)



# Performance improvement through technology (1)

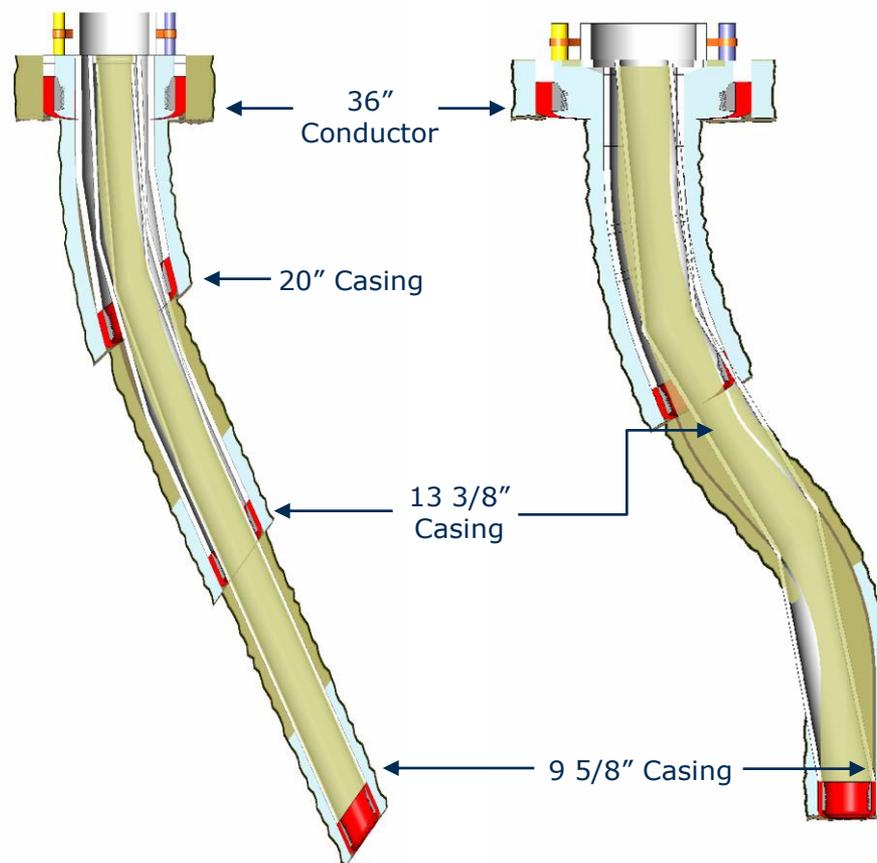
## Slim Hole

- Initial wells were 'full bore design'
- Slim hole design utilised
  - 20" casing eliminated
  - Wells with no shallow gas or low inclination
  - no compromise to safety
- Optimised directional profiles
  - to suit slim well designs
  - reduce drilling in hard stringers
- 3-4 days saving per well realised

**\$20 million saved over campaign using slim holes**

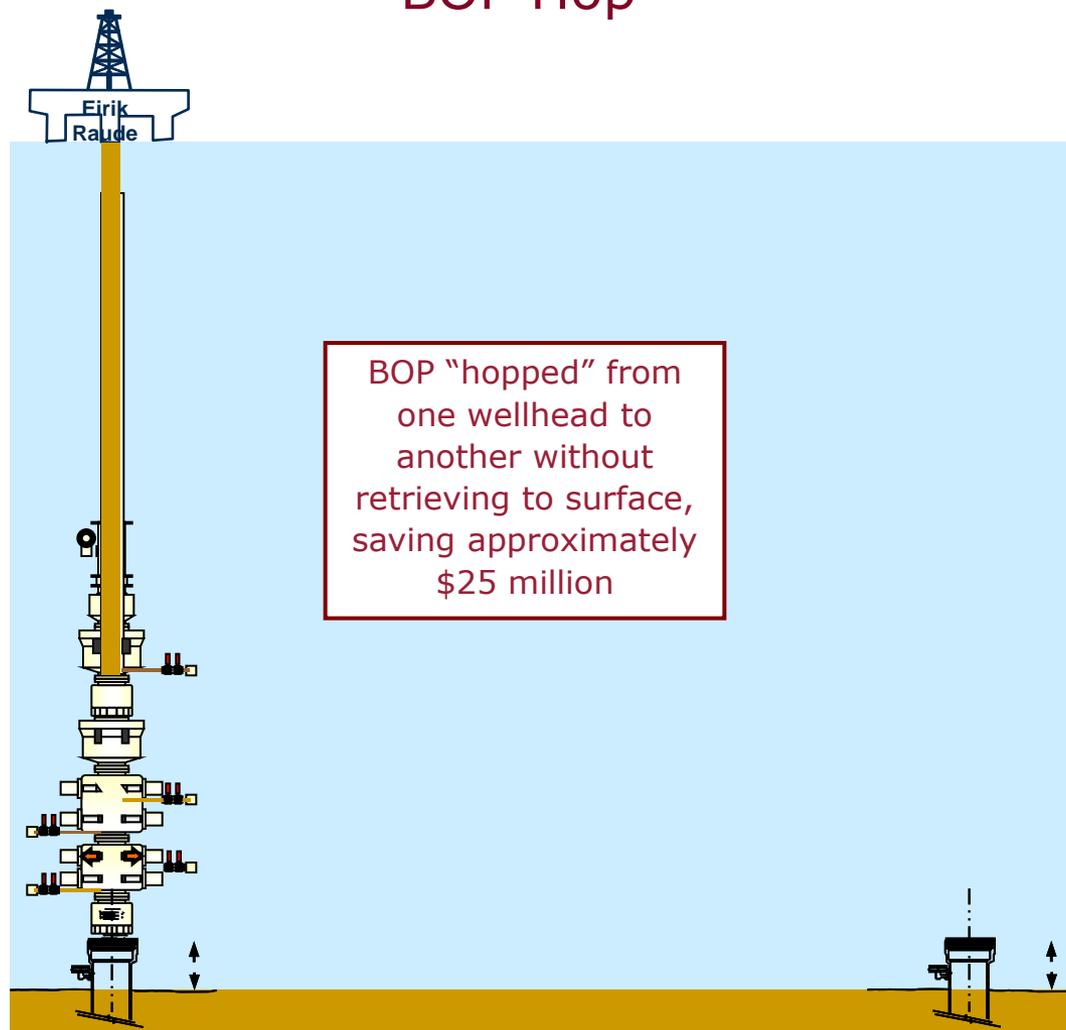
Full bore Well  
(With 20" Casing)

Slim Hole Well  
(No 20" Casing)



## Performance improvement through technology (2)

### BOP Hop



- BOP Hop Performed
  - J-11 to J-12
  - J-12 to J-01
  - J-10 to J-15
  - J-15 to J-14
  - J-14 to J-13
  - J-13 to J-17
- J-13 to J-17, 9.8 km rig move with BOP suspended
- Average time round trip BOP ~4 days

# Performance improvement through technology (3)

## Bit Selection

- Hard turbidite stringers encountered
  - Harder than steel
  - Unusual for deepwater drilling
  - Vibrations affect sensitive LWD tools resulting in frequent failures
  - Severely reduced bit life
  - Multiple bit runs required on early wells to reach TD
  
- Enhanced PDC bit developed
  - Improved LWD reliability
  - Eliminated failures during long bit runs



Tri-cone before



Tri-cone after



PDC before



PDC after

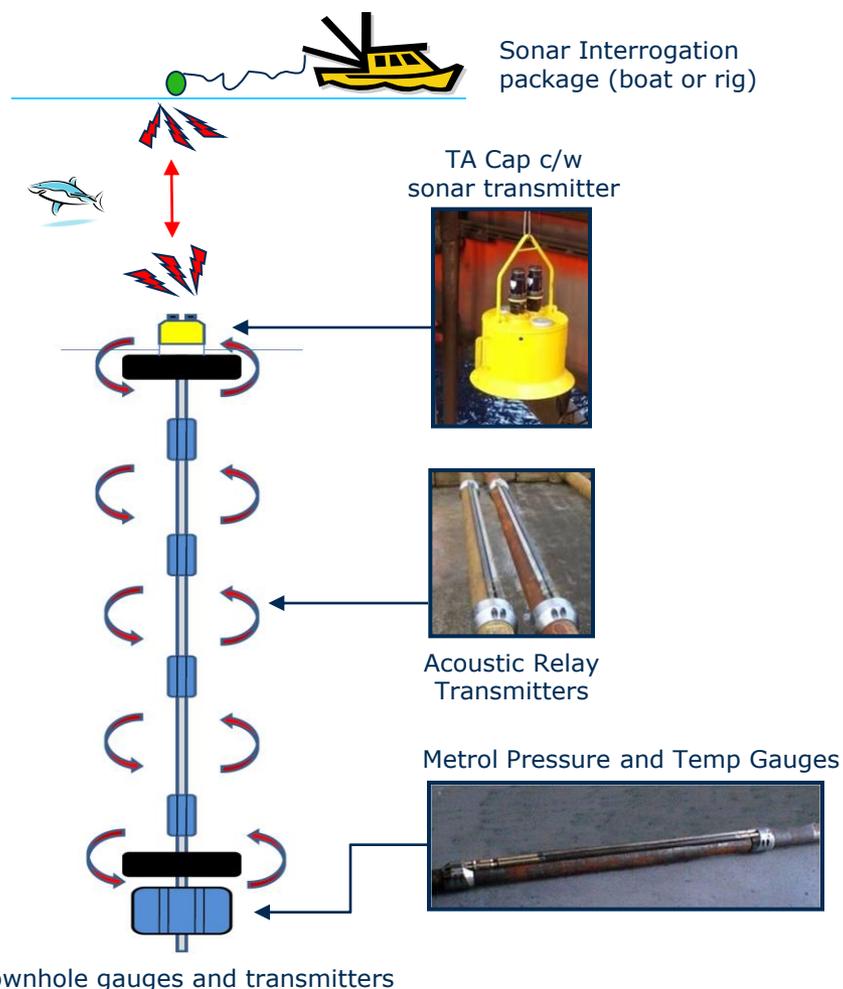


Enhanced PDC bit

Significant cost savings resulted from entire sections drilled with a single bit

# Performance improvement through technology (4)

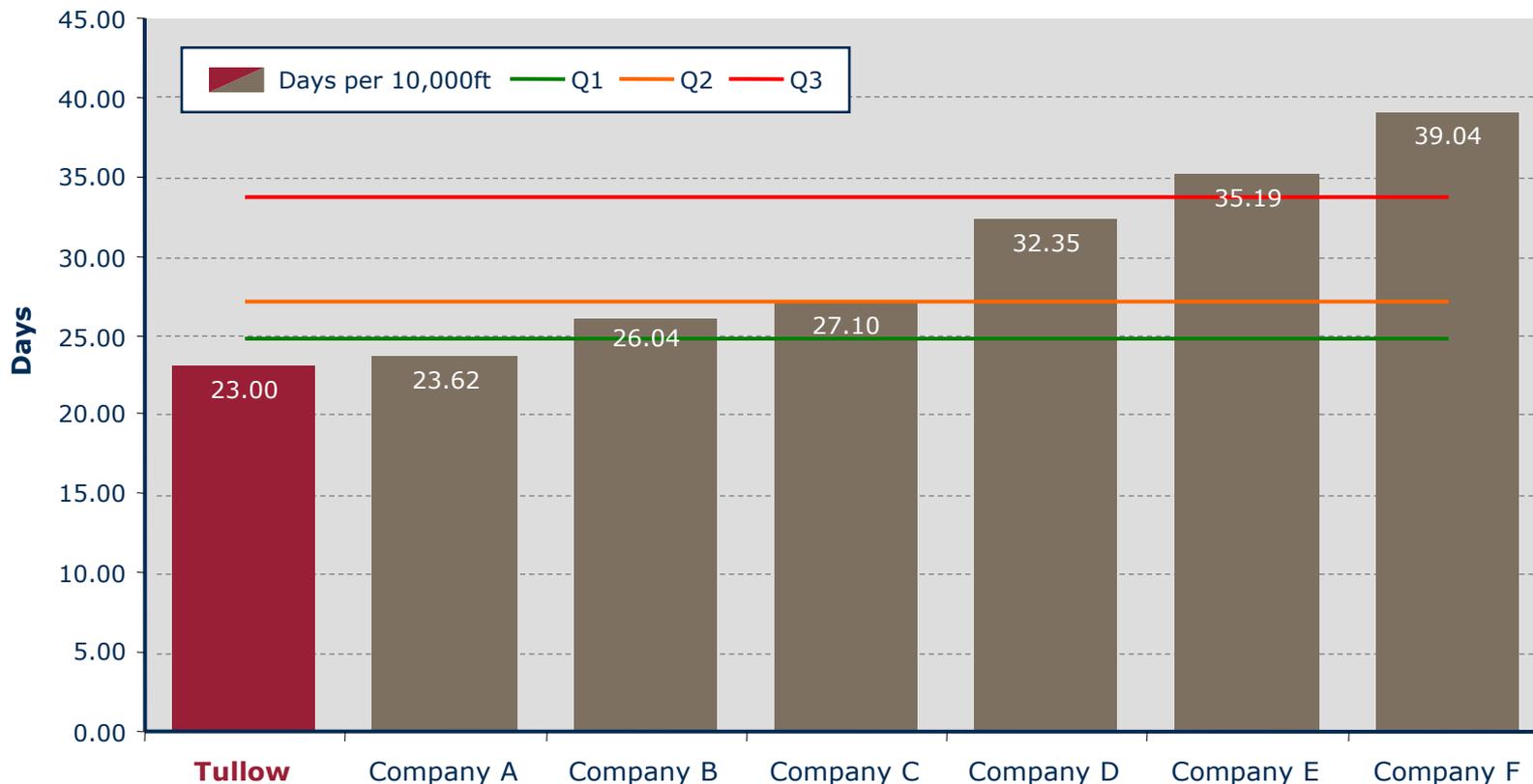
## Remote Gauge Observation wells



- Downhole gauges
  - installed in completions of 3 wells
  - 7 km apart
- Pressure and temperature data
  - Measured in downhole gauges
  - Transferred to transmitters
  - Transmitted to boat
  - Data downloaded every 3 months
  - Three year battery life
- Used to determine communication between wells through interference testing and to calibrate reservoir models

# Phase 1 drilling performance - Industry benchmark

Development Well Performance – Africa Offshore, Water Depth >3,200ft  
(Drillships and Semisubmersibles)



Tullow's deep water drilling has outperformed six Major IOC's\*

\*Source – Rushmore external benchmarking

## Phase 1 - Drilling phase summary

- Fast paced environment / minimum initial infrastructure in-country
- Achieved very good drilling performance from zero start in Tullow
  - assembled experienced team
  - applied targeted technology
  - continuously addressed performance and externally benchmarked
  - partner supported throughout
- Drilling Phase delivered ahead of an aggressive sanction budget which included limited contingency

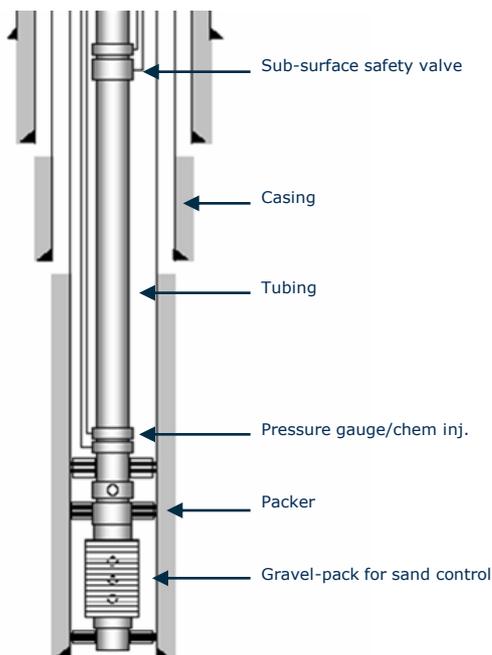
Item	Actual or Forecast (\$mm)	Sanction (\$mm)	Delta (\$mm)	Comment
Drilling to end J-17 (cost of work done)	780	800	-20	scope increase +90 <i>(well length/angle up, more testing + data gathering)</i> Performance -110

# Jubilee completions programme - Overview



FMC horizontal  
Subsea tree

Producer:  
typical completion schematic

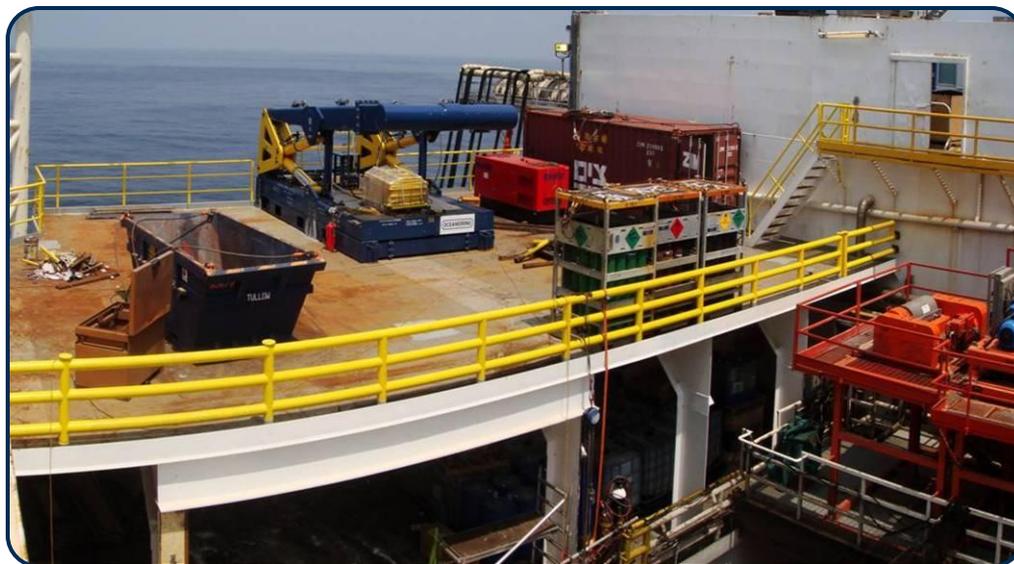


- Eirik Raude rig
  - high performance drilling rig, but little subsea completion experience
  - 2 DSTs however successfully completed on Blackford Dolphin
  
- 17 well complex completion program
  - Installation of 17 FMC Subsea trees
  - 9 Production wells - 5½" Chrome completion
  - 2 Gas injection wells – 7" Chrome completion
  - 6 Water injection wells – 7" Chrome completion
  - Installation of downhole chemical injection
  - Stacked frac packs for J-02, J-08, J-07 and J-03
  - Gauge pulling in J-2 and J-4 monitoring wells
  
- Significant equipment and interface challenges
  - 11 contractors involved
  - Equipment quality control & fast track delivery
  - Simultaneous operations (simops)

## Completion challenge - Eirik Raude modifications

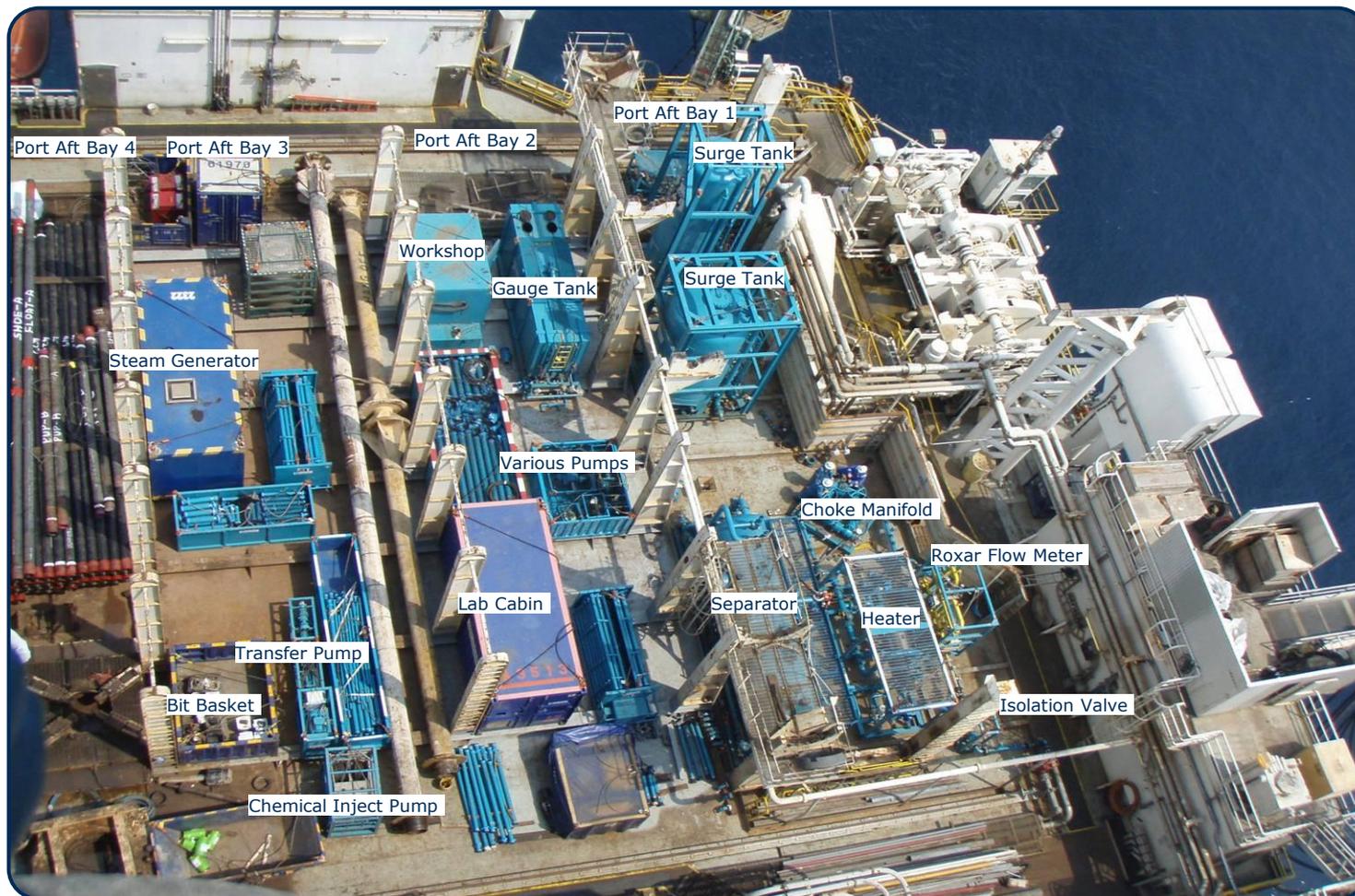


- New deck installed on Eirik Raude for completions equipment
- Modifications completed during drilling operations
- Operations completed safely with no incidents



# Completion challenge - Rig preparation

- Surface well test package set up for well clean-up
- Capable of cleaning up at rates of up to 15,000 bbls/d



## Completion challenge – Tree installation

- 9 production trees
- 8 injection (water and gas) trees
- 14 now installed
- Over 40 tonnes each
- Trees installed using Olympic Triton Vessel
- Significant time efficiencies compared to rig



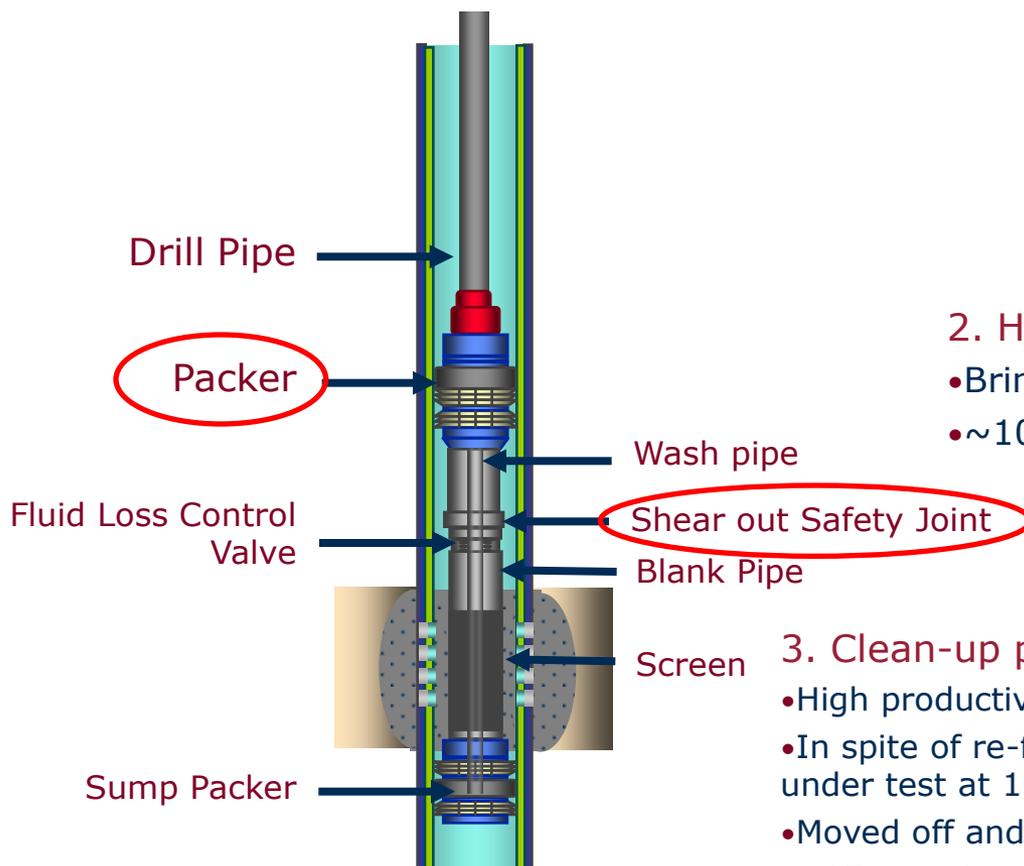
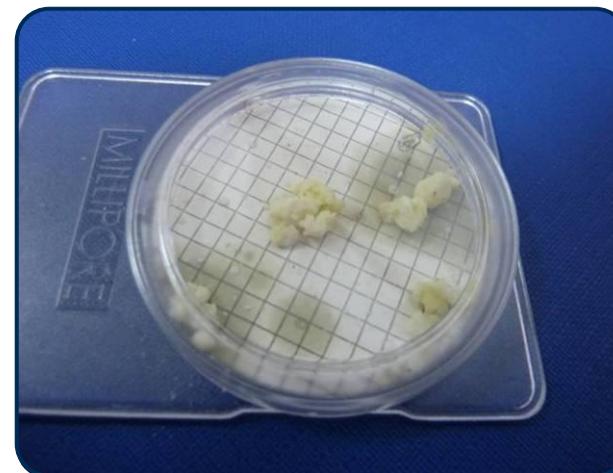
Approximately \$75 million saved



# J-01 Completion – Mechanical failure

## 1. Initial lower completion mechanical failure

- workover of an observed 20kbd+ well required
- ~40 days to workover, re-frac & re-run



## 2. Hydraulic fluid contamination in workover

- Brine and fluid precipitate in spite of flushing lines
- ~10 days to re-run upper completion

## 3. Clean-up post workover

- High productivity well required large “kill pills” to safely re-enter
- In spite of re-frac and stimulation treatments could only flowback under test at 10 kbd max
- Moved off and suspended for further clean-up to FPSO
- ~15 days further operations

# Jubilee completions programme – Improvement plan

## Lessons learnt and actions

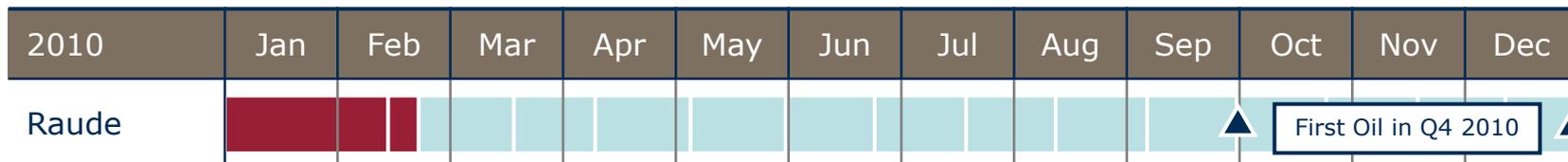
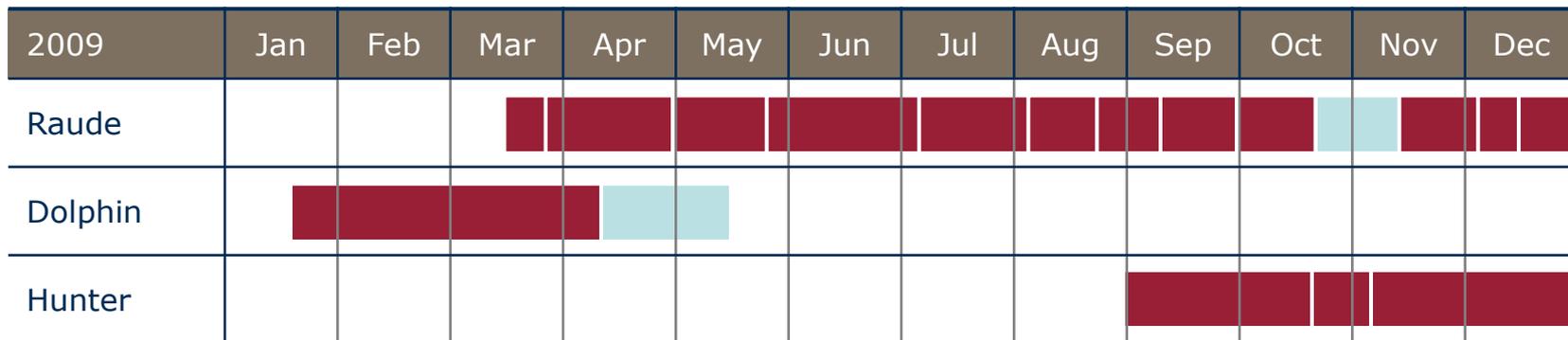
- Close out technical investigations with service companies
- Instigate program review
  - Gravel pack operations
  - Contractor performance
  - Fluid Loss Control Valve selection; design and QC
  - Control line; fluid compatibility, flushing methodology
  - Loss Circulation Material in workover; selection/deployment and remedial actions
- Resourcing
  - Partner involvement
  - External view-in to team

## Contingency plan

- Assess required well count for efficient first oil ramp-up
- Increase rig capacity to recover schedule slippage

Completions require – “get it right first time” - J-01 re-states this “rule”

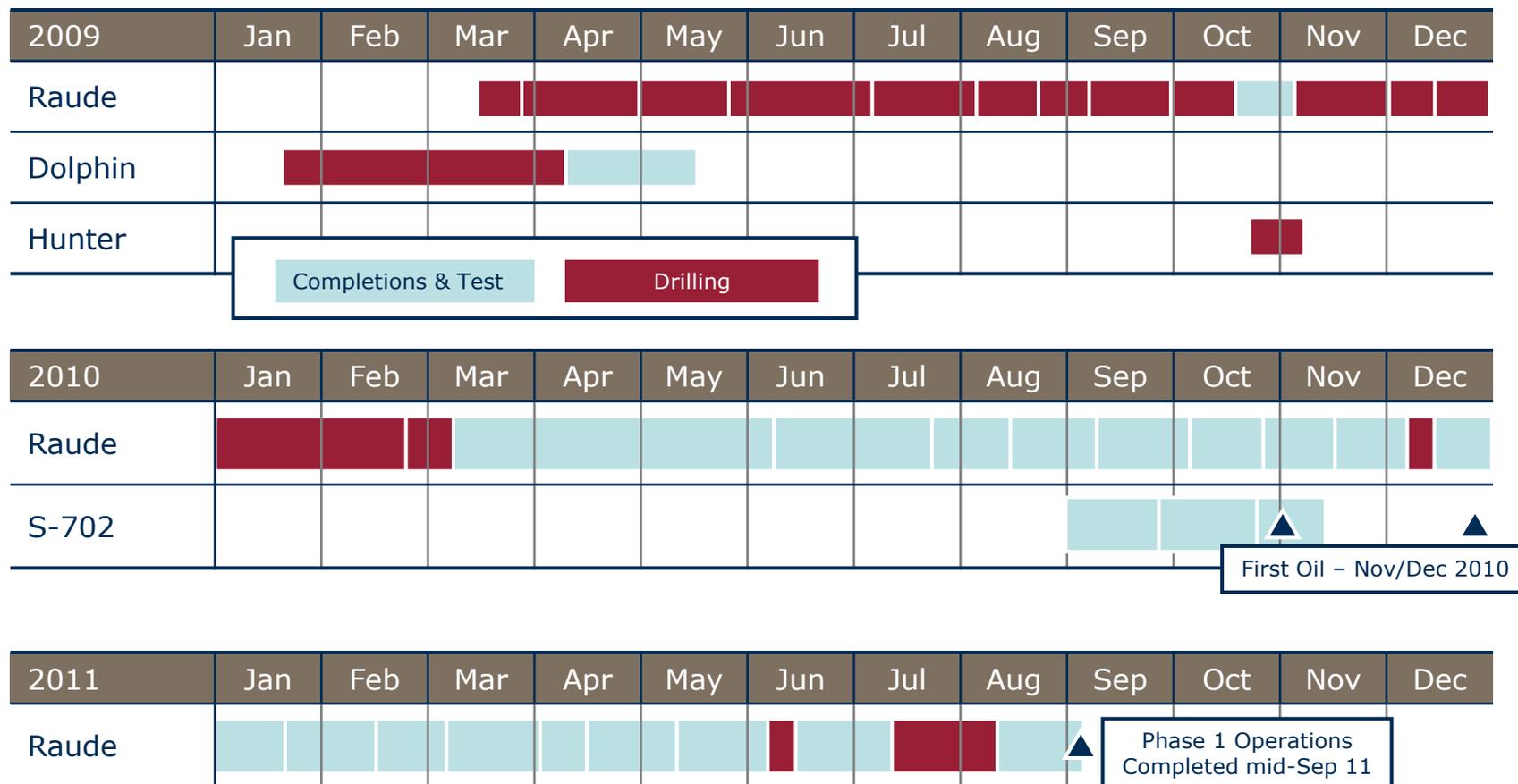
# Drilling & completion schedule – Pre J-01 delay



Completed Phase 1 Operations June 1, 2011

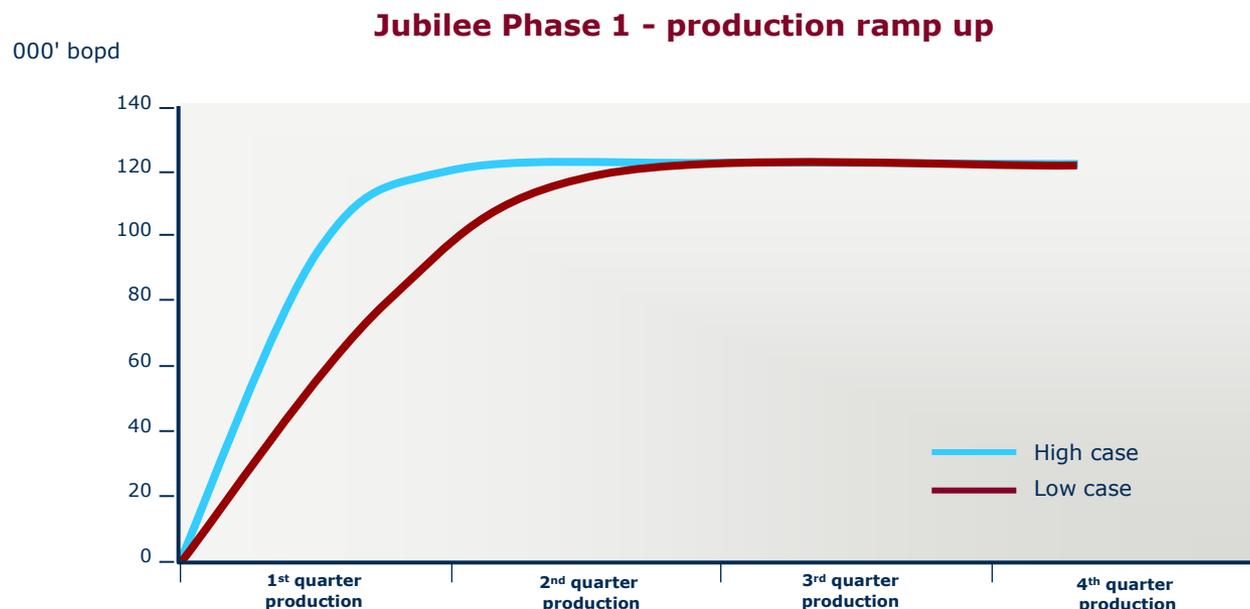
Completions & Test      Drilling

# Drilling & Completion Schedule – with Sedco 702



- Minimum well requirement for first oil; 2 producers, 2 water injectors, 1 gas injector
- 3 completions on Sedco 702 maintains forecast ramp-up

# Phase 1 ramp-up on track



- Production expected to start in Nov/Dec 2010
- Ramp up to 120,000 bopd within 6 months achievable with Sedco 702
- First cargo expected in December 2010 – January 2011

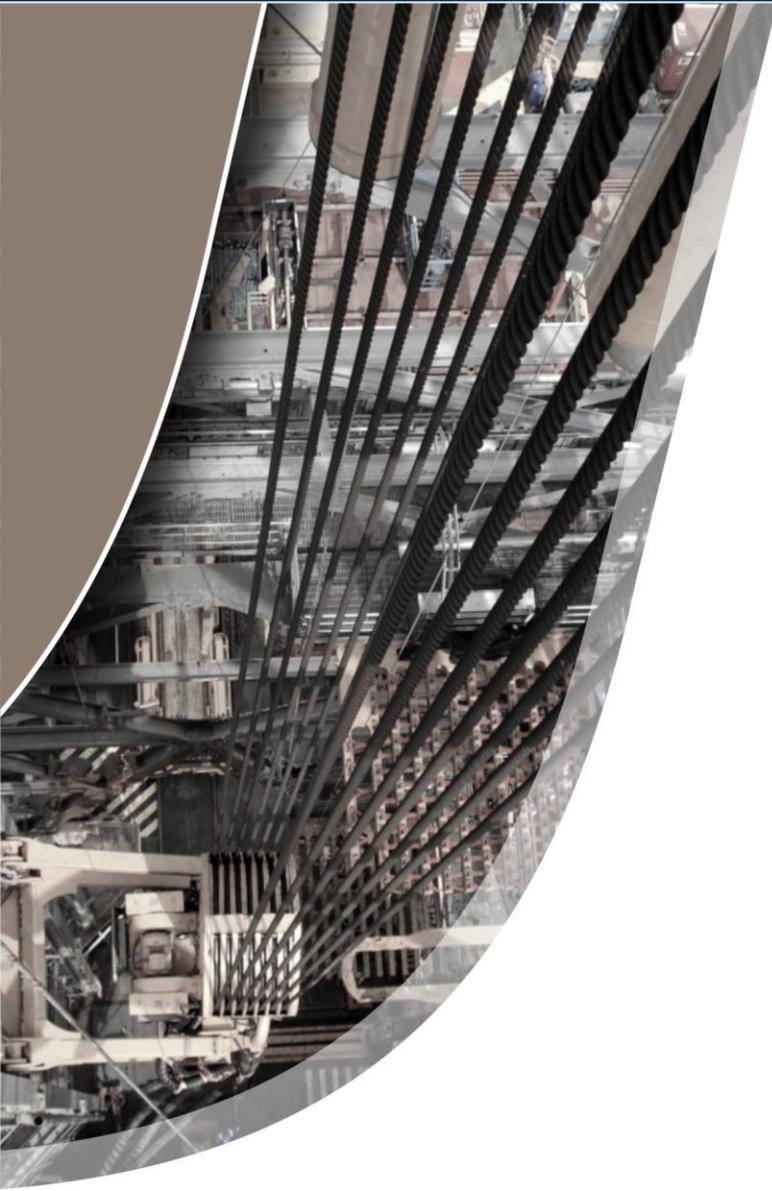
# Phase 1 cost summary – Well engineering cost forecast

Item	Actual or Forecast (\$mm)	Sanction (\$mm)	Delta (\$mm)	Comment
Drilling	780	800	-20	scope increase +90 (well length/angle up, more testing + data gathering) Performance -110
Completions	980	700	280	scope increase +125 J-01 re-work +100 2 <sup>nd</sup> rig use plan +30 vessel tree work -75 contingency + 20 No services share +60 IWOCS purchase +20
<b>Total</b>	<b>1760</b>	<b>1500</b>	<b>260</b>	

Green = positive, Amber = neutral, Red = negative

- Performance savings of \$186m
- J-01 completion failure total impact ~\$130 million
- Positive scope changes and inability to share services had impact of over \$300m
- Well completions are now overall project critical path item

# Facilities – Stuart Wheaton



## Facilities status

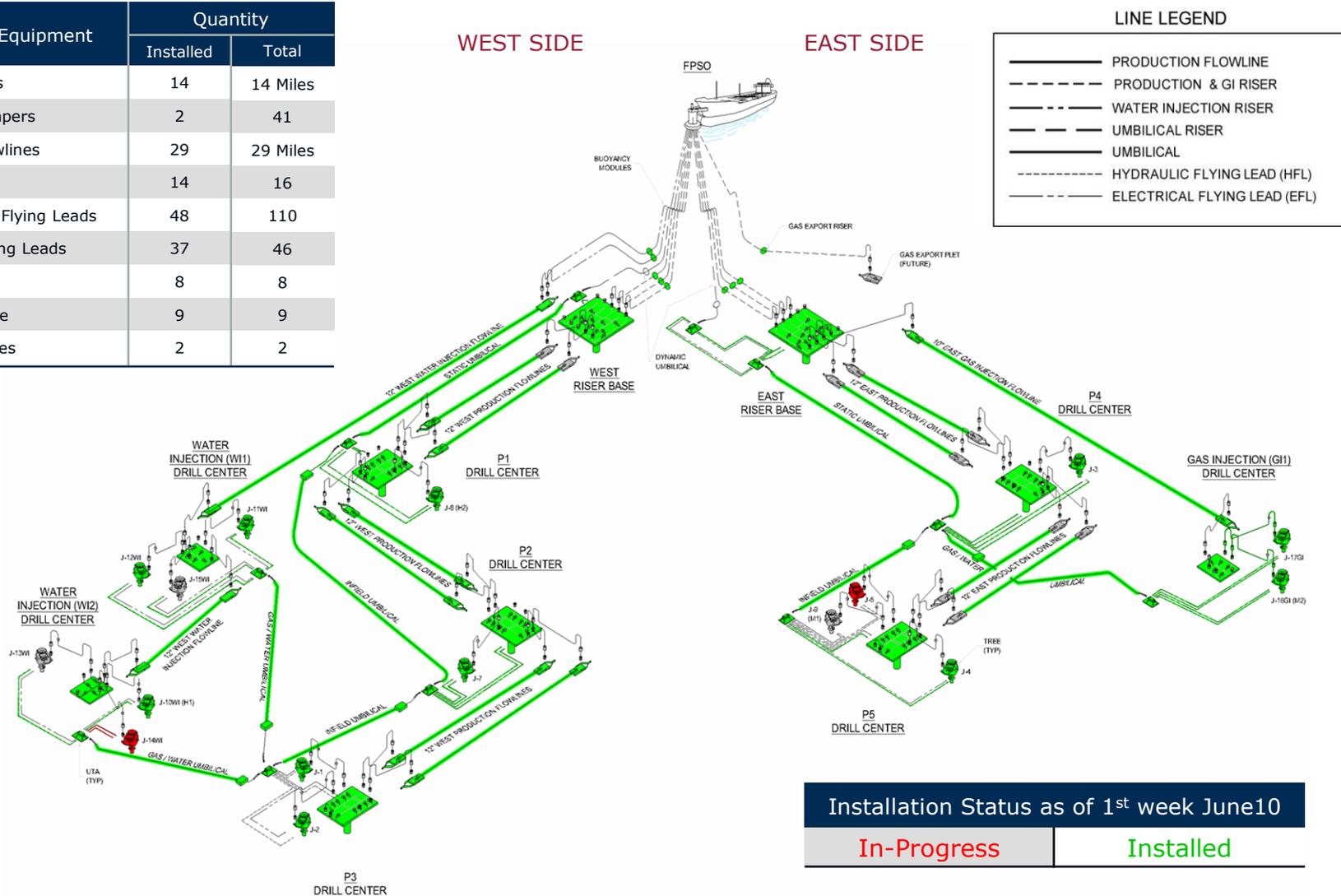
- FPSO now ~99% complete
- Arrived in Ghana - 21 June
- Commissioning transit
  - Leak testing completed
  - Major sub-systems pre-commissioned
    - heating medium
    - power
    - firewater
  - Pre-commission oil process train on diesel including turret manifolds
  - Deck hydroblast and painting
- Mooring pile installation completed
- Mooring leg installation vessel has commenced work
- Subsea equipment
  - All trees required delivered to Ghana
  - Flexible risers loadout this week in France



Jubilee FPSO at final deep water anchorage prior to sailaway from Singapore (20 May)

# Subsea facilities - Installation schematic update

Subsea Equipment	Quantity	
	Installed	Total
Umbilicals	14	14 Miles
Rigid Jumpers	2	41
Rigid Flowlines	29	29 Miles
Trees	14	16
Electrical Flying Leads	48	110
Steel Flying Leads	37	46
Manifolds	8	8
Tether Pile	9	9
Riser Bases	2	2



# Subsea facilities delivery in 2009



- delivered on time
- delivered under budget
- now installed subsea

# Subsea facilities delivery & install work 1Q 2010

Deep Blue reeling pipeline (Technip)  
- 2nd reeling in Angola



149 flying lead connectors for  
sub-sea - (Deep Down supply)



28 km Flexible risers - in LaTrait  
France, on schedule (Technip supply)



subsea controls distribution units  
ready to install (FMC supply)



# Subsea facilities installation work 1Q 2010: All to schedule



Manifold installation example



Technip flowline construction yard at Sekondi set-up – direct local employees – strong IPT involvement/drive

Deep Blue major installation vessel at work in field



# Flexible risers buoyancy module trial fit in Le-Trait, France (2Q 2010)

- several 100's of these "floats" will be installed on the risers connected to the FPSO turret
- reduce load on the turret
- allow riser movement



## Flexible risers and flowlines stored in Le-Trait, France



- Each riser is over 1 km long to connect subsea riser base to FPSO turret
- Ready to load-out from France

# Technip flowline “jumper” yard – Sekondi (22 May 2010)



- “jumpers” connect the subsea trees on the wells to the manifolds where production or injection is gathered or distributed
- jumpers also connect manifolds to major flowlines/pipelines on the sea bed
- jumpers made after the exact manifold and flowline/well locations are known
- a very important local content step
- yard managed by Technip
- over 40 will be made

## First jumpers loading on MV Aalesund Vessel



- “jumpers” are shaped to allow for temperature cycling/expansion
- awkward shape
- note special end connectors

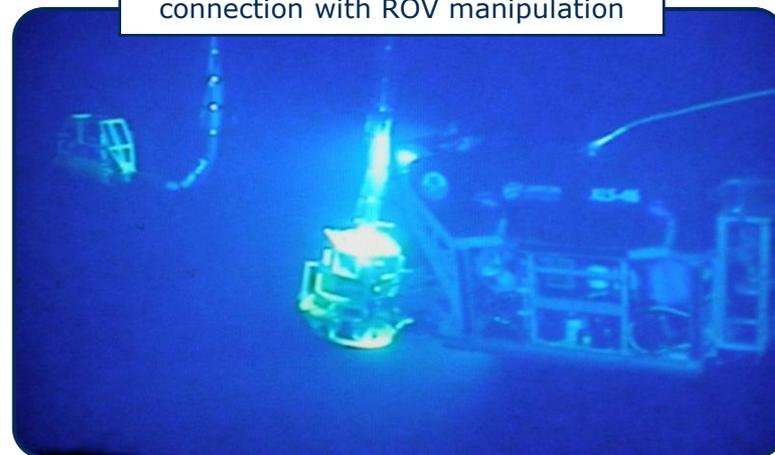


# Jumper installation

lifting from the vessel deck  
by construction crane



connection with ROV manipulation



# FPSO Turret – Riser pull-in critical activity



- risers will be pulled in and connected to turret using winch and construction vessel crane
- turret access platform for monitoring of operation and future inspection activity
- an important “get it right first time” activity

## Facilities summary plans

- Remaining FPSO installation scope
  - Install and connect/pull-in 9 mooring legs (chain and poly) – Olympic Zeus
  - Install three seawater lift hoses (includes diving)
- Commence riser pull-in works for ~2 months from mid-July
- Commission subsea – topsides interface Sept-November
  - Rotational commissioning/production FPSO crew commences July
- First oil - November/December 2010
  - Project stretch target remains early November
- Project team assistance to operations shake down phase
- The facilities progress is world-class and reflects the experienced and dedicated multi-company (Partner) team

## In-country infrastructure and production preparation



# Jubilee field – Operational scale

## Initial Estimate (Phase 1)

150-160 Tullow Ghana positions  
 ~700 in-country total contractors, of which ~400 rotational positions

**Total personnel ~1200**

*Project install +400-500 persons at any one time*



Accra-Takoradi upgraded air-bridge from Nov 09, 10-15 contractor



HQ office  
 ~130 TLW +20-30 contract + MODEC Accra

CÔTE D'IVOIRE

GHANA

EFFASU

TAKORADI

ACCRA

TEMA

Gulf of Guinea

**JUBILEE**



FPSO 50-80 POB, max 120



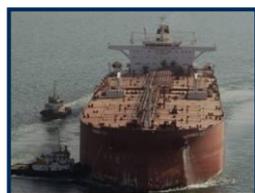
Rig 1, 100-120



MPV – Bourbon Astyanax



Supply + port base  
 + port ~30 TLW + 20-30 contract persons inc MODEC  
 + ~25 direct labour contractor +20 stevedore etc



Tanker handling  
 Tug/AHT ~12



Rig 2, 100 (rig share)



Daughter Craft.

Marine Fleet  
 1 MPV with ROV, 1-3 AHT/PSVs  
 1 daughter craft, ~100 direct contractor staff



Upgraded helo operation  
 10 pax + 2 crew, x2 craft  
 Latest OGP spec;  
 20-25 contractor

## Office development – Accra



Approaching completion – ready to occupy July 2010

for all departments. Includes;

- Emergency Response Room
- MODEC representation
- Collaborative Working Environment (see below)
- Major meeting location + training rooms



# Offices & staff housing (Takoradi)

## Bay Court regional office - Takoradi



Paloma House  
shorebase team



Airport Ridge  
Project & shorebase teams

## Logistics Base offices - Takoradi



Chapel Hill - Takoradi project  
team accommodation

# Phase 1 Civils – Takoradi shorebase and ports 2008-2009

## Access – new roads built



## Takoradi Pipeyard – major construction



## Lighting/Fencing/Buildings at shorebase



## Sekondi naval port – quayside repair for navy base



# Phase 2 Civils – Takoradi shorebase works 2010

QA/QC Inspection Area for well equipment



New Pump House & A/C Store at shorebase



Covered Storage Facilities



Water & Fuel Storage



Taxiway Improvements



## Other key facilities developments – Takoradi

Marine Offices (and Skandi Aker)



Prodn chemicals store quayside – to build



Bird scaring - Takoradi  
Airport – 4 gas cannons  
installed + vehicle/team



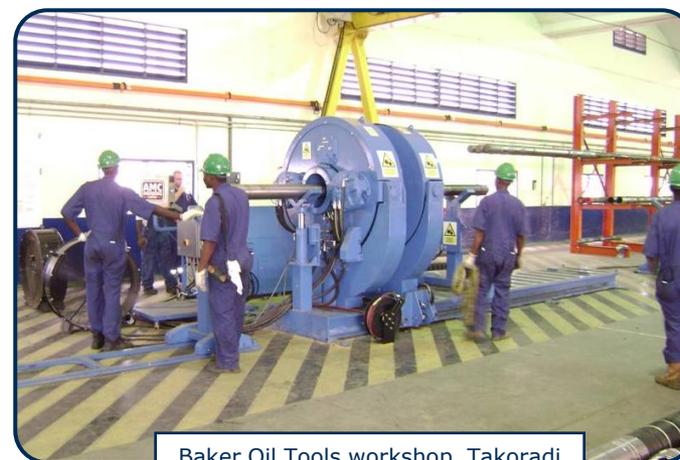
# Jubilee Phase 1 – Local content & development

- Local content is a key focus
  - long term commitment & TGL has dedicated LC team
- Since project start, Tullow Ghana has awarded
  - >750 local contracts/POs
  - in 2009 \$45million paid to local entities
  - in 2010 forecast at >\$70 million
  - TGL new local awards now running at \$0.2-0.5 million per week
- Major oil service contractors establishing
  - >500 direct contractor positions to Jubilee
  - >\$20million in local content set-up to date

Tullow Ghana pipeyard, Takoradi



FMC new site works start in Takoradi port

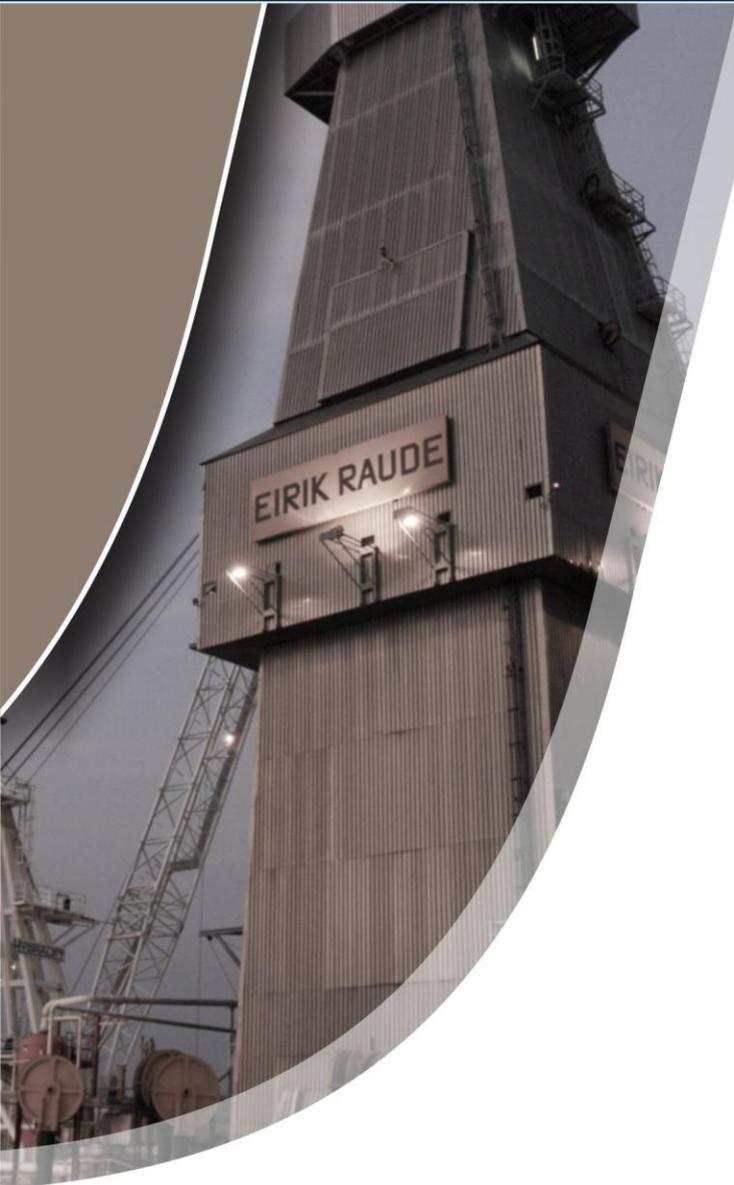


Baker Oil Tools workshop, Takoradi

## Production readiness - Summary

- Organisation
  - Tullow production operations team in place in Ghana
  - MODEC FPSO – crew recruitment on-going
    - MODEC target 40-50% national staff at start-up
    - MODEC Jubilee is integrating into Tullow Ghana organisation
- Start-up preparation & Review/Audit
  - April 2010 FPSO contractor readiness review
  - Start-up FPSO and subsea documentation prepared
  - August 2010 Start-up on Paper workshop
  - Independent ready for start-up audit prior to first hydrocarbon
- Government agency engagement – wide ranging in all aspects
- Data management – real-time and data historian systems
- Performance monitoring & optimisation preparation
  - Well & reservoir performance and forecasting
  - FPSO process performance focus areas identified

# Cost and Schedule Summary – Stuart Wheaton





## Jubilee Phase 1 – Summary cost performance

All \$ bn (gross)	Sanction	Forecast	Comment
Facilities (incl contingency)	1.4	1.3-1.4	Running to budget – some contingency may remain unused
Well Engineering	1.5	1.75	Drilling slightly under budget Completions scope and J-01 performance over
G&A + Prodn Preparation (incl. infra-structure)	0.3	0.25	Running slightly under budget
<b>Grand total</b>	<b>3.15</b>	<b>3.3 – 3.4</b>	<i>VOWD ~ \$2.1 bn (65% of sanction). Remaining contingency ~10% of remaining spend</i>

- Well engineering completions impacting project out-turn
  - current forecast for project is 5-8% over sanction
- FPSO Lease Agreement – re-worked after 2008 financial turmoil
- Plateau period opex ~\$7-8/bbl
- FPSO purchase option may be exercised at anytime; decision made when reservoir and vessel performance proven

# Development plan – Jubilee Unit and southeast Jubilee

## Jubilee Unit – Phase 1

- FPSO in field and starting installation phase
- Subsea equipment ~75% installed
- Drilling of 16 development wells complete
- Well completions under way
- On track for 4Q 2010 first oil and delivery within 10% of budget

## Jubilee Unit - Phase 1a

- Infill program potential of 5-8 wells identified to maintain plateau
- Detailed work underway
- Phased sanction likely in 2010-2011
- Timing depends on Phase 1 performance

## Jubilee Unit - Phase 1b

- Further significant infill program
- Likely also require expansion of subsea infrastructure
- Sanction likely in 2011/12
- Use of existing FPSO or combined development with southeast Jubilee under review

## Southeast Jubilee

- Appraisal programme complete (M3, M4, MD-2 & M5)
- Work underway reviewing development options
- Independent and satellite options being considered
- Neighbouring prospects included and planned to drill 2010-2011

# EHS in Ghana



**Dai Jones**  
President and General Manager of Tullow Ghana

# EHS 2010 Performance YTD June 16th

TYPE	TGL 2009 Actual	Group Actual 2009	TGL 2010 Target	Group Target 2010	TGL 12 MRA YTD	TGL YTD
<b>Major Incidents</b>						
Workforce fatality	0	1	0	0	0	0
HIPOf	3.0	1.54	<3.0	<1.54	1.3	0.8
<b>Health and Safety</b>						
Loss time injury f	1.0	0.77	<1.0	<0.77	0.4	0
Total recordable injury f	6.0	3.09	<6.0	<3.09	3.9	2.2
Driving safety	0	1.96	0.0	<1.96	0.0	0
<b>Environmental</b>						
Oil spills >1 bbl	0	n/a	0	n/a	1	1
Env. Significant incidents	0	0	0	0	0	0

## Reduction in Lagging Indicators:

- ✓ Dropped Objects Prevention Program , Audit of crane and lifting procedures
- ✓ Reinforcement of intervention in ER Rig, Audit of Control of drilling fluids/Equip lead to reduction in minor spills

# TGL EHS Success

## Relationships with Key Stakeholders:

- Environmental Protection Agency,
  - Oil On Cuttings Survey W/Norway
  - EIA & Public Hearing Process
  - 40 Consultation meetings (~4000 people)
- Ghana Maritime Authority
  - Exclusion Zones / IMO Charting
- Ghana Navy
  - Patrolling Fishing Boats
  - Voluntary Principles & Human Rights
- Emergency services
  - Showcase Aberdeen
  - GOELF - Ghana Offshore Emergency Response Leadership Forum
- Assisting with technical advice, formal training and funding for sourcing of technical expertise



**“You achieve the level of safety you demonstrate you want”**

## TGL EHS Success

### People:

- Developing local content through recognised EHS qualifications
- National Examining Board in Occupational safety and health
- Dangerous goods safety advisor
- Occupational Health physician
- Security liaison specialists
- Ghanaians EHS Professionals
  - 4 EHS Team
  - 2 GNPC EHS Professionals



“You achieve the level of safety you demonstrate you want”

# Compliance and Regulations

## The Challenge

- Fast Track Project
- First Time – for Regulatory Agencies

### **Milestones**

- Compliance with Regulatory Requirements

### **Environmental Permits on time for**

- Exploration and Appraisal Drilling Phase
- Development Drilling Phase
- Installation phase
  - Sub Sea & FPSO Installation

### **Flexibility from Regulators**

- Supportive permit requirements

## The Approach

- Collaborative working with Regulators & Key Stakeholders
- Sharing examples of other regions –
  - Industry Best Practice
- Contribution and joint funding
  - Offshore survey & capacity building
- Joint Development of Environmental standards
  - Medium to long term view
- Collecting Data and Monitoring Impact
  - 3 year Period
- Extensive Public Consultation Meetings
  - Regional and National Stakeholders

# TGL EHS Success

## EHS Programme

- Emergency Response and Crisis Management
  - Regular Training for response teams for identified Scenarios
  - Oil spill Contingency Planning, modelling of oil spills
  - Specialist resource and support
- Health Management
  - Malaria Prevention Program
    - 2Q First quarter free of malaria cases
  - WARA (Accra, Takoradi)
    - West African Rescue Association
  - Helicopter winch capable
    - Fuel capacity for Accra response



“You achieve the level of safety you demonstrate you want”

# Oil Spill Response

## Environmental Oil Spill Response criteria:

Old system	New System
Tier 1 <10bbbl	Individual company capability
Tier 2 >10 <1000bbbl	National Capability
Tier 3 >1000bbbl	International capability

## Current Oil Spill Response Equipment:

- 2x Afedo dispersant sprayers located offshore
- 1x Sidesweep boom on security patrol vessel Orion. Aimed at Tier 1 response.
- A Tier 2 oil spill response is provided by the WACAF aerial surveillance and dispersant application service operated by OSRL. OSRL have a small stock of dispersant in Accra
- OSRL Tier 1&2 Harbour and Onshore /Near shore package located in Takoradi. This equipment is to protect the shoreline in the event that an offshore spill heads towards shore.

## Planned Oil Spill Response Equipment for 'Safe' first oil:

- Tullow will establish 100% redundancy for a Tier 2 capacity and maintain a semi-permanent OSRL presence to further develop local capacity and capability

**"You achieve the level of safety you demonstrate you want"**

## Learning From Others:

Main focus by the US Government's on BP blowout 2010, Pemex Ixtoc 1979 :

- Well development and design

Additional areas of focus / root causes:

- Project management
- Contractor management
- Oil Spill Response

Assurance - What will we do differently?

1. Well design and integrity

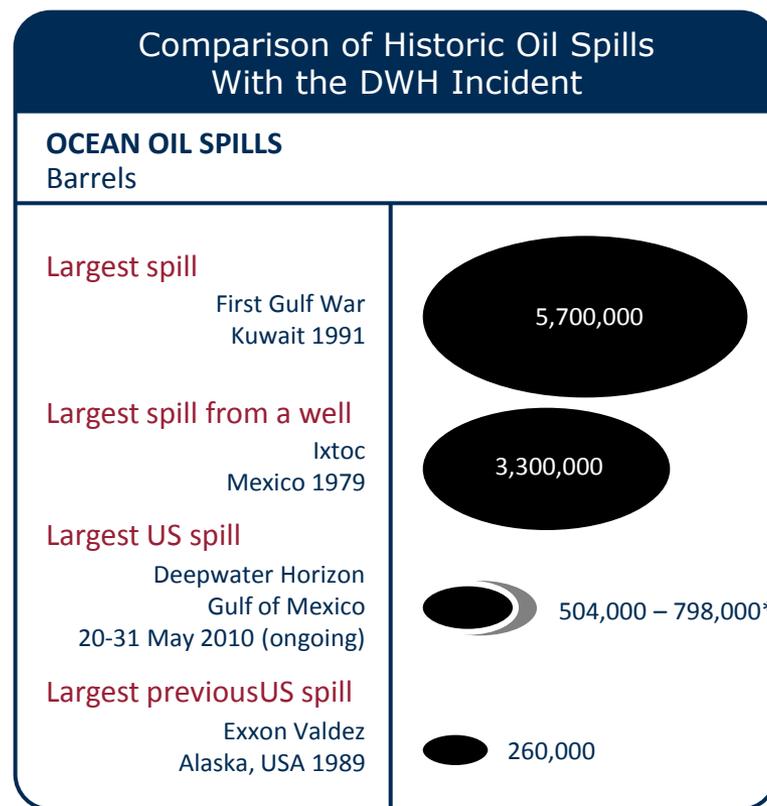
- Differential technology,
- Reliability of safety critical equipment

2. Process control and Quality assurance

- Systematic tested operating instructions
- Stage gate **Go/No Go**

3. Emergency preparedness and capability

- QRA/Safety case evaluation
- Training / Testing and building capacity
  - Self reliant Operator infrastructure



\* 12-19,000 barrels per day

Source: Oil Spill Intelligence Report,  
All figures are estimates

**“You achieve the level of safety you demonstrate you want”**

# EHS Management going forward (1)

- Redundancy in the systems:
  - Safe systems of work, Emergency response, crisis management
  
- Management of our licence to operate through corporate governance
  - Independent audit/s
  - Proactive intervention for operations
  - Policy, procedures, integrity management, organisational competency
  
- Evaluate emergency response capability
  - Review worst case scenario – ‘prevention’
  - Independent audit of emergency response capability
  
- Identify ‘Best Practice’ for continuous improvement:
  - Well design
  - Emergency Response
  - Preventative maintenance programme
  - Staff competency
  
- Enterprise Risk management
  - Corporate governance for risk management
    - Protection of shareholder investments and company assets through governance
    - Audit of control processes
    - Develop internal audit function
    - Integrated EHS/Business risk management.

## EHS Management going forward (2)

### Achieving Sustainable top quartile EHS performance requires:

- Established clear Delegation of Authority with appropriate governance
  - Financial authority vs Operational authority.
- Ensure transparent collaborative hazard identification
  - Leadership risk management
- Enterprise Risk Management (define ALARP)
  - Safety case Levels of protection
- ALARP Assurance (Independent EHS Audits)
  - Reliability of risk control measures
  - Continuous improvement process
  - “No Surprises”
    - Integrity Management
    - Process control and Quality assurance
    - Emergency preparedness and capability
    - Active monitoring and reactive learning

**Delivering  
'Safe' First Oil**

**“You achieve the level of safety you demonstrate you want”**

# Commercial Update



**Ted Harrigan**  
Ghana Commercial Manager

# Agenda

---

- Jubilee Crude Marketing
- Domestic Supply Requirement
- Gas Market and Infrastructure

# Jubilee – General background

## Deepwater Tano

Area: 1108 sq km

PA signed 10 March 2006.

Licence effective from:  
19 July 2006

### Partnership:

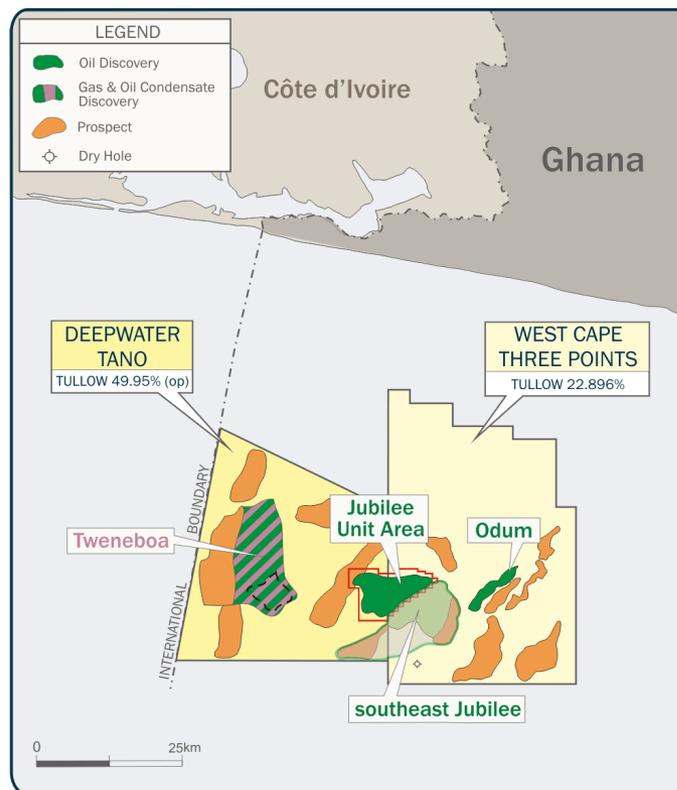
**Tullow: 49.95 (op)**

Kosmos: 18%

Anadarko: 18%

GNPC: 10%

Sabre O&G: 4.05%



## West Cape Three Points

Area: 1957 sq km

PA signed 22 July 2004.

Licence Effective from :  
17 Nov 2004

### Partnership:

Kosmos (Op): 30.87%

Anadarko: 30.87%

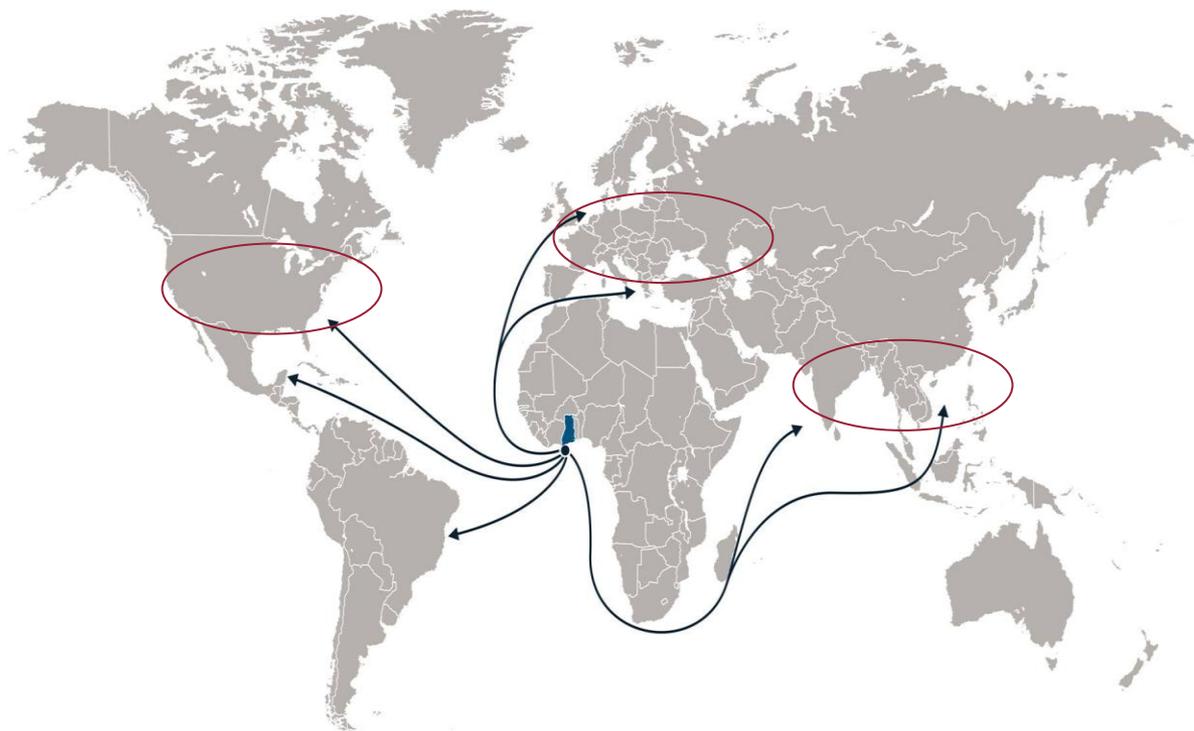
**Tullow: 22.89%**

GNPC: 10.0%

EO Group: 3.5%

Sabre O&G:  
1.85%

# Jubilee – a crude oil with a global reach



## Location

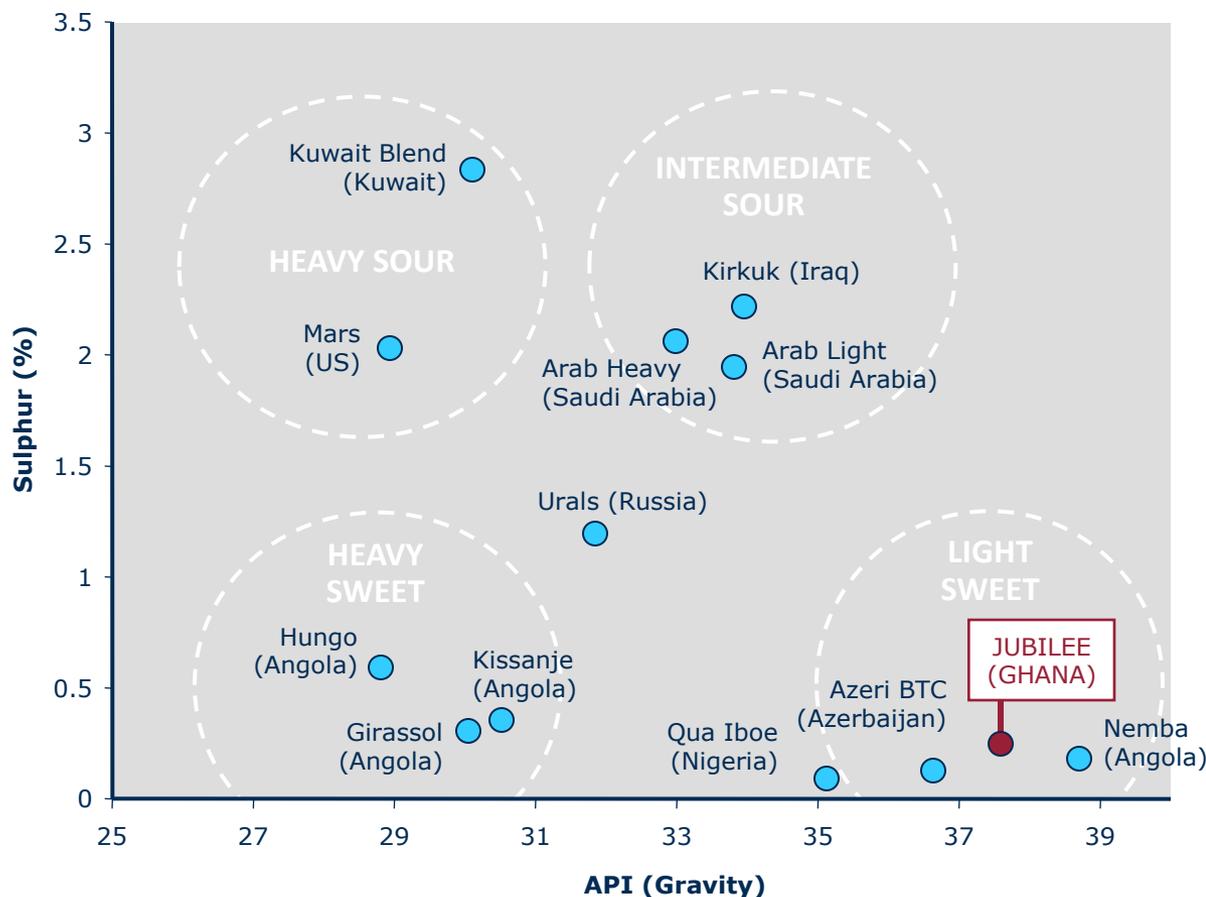
The location of the FPSO offshore Ghana will allow Jubilee to access all the major refining markets of Americas, Asia and Europe.

Jubilee will be able to swing export between regions always catching the best buyers

## Shipping Flexibility

- The FPSO will have the flexibility to load between 0.6 and 1.0 mmbbls of oil
- The range will allow full loading of Aframax (0.6 mmbbls) and Suezmax (1.0 mmbbls) vessels
- The deep draft will also enable the FPSO to co-load VLCC vessels (2 mmbbls)
- Oil traders will be able to profit from Jubilee's freight economics, enabling it to be shipped into all major markets

# Jubilee Quality



- Crude Oils are categorised according to API and Sulphur
- API is a measure of crude oil density. The lighter (higher API), the better the crude quality (Light vs. Heavy)
- Sulphur needs removing from crude oil (as levels are capped in final products). The lower the Sulphur level, the higher quality the crude oil (Sweet vs. Sour)

Jubilee Crude is a high quality LIGHT SWEET CRUDE OIL

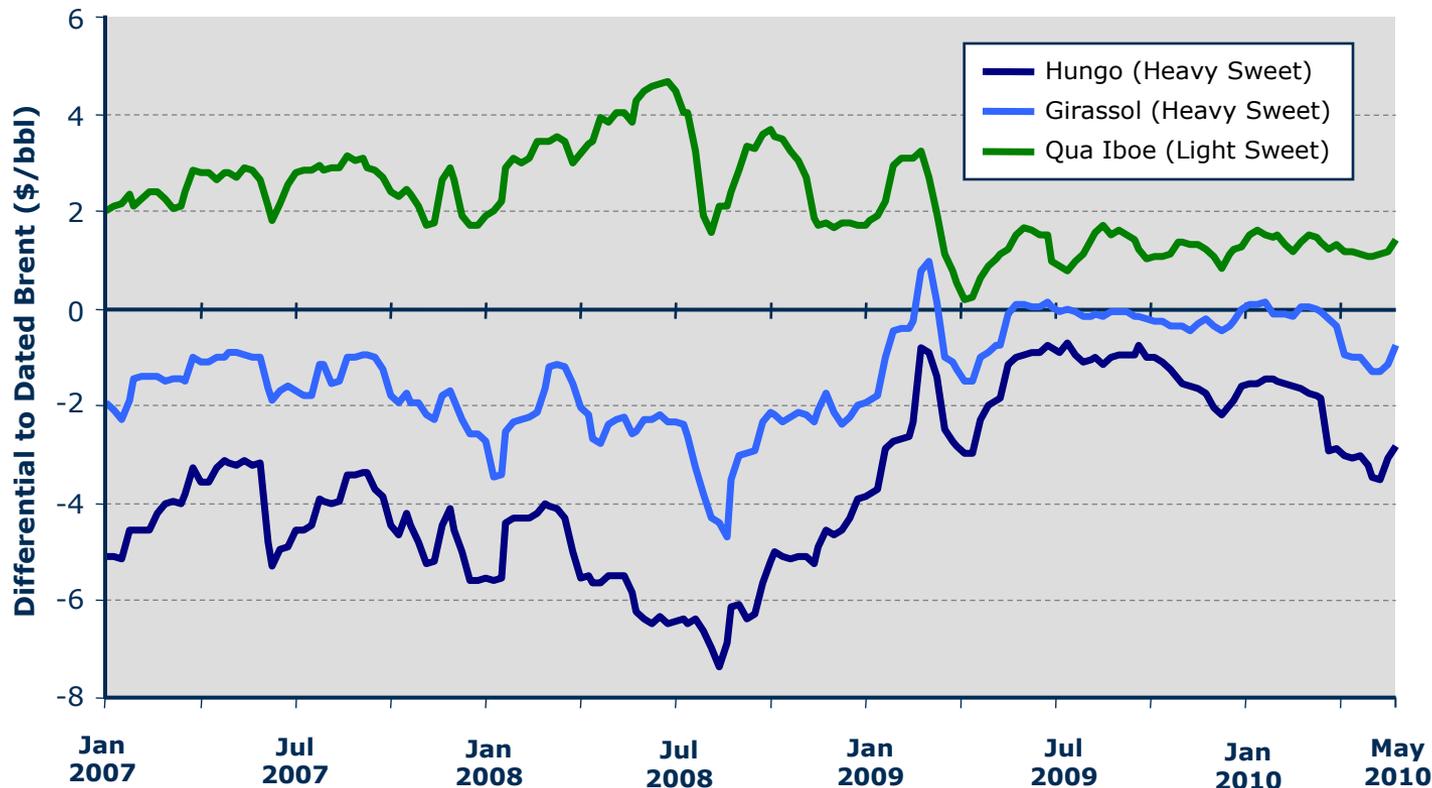
# The Light Sweet Crudes



- Jubilee crude is similar to the North Sea grades of Ekofisk and Oseberg.
- Nemba (Angola) and Qua Iboe (Nigeria) are the most similar quality crude in West Africa

Light Sweet crude oils will appeal in particular to topping refineries which should value its excellent quality

# Crude Prices

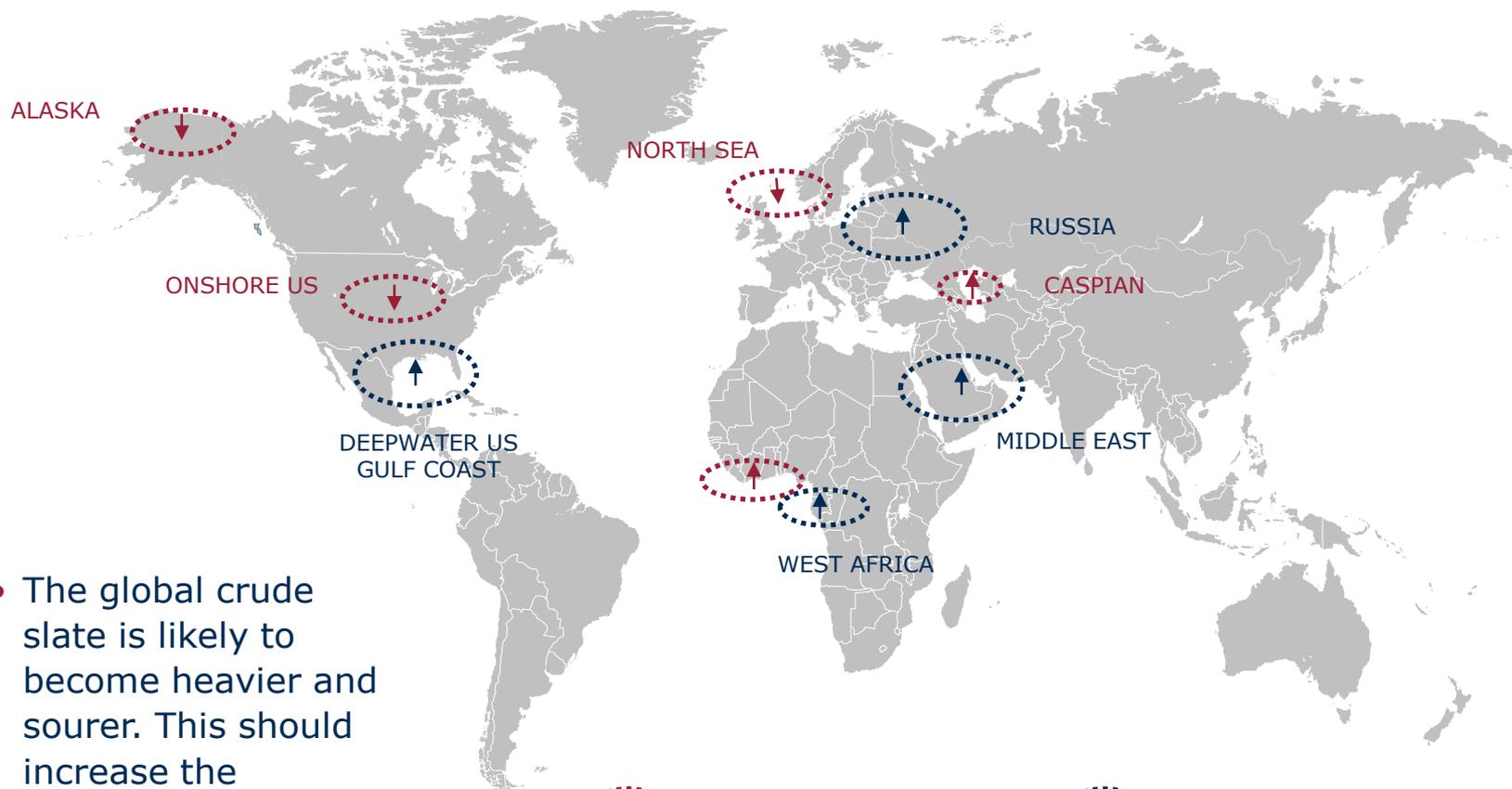


Refiners will pay more for crude oils with favourable characteristics

Jubilee has excellent properties

Light Sweet crude oils from West Africa tend to trade at a premium to Dated Brent whereas the Heavy sweet grades tend to trade at a discount

# Global Crude Qualities



- The global crude slate is likely to become heavier and sourer. This should increase the demand for Light Sweet Crudes

 Light sweet crude supply is generally in decline (North Sea and onshore US) despite developments in Caspian and West Africa .

 Sourer, heavier crude supply globally is increasing from Middle East, Russia and non-OPEC developments (Angola/USGC).

## Domestic Supply Requirement (DSR)

- As in most international projects the Government of Ghana has the right to purchase Jubilee Crude to meet supply requirements for the country that are not satisfied by the GoG share of production.
- DSR to be purchased by GoG at market price.
- Jubilee partners and GoG will evaluate how to create the best overall value for Jubilee Crude.
- DSR procedures to be agreed
  - Quantity
  - Nominations
  - Lifting

## Domestic Supply Requirement

- Crude oil is imported to Ghana for use at Tema and the VRA power station at Takoradi
- The DSR is for crude oil consumption in Ghana, not for re-export as crude or products
- Product demand growth is likely to continue
- Crude demand likely to change in future as
  - Refinery may be expanded
  - Gas replaces oil for power



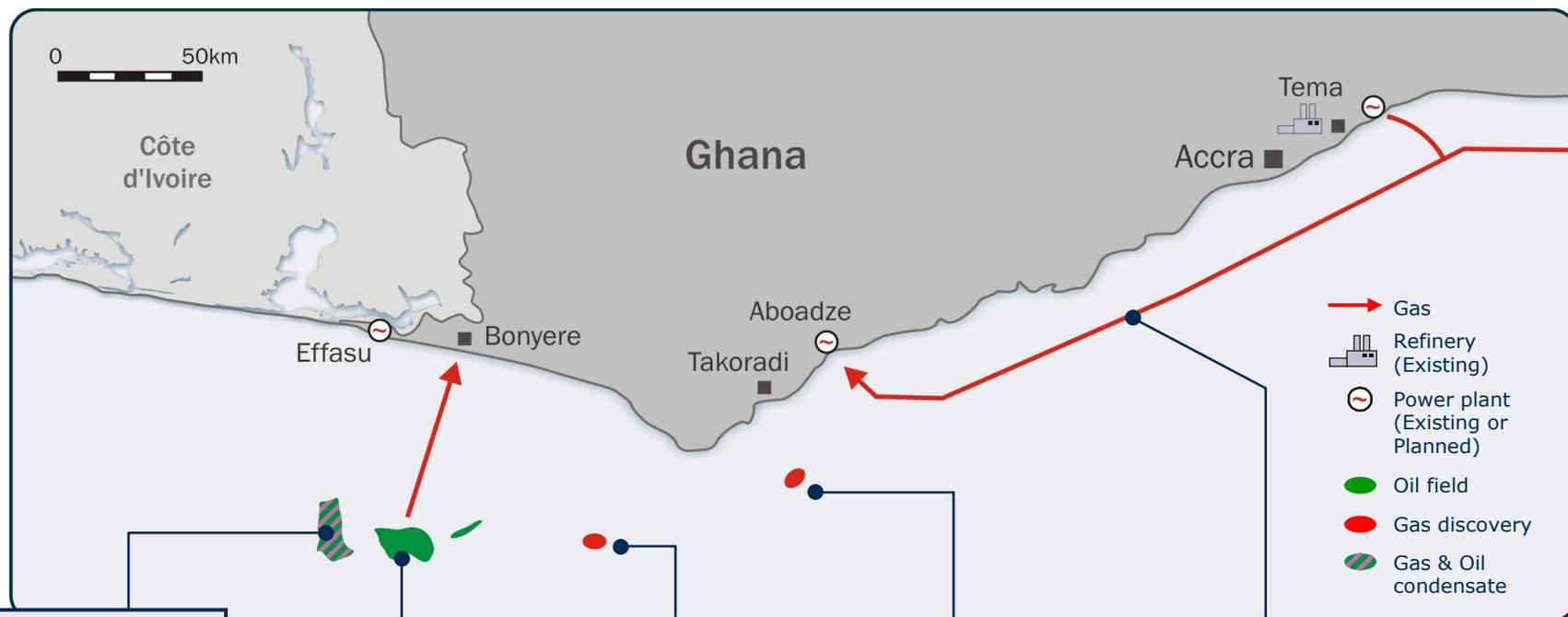
## Crude marketing challenges remaining

- Completion of the Crude Oil Lifting Agreement
- Conclude crude Marketing Agreement
- Completing the Domestic Supply Requirement procedures
- Hydrocarbon Allocation System

## Natural Gas Overview

- Natural Gas - Positive contribution to Ghana's economy
  - Government looking forward to Gas as an economic stimulus
  - Saving oil by conversion of oil fired power
  - Stimulate industrial gas demand at gas hubs
  - GNPC to develop open access infrastructure
- Good progress over the past year
  - Initial Nigerian supplies to Takoradi power plant via WAGP
  - Completion of Shenzhen gas IPP
  - Initial Infrastructure anchored by Jubilee (phase I) underway
- Future market, infrastructure and supply growth
  - Significant activity will take place over the next 2-3 years
  - Gas discoveries by Vitol (ENI) and Lukoil
  - Ramp up of supplies from Jubilee

# Gas supplies



**• Tweneboa**

- ongoing appraisal to assess fluid volumes and composition
- Gas availability will depend on development scheme
- Gas recycling likely for a period to enhance liquids recovery

**• Jubilee**

- will supply first 200 bcf of gas without charge
- Rate expected to be up to 70 MMscfd, with remainder reinjected
- Infrastructure underway

**• Sankofa, Vitol**

- gas discovery in Sept 2009
- Needs appraisal

**• Dzala, Lukoil**

- gas discovery in Feb 2010
- Needs appraisal

**• WAGP**

- supplies gas from Nigeria
- Currently 50 MMscfd, but should increase to 120 MMscfd
- Capacity of up to around 400 MMscfd
- Gas price reportedly at \$5-7/MMbtu
- Concerns over reliability of Nigerian production and transport

## Current Activities in Jubilee and Tweneboa

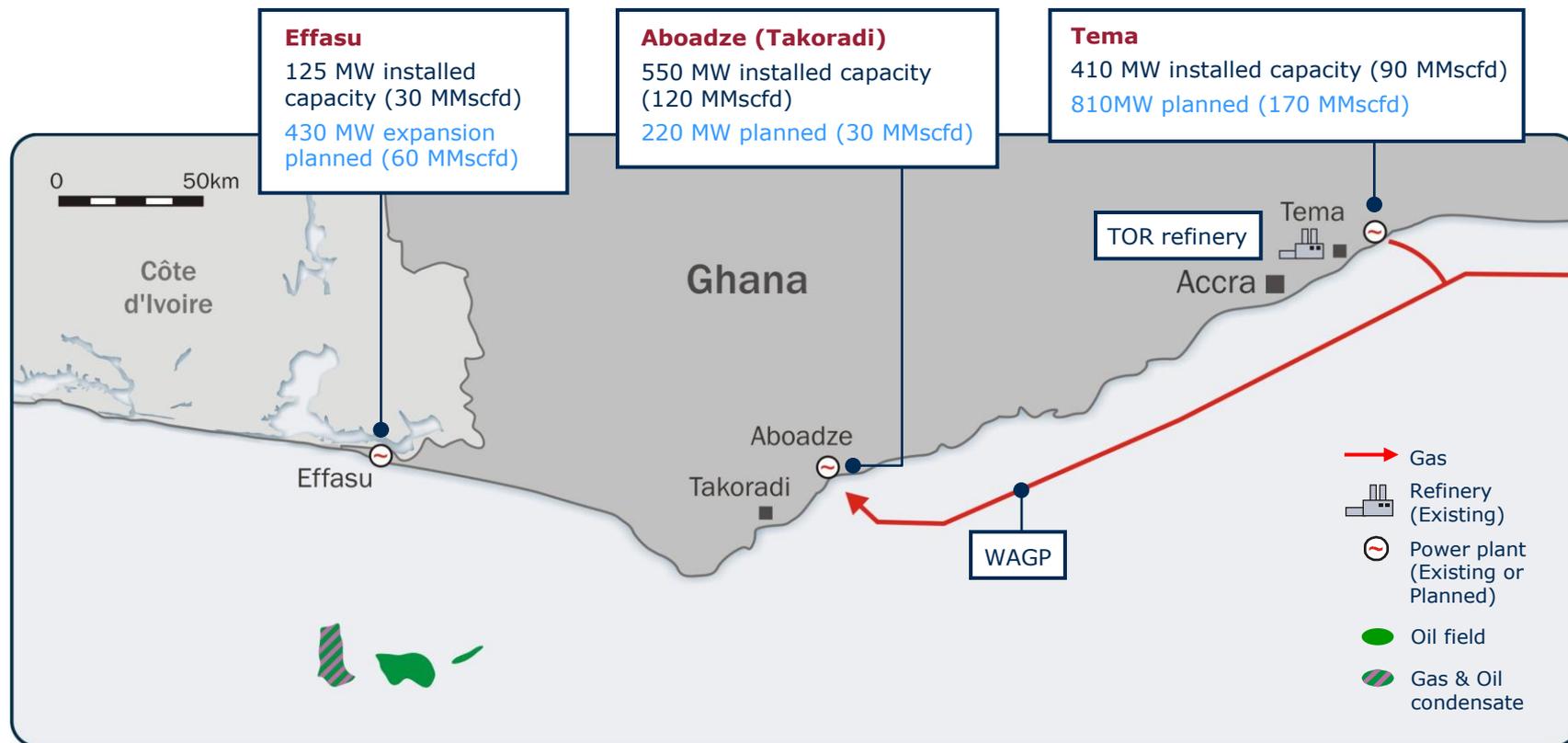
### Jubilee

- Negotiation of gas supply arrangements for Jubilee
- More detailed long term gas market review
- Co-operation on construction of Jubilee infrastructure
  - Phased approach being followed
  - GNPC laying deep water pipe in Q4 2010
  - First gas supplies mid 2011
  - Phase 2, with onshore gas processing targeted for 2012
  - Gas to be re-injected ahead of infrastructure being available

### Tweneboa

- Tweneboa development work
  - Owo-1 and Tweneboa-3 wells in 2010
  - Conceptual design studies
  - Project selection targeted for mid-2011
  - Not reliant upon short term gas demand

# Markets

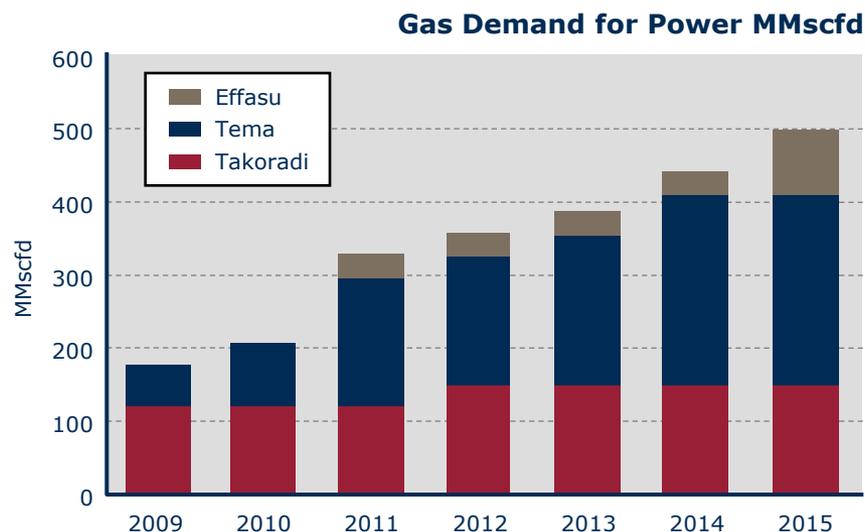
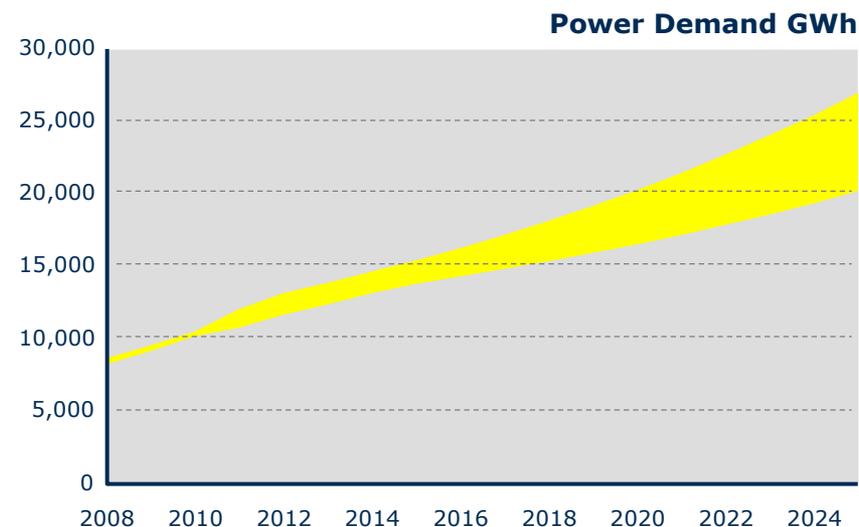


Gas demand	
Firm	240 MMscfd
Potential 2015	500 MMscfd

Gas supply	
WAGP	120 mmcf

## Gas demand - power

- Gas demand will be dominated by power generation
- Some new hydro, but the bulk will be gas
- Currently a shortage of power capacity
- Power is a key area of Government policy
- Rectifying the shortage and achieving the higher end of range depends on meeting a number of challenges
  - Macroeconomic management
  - Power pricing and sector viability
  - VALCO and other major projects
  - Gas supply and infrastructure development



## Power projects

- Power generation currently dominated by VRA
- Some existing plants do not operate
  - Lack of gas supplies
  - Contractual issues
- Hydro has been major source, but expansion prospects limited beyond Bui
- Substantial IPP interest in the past, and re-awakened now that gas is becoming available

Plant	MW
VRA Existing plant	
Hydro	1170
CCGT	330
Other Thermal	435
<b>Sub-Total VRA existing</b>	<b>1935</b>
Other existing plant	
Balkans barge	125
Shenzhen CCGT	200
<b>Sub-Total other existing</b>	<b>325</b>
VRA Thermal under construction	330
Bui dam (under construction)	400
IPPs under construction	120
VRA planned	110
IPPs planned	900
<b>Total existing and planned</b>	<b>4120</b>

## Gas demand non-power

- Existing industrial demand likely to be limited
  - Replacement of oil
  - New small industry around gas hubs
- The Government vision includes petrochemical plants
  - A methanol or fertiliser plant would consume 100-150 MMscfd
  - Each would need a minimum of 1tcf proven reserves
- Exports as gas or power to neighbouring countries
  - VRA aim to supply power to West African Power Pool
  - Likely to be preferred over LNG unless very substantial new discoveries are made
- Lack of long term demand unlikely to be a constraint on gas development, but market development is the challenge

# Gas market challenges

## Forward plan

- Achieving first Jubilee gas supplies to the Ghana market as quickly as possible
- Building a consensus over prices for new supplies
  - Sufficient to generate a return for existing discoveries and justify proving up of new discoveries
  - Competitive in the marketplace with alternative fuels
- Creating a regulatory process and industry structure that stimulates infrastructure investment and market development
- Developing a shared gas master plan with all stakeholders

Unleashing the potential of our people



**Festus Anagblah**  
Ghana Human Resources Manager

## Agenda

- Getting the best people for the business
- Building capabilities for top performance
- Engaging our people to deliver our promise

## Getting the Best People for the business

### Approach to recruitment to get the best Ghanaians

- Local professionals with little or no E&P experience – mines etc.
- Job fairs in Houston to recruit qualified Ghanaians engineers/geoscientists.
- Graduate trainees from local universities and polytechnics
- Use of local recruitment agencies.
- Hiring decision based on demonstrated competence, fit and potential.



## Getting the best people for the business

Tullow Ghana has a diverse workforce of 257 in-country.  
Made up of employees, contractors/consultants and secondees.

Annual Headcount	No.
2007	9
2008	45
2009	209
2010	257

Nationality (In Country)	%
Expatriates (excl. Contractors/consultants)	13%
Ghanaians	87%

Nationality (In Country)	%
Expatriate Employees	8%
Expatriate Consultants/Contractors	35%
Ghanaians	57%

Leadership Team (In Country)	%
Expatriates	50%
Ghanaians	50%



# Getting the Best People for the business

Ghanaians Hiring Plan		
Period	Plan	Actual
End of 2008	45	45
End of 2009	125	127
June 17, 2010	125	154
First Oil (Q4 2010)	150	
End of 2010	145-169*	
End of 2015	150-200*	
End of 2020	150-200*	

\*Plans are dependant on exploration success and development progress



## Building Capabilities – Short Term

### Industry development for Ghanaians

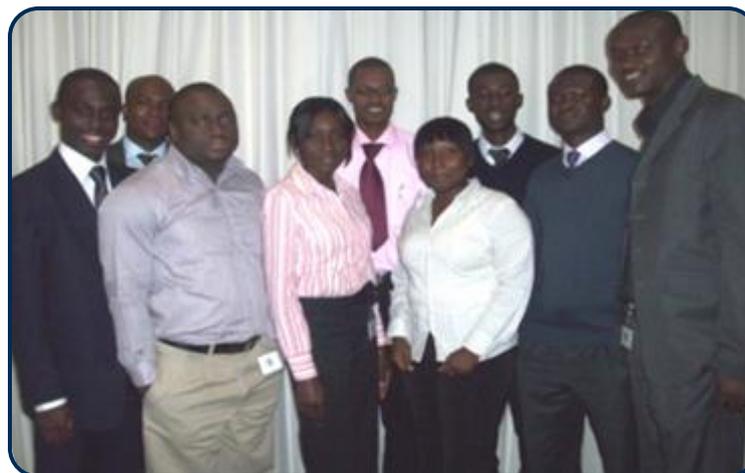
- New hires induction programme
- Basic exploration and production awareness training
- Cultural awareness training to promote integration of our employees
- Exploration and production accounting (Levels 1 – 3)
- Drilling accounting for finance team
- Safety toolbox to raise EHS awareness
- EHS mandatory training



## Building Capabilities – Short Term

### Industry development for Ghanaians

- Trainee production technicians
- Vocational Qualification 2 from TTE Technical Training Group; offshore survival training & offshore secondment programmes with MODEC in Singapore
- GNPC Secondees – work placements & MSc programmes



## Building Capabilities – Short Term

### Building on employees' competence in current role

- Objectives setting & performance reviews
- Coaching & mentoring skills for all supervisors & managers
- Coaching & mentoring framework developed to support nationalisation plan
- General skills training - IT, effective writing skills, negotiation skills
- Working on assigned projects
- Professional certifications – partnerships with professional associations



## Building Capabilities – Short Term

### Expats as Mentors

- Geoscientists
- Engineers
- EHS professionals
- Finance professionals
- Supply Chain professionals



### Localisation

- IT, Corporate Affairs, Legal & HR roles fully localised
- Expat Facilities Manager role localised as at April, 2010
- Expats job shadowing on-going in shore base, aviation, marine, warehouse, finance, EHS
- Selection and development of top talents to be shadowed into expat positions on-going

## Building Capabilities – Medium Term

### Transition of responsibility

- Deputy Shore Base Manager ready to assume Expat Shore Base Manager role
- Ghanaians ready to take over from expat accountant roles
- Ghanaians ready to assume expat roles in procurement & contract, aviation, marine, warehouse roles

### Further Coaching and Mentoring

- Fully embed coaching & mentoring culture in our operations
- Advanced coaching & mentoring training for all supervisors & managers

### Localisation

- Accelerate job shadowing programme to facilitate localization of expat roles in the technical functions

## Building Capabilities – Medium Term

### Leadership development

- EHS leadership skills for Leadership Team (modules 1 - 3)
- Effective use of e-learning tools by managers to ensure continuous development
- Continue the development of leaders

### Further technical development

- Trainee engineers and geologists making progress in their structured development programmes
- Trainee planning & cost engineers making progress in their structured development programmes
- Production technicians to acquire VQ3 on-board FPSO Kwame Nkrumah

### Support to enhance technical/vocational training in country

- Fostering partnerships with local universities/polytechnics
- Provision of industry size equipment –compressors etc
- Revision of syllabi
- Train the Trainer programmes

## Building Capabilities - Long Term

### Continuous technical skills development for the future

- Geoscientists & engineers ready to assume some expat technical roles
- Ghanaians ready to assume some expat EHS roles
- Development of 'world class' technical experts
- Graduate recruitment/talent pipeline
- Begin training of production assistants in country

# Engaging our people to deliver our promise

## Tullow Talkback

- Employee engagement survey conducted in October 2009
- 90% of staff participated in the survey
- 92% of our employees say they will recommend Tullow as a good employer
- Outcome of survey shared with staff in a series of presentations
- Areas for improvement being worked on

## Tullow Sports & Social Club

- Football team (Tullow FC)
- Netball team
- Tullow health walk

## Team Building Event

- Tullow one family event (TOFET)
- Happy hour
- Team away days
- Quarterly town hall meetings



# Social Enterprise in Ghana



**Ken McGhee**  
Ghana CSR Projects Manager

## Social Enterprise Approach and Strategy

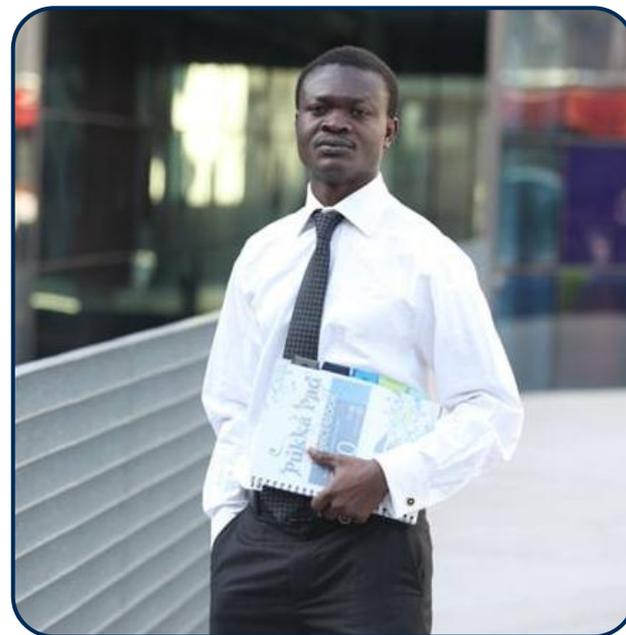
- Shift away from 'handouts' to long-term integrated and sustainable social and community investments
- Oil and gas resources act as a catalyst for socio-economic opportunities and economic development – **Creating Shared Prosperity**
- Focus on creating a culture which encourages:
  - **Environmental protection**
  - **Access to good health**
  - **Education**
  - **Enterprise development**
- Relevant to business strategy and makes a difference to real local needs



*'Establishing a culture of success that cuts across many social sectors'*

## Principles – Ghana Social Enterprise Projects

- Respect for Ghana's socio-cultural diversity
- Working in long term progressive partnerships
- Environmental awareness
- Transparency, honesty and accountability
- Stakeholder engagement  
(Community participation/approval)
- Capacity building
- Transfer of skills and technologies
- Focus on delivery



The story so far...



## Summary of Projects – Tullow

### Mandate

- Identify, select and implement Tullow's own Social Enterprise projects

### Scope

- Nationwide focus
- Long-term sustainable impact
- Cross-cutting themes
- National legacy projects

## Informing and Consulting Communities

### Community Engagement, Consultation and Information Disclosure

- Environmental Impact Assessment (EIA) Process
- Social Enterprise strategy and framework
- Community investment projects
- Project implementation



Community Engagement is a continuous activity throughout the life of the project

## Health and Sanitation

### Constructed 26 boreholes/water wells

- Across 6 coastal Districts
- Part of comprehensive water management project with Community Water Sanitation Agency

### River Blindness Program

- 3-year project with Sight Savers International for distribution of *Mectizan* tablets to over 1000 people in rural communities
- Raise awareness of blindness and treatment programs among local communities
- Ophthalmology training for 20 nurses



## Education

### Half Assini Secondary School, Jomoro District, Western Region

- Refurbished and equipped the physics, biology, and chemistry departments with modern laboratory equipment

### Tertiary Education Program

- University partnerships supporting oil and gas curriculum development and training



## 2010 Jubilee Phase 1 Projects



## Summary of Projects – Jubilee Partnership

### Projects – Immediate Delivery

- Community engagement, consultation and awareness project
- Malaria education, prevention and mosquito control
- Disease education, minimization and control
- Education infrastructure and resources
- “First Oil” projects
- “Education Roadshow”

### Projects – Longer Term

- Support for strategic planning and development activities – Sekondi / Takoradi Municipal Area
- Support for health infrastructure improvements – Western Region
- Integrated community development activities – Western Region
- Small enterprise development

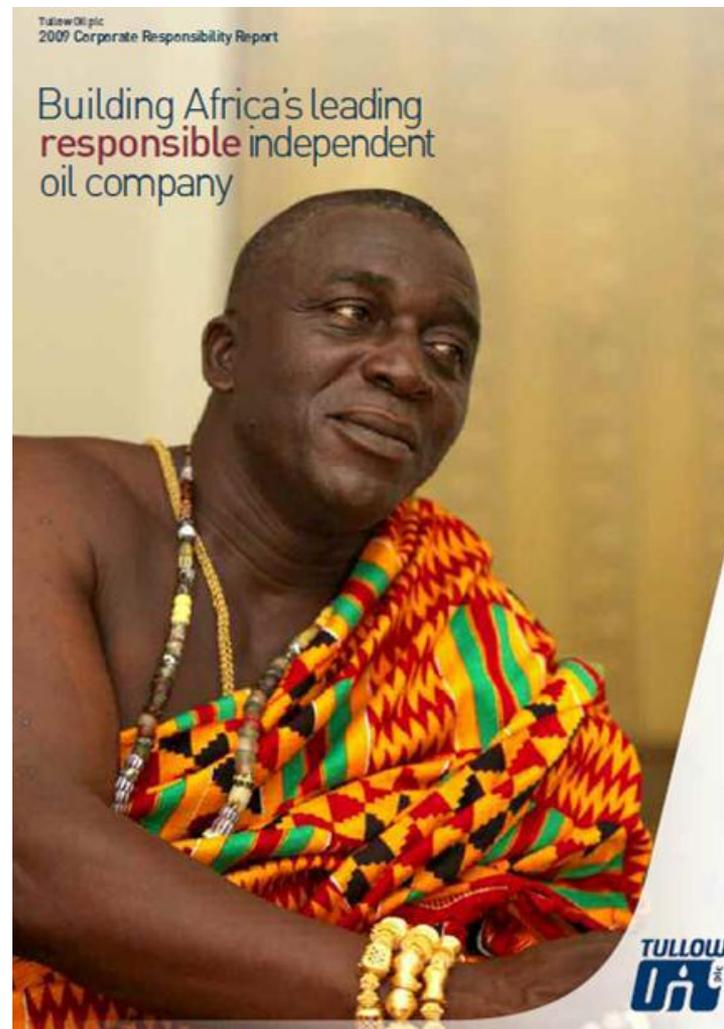
# Support Community Facilities for Stakeholder Engagement and Public Education

- Kick-off activity – Provide TVs for community viewing of World Cup matches and future community-based activities
- Provide positive framework for future project activity between Jubilee partners and communities
- Build on existing goodwill between Jubilee partners and communities
- Strengthen stakeholder engagement and support within each community
- 3 sites per District



## Conclusions

- Strong leadership commitment
- Exemplary track record on Social Enterprise projects
- Continue to apply new Social Enterprise strategy to community activities
- Balancing short term project success with long term project sustainability

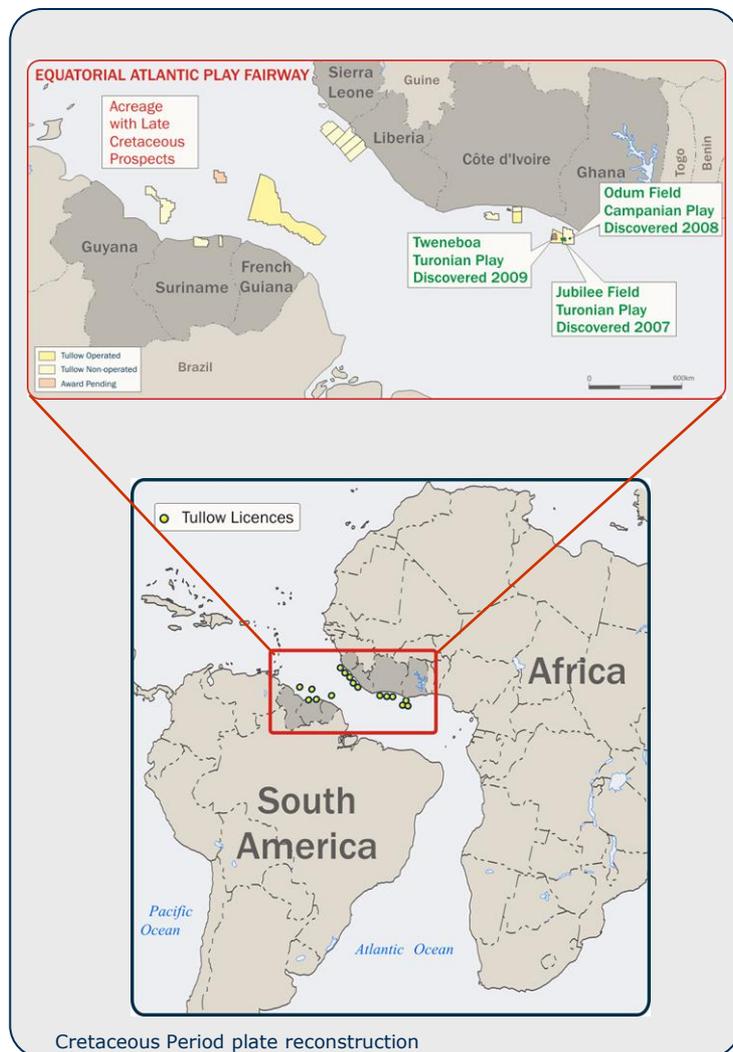


# Beyond Ghana



**Robin Sutherland**  
Exploration Manager – Gulf of Guinea

# Beyond Ghana - Extending the Jubilee Play



## History

- Jubilee – opened a new Turonian stratigraphic play
- Odum – Further stratigraphic play in the Campanian
- Tweneboa – Extended the Turonian fairway westwards
- Venus-1 & Mahogany-1 'book-ends' to 1,100 km play
- Internal database and experience invaluable

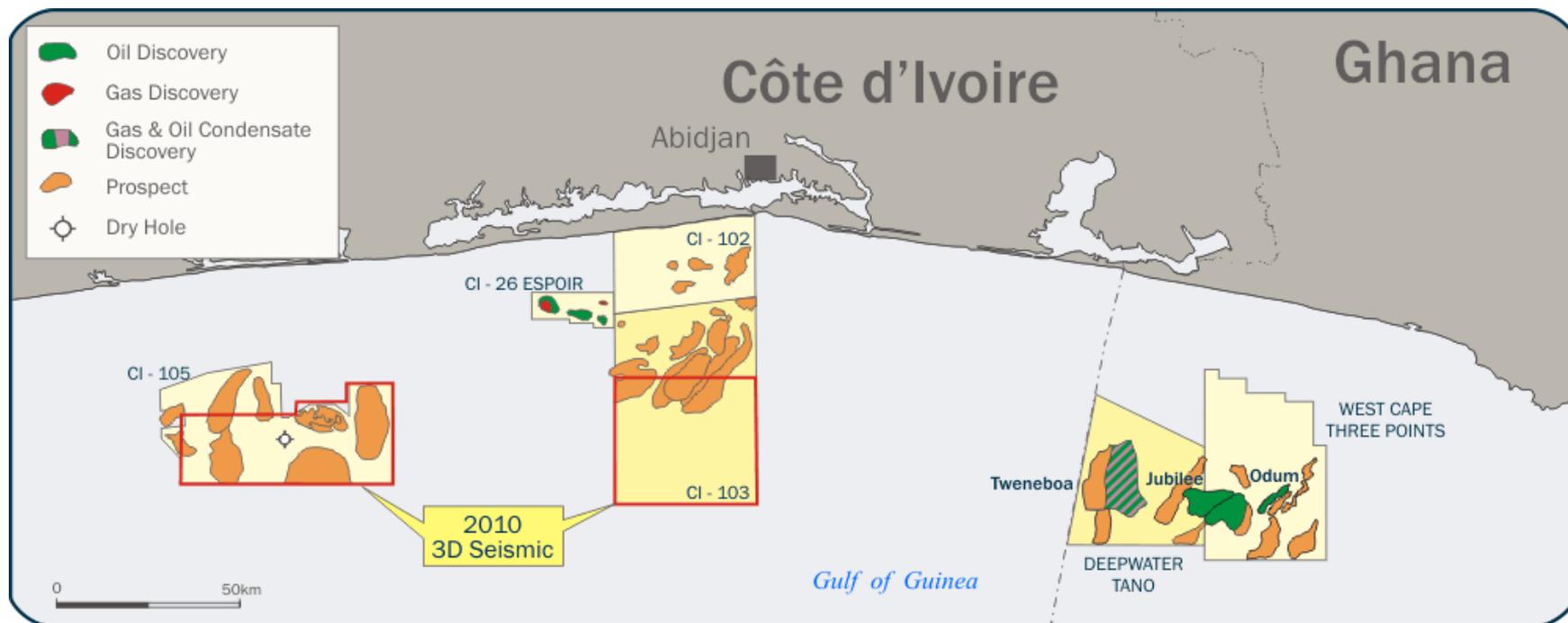
## Jubilee play follow-on strategy

- Capitalising on knowledge of working plays
- Aim to repeat transformational performance
- Building strong acreage position
- Leveraging expertise built

## Atlantic twin basins in South America

- French Guiana – major frontier licence
- Guyana – drilling end-2010
- Suriname – offshore position

# Play breakthrough in Tano-Ivorian Basin



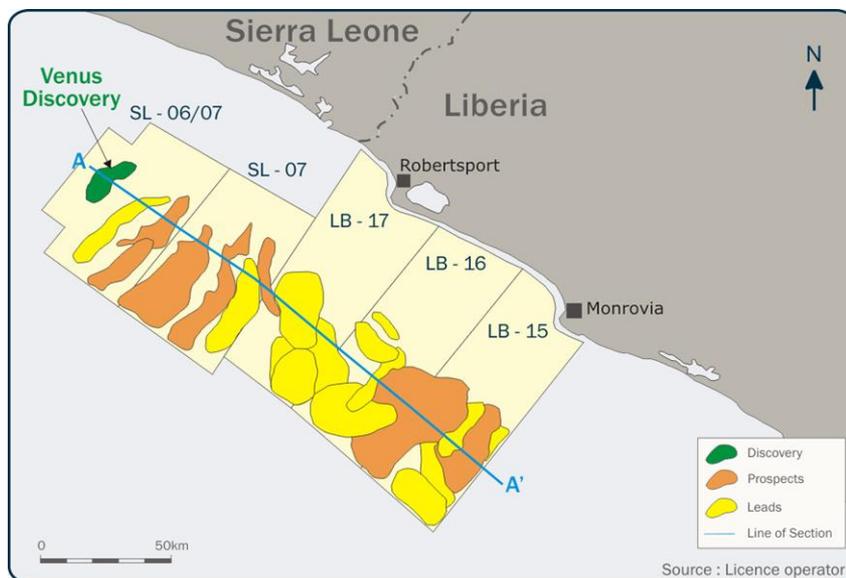
## Greater Basin Architecture

- Jubilee is in the Tano basin in Ghana
- Extensional part of the greater Tano-Ivorian Basin
- Several Upper Cretaceous sedimentary inputs identified across the basin
- CI-103 and CI-105 directly on these inputs
- Acreage secured through application and farm-ins

## CI-103 & CI-105

- South Grand Lahou well drilled in 2009
- Found excellent reservoir and source rocks
- 2,200 sq km of 3D acquired across acreage in 2010
- High end processing includes PSTM and PSDM
- One well in each block scheduled for 2011

# Expanding into Equatorial Atlantic West Africa



## Where to next

- Western part of Côte d'Ivoire not prospective
- Undrilled Liberian basin geologically favourable
- Review of 2D data highlighted five blocks

## First mover advantage – 1H 2009 farm-ins

- Two licences in Sierra Leone & three in Liberia

## Venus-1 discovery opens Liberian Basin

- Well proves working petroleum system
- Intersected a number of live source rocks
- Jubilee play extended 1,100 km from Ghana

## 3D seismic reveals many leads & prospects

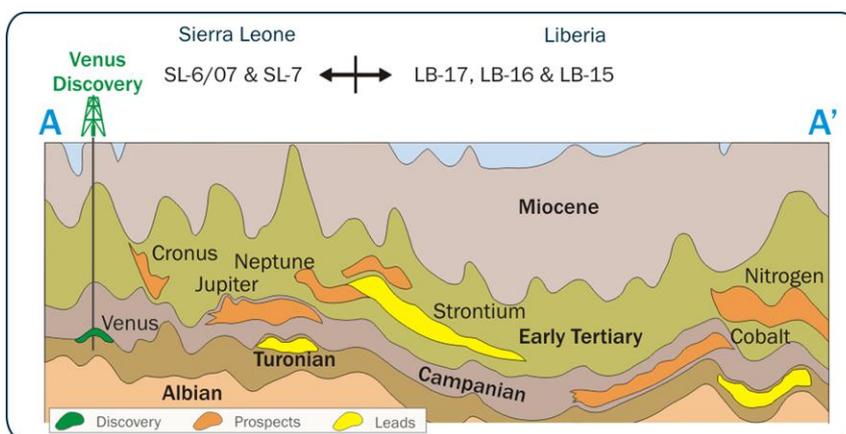
- Database now includes 10,000 sq km of 3D data
- Seismic processing nearing completion
- Several robust prospects emerging

## Preparing to drill in Sierra Leone/Liberia

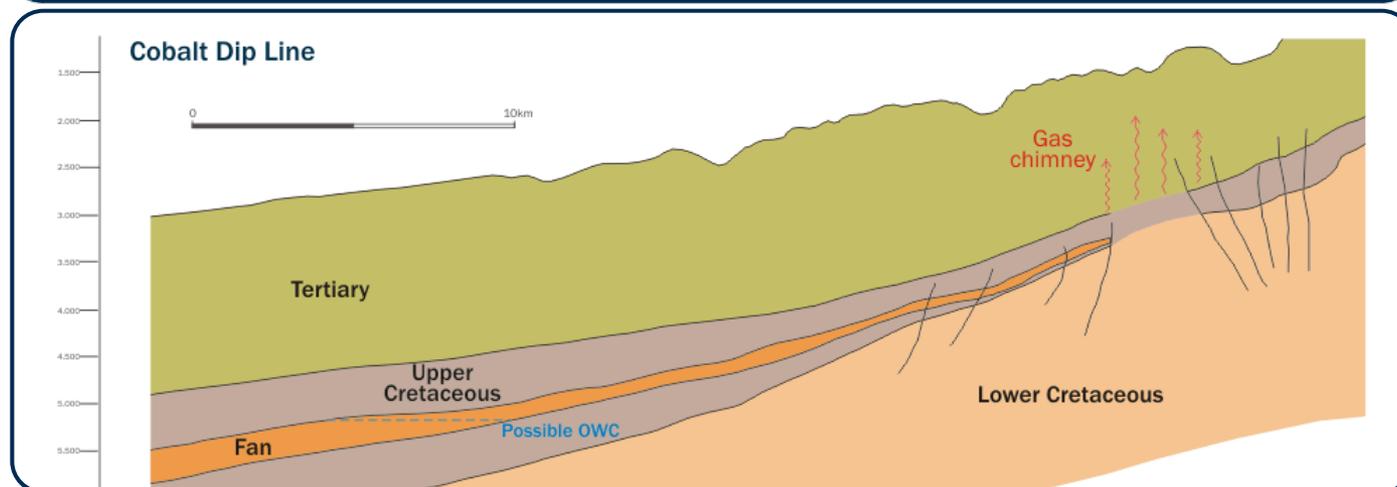
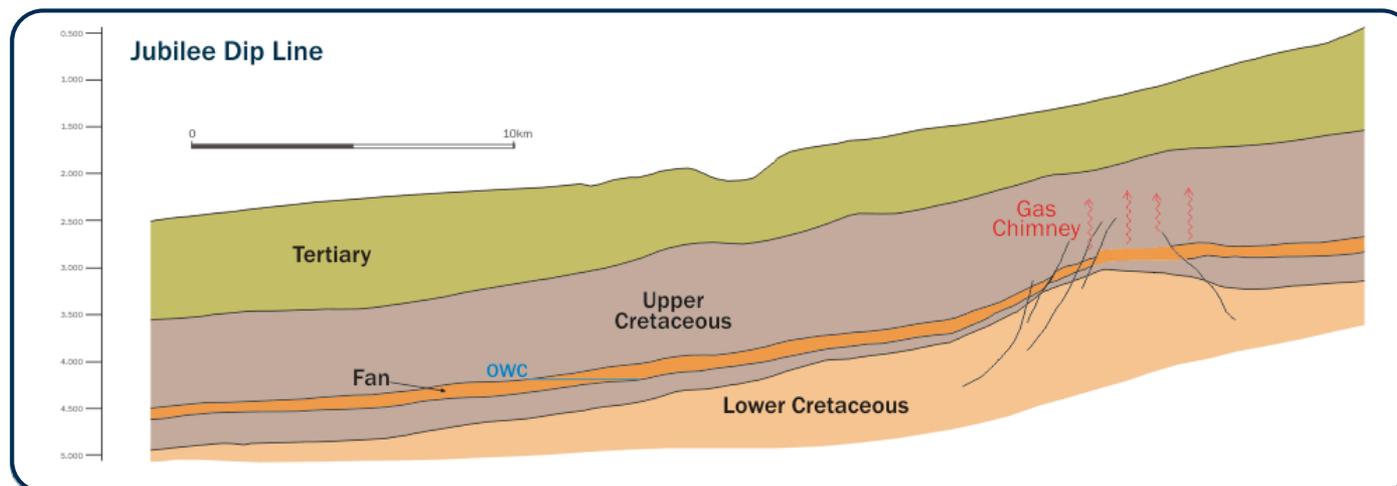
- Two or three high-impact wells planned 2H 2010
- Cobalt prospect remarkably similar to Jubilee

## Further expansion

- Current acreage in heart of prospectivity
- Surrounding blocks considered higher risk
- Exploring Mauritania for Cretaceous Turbidites

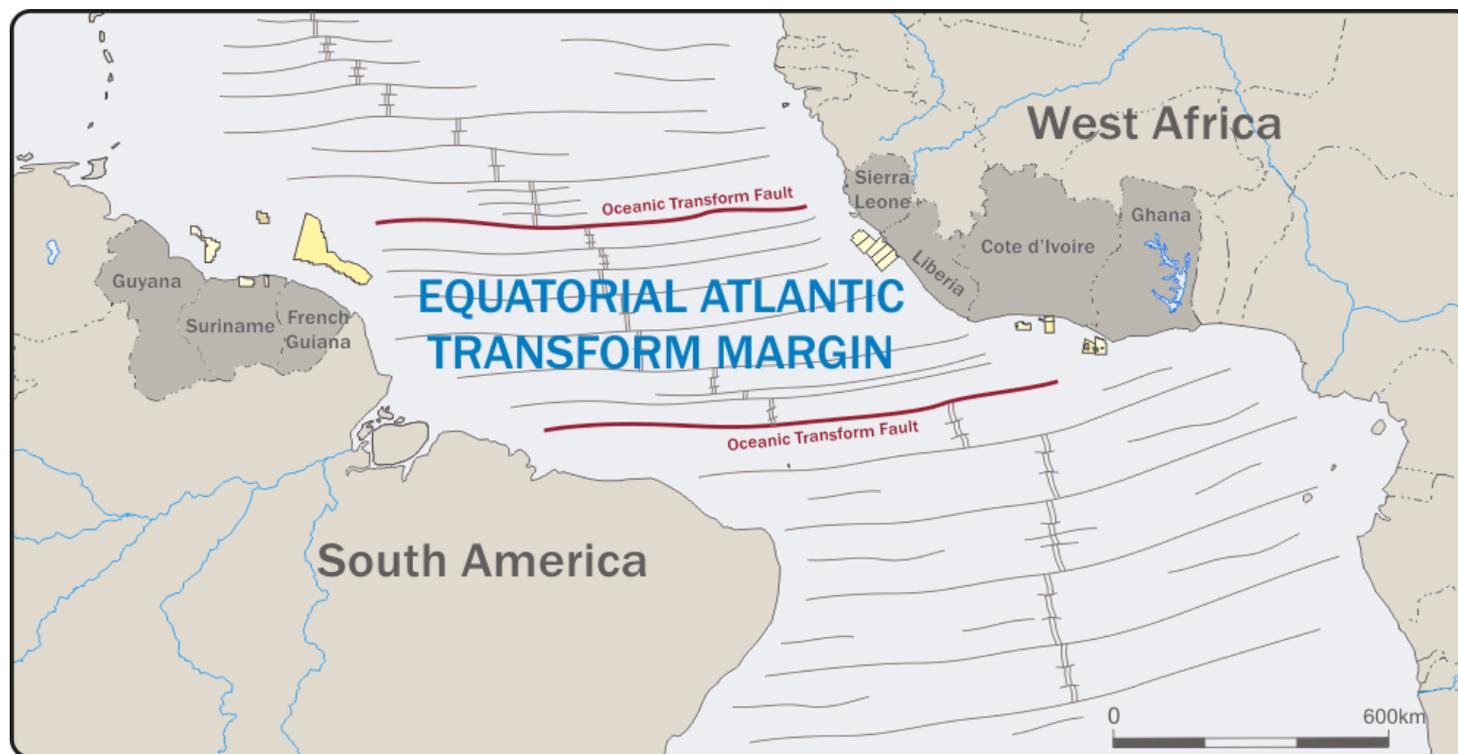


# Liberian Basin: Strong resemblance between Cobalt & Jubilee



- Cobalt shows a remarkable resemblance to the Jubilee field
- Very similar trapping geometry and an almost identical gas chimney effect

# Extending West African success across to South America



## Plate tectonics & 'Atlantic Twin' basins

- Final separation of South America and Africa occurred at the end of the Early Cretaceous
- Passive margins with similar geology developed on both sides of the Equatorial Atlantic region
- Analogue stratigraphic traps identified in Guyana-Suriname Basin at same stratigraphic interval as Jubilee
- Offshore acreage being explored in French Guiana and Guyana
- Capturing additional opportunities e.g. HOA signed for Block 47 Suriname (PSC being negotiated)

# Equatorial Atlantic South American Campaign

## French Guiana

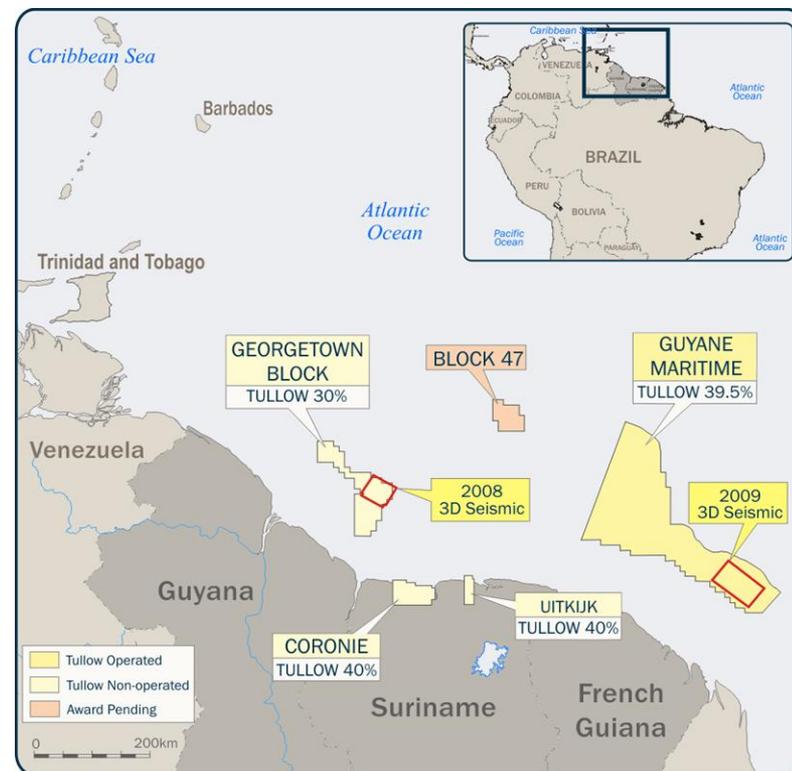
- Guyane Maritime: Tullow 39.5% operated
- Targeting Cenomanian/Turonian turbidites
- Drilling planned for Q4 2010/Q1 2011
- Deep water 2,300 m
- Acquired 2,500 sq km 3D seismic on Eastern Slope
- Farmed out in 2009 to Shell & Total

## Guyana

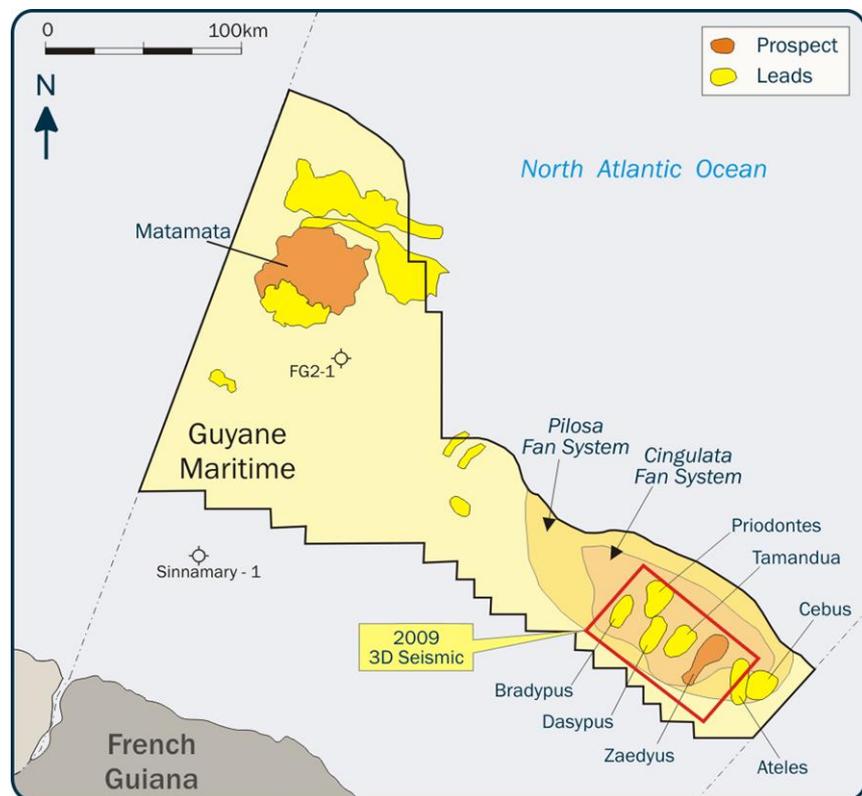
- Georgetown: Tullow 30%, Repsol operated
- Drilling Turonian stratigraphic trap in Q4 2010/Q1 2011
- 1,831 sq km 3D seismic acquired late 2008
- Prospects in <100m water depth

## Suriname

- HOA signed with Staatsolie – PSC negotiations underway for Block 47: Tullow 100% operated
- Cretaceous deepwater stratigraphic traps identified
- Uitkijk & Coronie: Tullow 40%, Paradise Oil 60% (op)
- Drilling in Coronie Q3 2010
- Onshore heavy oil play (proves regional oil charge)



# French Guiana – Jubilee analogues in Eastern Slope



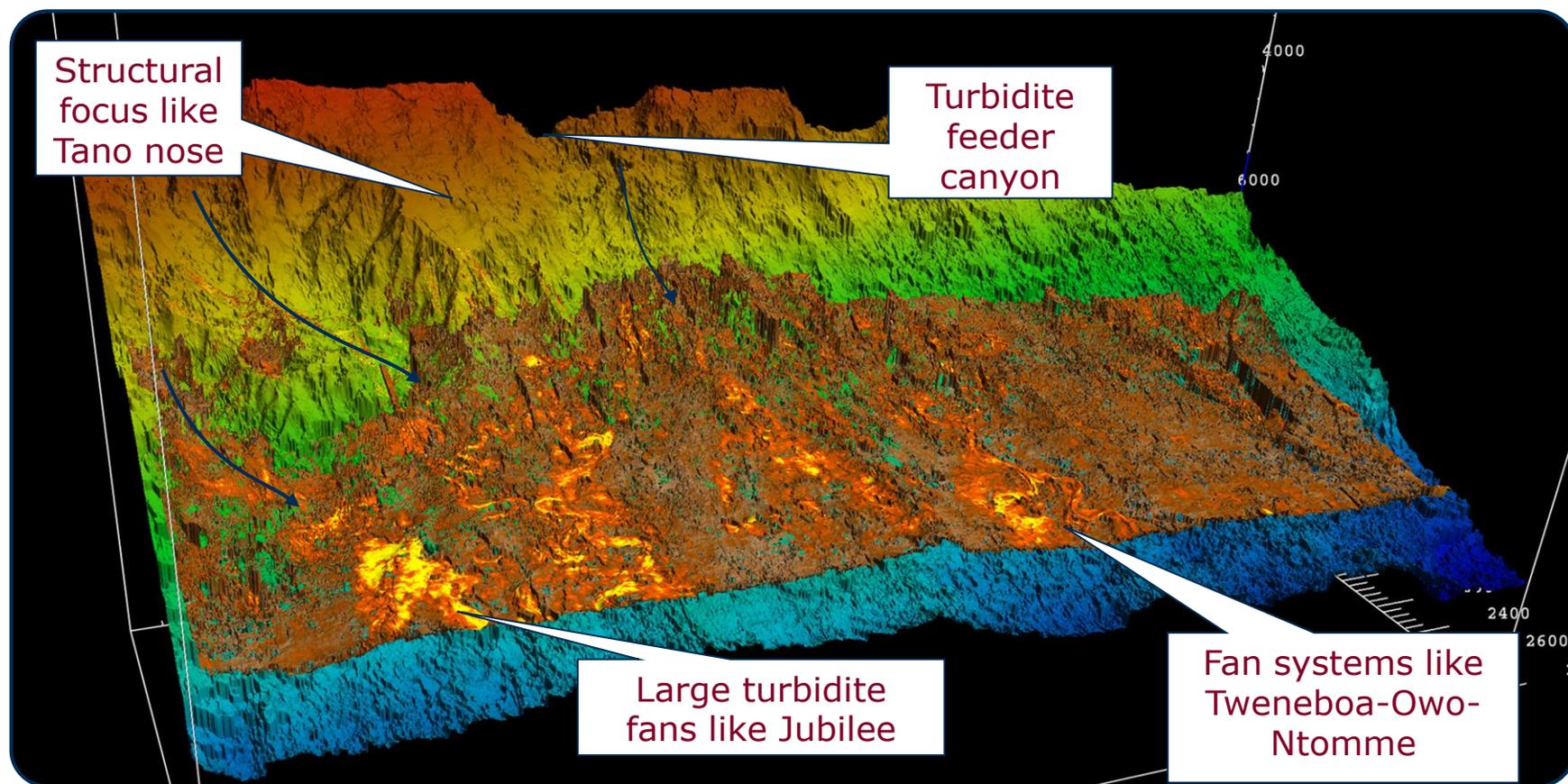
## Eastern Slope

- Two major systems of turbidite fans
- Cingulata fan system (Cenomanian/Turonian)
  - Jubilee analogue leads & prospects
  - Priodontes, Dasypus, Zaedyus, Cebus
  - Focus area for initial exploration campaign
  - New 3D seismic firms up prospects for drilling
- Pilosa fan system (Tertiary)
  - Bradypus, Tamandua, Ateles
  - Top seal risk & uncertain reservoir distribution
  - Leads being matured based on new 3D seismic

## Matamata Ridge

- Structural & Structural/Stratigraphic traps
- Albian–Aptian–Barremian aged (pre-Jubilee)
- Pending data from regional exploration wells

## French Guiana – 3D seismic reveals Jubilee type fans



- 2,500 sq km 3D seismic survey acquired in 2009/2010
- Very good quality data set with many similarities to the Jubilee 3D seismic surveys
- Large fan features identified on regional 2D grid are being worked in detail in 3D

## Beyond Ghana: Volumes & conclusions

	Gross Upside
Côte d'Ivoire 2011 Campaign	>600 mmbo
Liberia & Sierra Leone 2010/2011	>1,200 mmbo
South American Transform Margin	>1,700 mmbo

- Play breakthrough in Tano-Ivorian basin
- First mover advantage being leveraged
- Upside potential throughout Equatorial Atlantic regions
- Liberian basin has significant Jubilee type prospectivity
- Guyana-Suriname basin exploration campaign to commence at year end

# Conclusions



**Dai Jones**  
President and General Manager of Tullow Ghana

## Our Success in Ghana

- Environment, Health and Safety
  - Excellent record
  - It will not be compromised, we are ever vigilant
- Fast track world class project – from sceptics to believers
  - Performance, delivery, excellent people
- Transformation
  - Takoradi
  - Jubilee Field
  - Accra
  - London
- Relationships
  - Government of Ghana
  - GNPC
  - Partners
  - Industry leader
  - Local communities
- Culture
  - Preserving the Tullow sense of family

## Remaining Challenges

- First Oil – Safe First Oil - remains the primary focus
  - Well completions
  - EPA permit
  - Hook up and commissioning
- Advancing our exploration and appraisal programme
- Development of the natural gas market
- Managing business risks

## Conclusions

- We have world-class projects and a high potential E&A programme
- We have a highly effective organisation in place to deliver
- We have developed a business and in-country infrastructure for the long term
- We work with a supportive Government and an aligned and effective partnership
- We have a strong platform for future growth in Ghana and beyond

Tullow Oil plc

3rd Floor, Building 11  
Chiswick Park, 566 Chiswick High Road  
London, W4 5YS

Tel: +44 20 8996 1000

Fax+44 20 8994 5332

Investor Relations Contact

Chris Perry: [chris.perry@tulloil.com](mailto:chris.perry@tulloil.com)

