

## Update on Mafia Deep Drilling



### TANZANIA: Bigwa Rufiji Mafia exploration license

|               |              |
|---------------|--------------|
| Maurel & Prom | 60% operator |
| PetroQuest    | 20%          |
| Hollick       | 20%          |

### OBJECTIVES

Mafia Deep drilling began 4 August 2008. The initial target depth was 4,600 m. While drilling was underway, interpretation of well data led to the reinterpretation of the seismic data and the target was changed to approximately 5,600 m depth. The gas targets represented 5 TCF or 830 MBOE at 100%, or 436 MBOE as Maurel & Prom share net of royalties.

### TECHNICAL AND DRILLING CONDITIONS

A depth of 3,050 m was reached on 22 November 2008. The Group then drilled a series of sidetracks to reach a final depth of 5,632 m on 30 August 2009.

During drilling, the depth of the wellbore forced the teams to very frequently cope with temperatures that are exceptional for the oil industry (over 255°C or 500°F) and pressures of 10,000 psi, imposing long delays for each operation. Drilling and testing equipment could not operate in a normal manner in these conditions, and the Maurel & Prom teams were challenged to create the necessary innovative techniques to complete the drilling successfully, while respecting safety standards.

### AREAS OF INTEREST AND TESTS

Three areas of interest were highlighted during drilling:

- The deep zone (from 5,519 m) was first reached on 5 May 2009. Drilling conditions made well control difficult. Thus, a number of plugging agents were injected to creating an impenetrable barrier, fracturing and acidizing being ineffective at such temperatures. It was therefore impossible to test this zone and its potential remains intact and unknown.
- The logs of the intermediate zone confirmed the existence of a gas column 600 m thick in a fractured formation, and the existence of a column with a total thickness of 110 m in low porosity sandstone reservoirs. As this gas appeared through a fault system, that was not the objective, it was always sealed with large quantities of suitable products and barytes during the drilling phase. That is why perforations produced insignificant quantities of gas – less than 1 MCFPD.

Nevertheless, by adding up the volumes at the various impregnated heights, the recoverable gas for this zone could be quantified at about 4 TCF. To confirm the quality of these resources, the Group is going to instruct an independent expert to assess the quantities of recoverable gas under satisfactory economic conditions.

- Tests carried out in the upper zone showed a good-quality reservoir, with low flow potential (100 to 160 boepd of filtrate) due to the formation being penetrated during drilling. This low flow rate, coupled with the time that would be needed to install a pump, led to the decision to demobilise the Caroil 14 rig and test this zone using a crane. Given the losses noted, the quantity of filtrate entering and permeating the formation has not been very precisely determined, and it may take several weeks to determine the nature of the fluid in this formation (water or hydrocarbons). At this stage, the Group has not yet evaluated the extent of the possible reservoir.

The presence of oil would allow for rapid cash flow generation.

The Mafia Deep well is today considered to be a stratigraphic well drilled in a new basin that could be transformed into a commercial well (oil or gas).

### DETAILED DESCRIPTION OF DRILLING

During drilling, the Mafia wells showed indications of hydrocarbons in Eocene, Paleocene and Cretaceous sandstone reservoirs.

- 1) Between 1,968 and 1,989 m, a sandstone layer showed gas (up to 12%) and points of active yellow fluorescence in the Eocene. Continual losses of mud began to be registered after drilling at this level and continued (>0.4 m<sup>3</sup>/h) until a 13-3/8" casing was installed. Nothing was logged at this level. This zone could develop an oil potential of 17.6 MBOE/km<sup>2</sup>.

| Surface | Useful Height | Volume of Rock | Porosity | Oil Saturation | Volumetric Factor (bo) | OOIP  | OOIP |
|---------|---------------|----------------|----------|----------------|------------------------|-------|------|
| km2     | m             | MM m3          |          |                |                        | MM m3 | MBOE |
| 1       | 20            | 20             | 0.2      | 0.7            | 1                      | 2.8   | 17.6 |

At this stage, the Group has not yet evaluated the extent of the possible reservoir.

- 2) Based on the 4,200 m reading, numerous and very high indications of gas appeared in the Cretaceous layer (to saturation point in the gas detectors), which led to the mud density during drilling to be increased from 1.09 to 1.26 to retain well control. Increasing the mud weight weakened the geological formations and caused large losses of mud that were controlled only by large steady volumes of lost circulation materials (LCM).

At 5,519 m, gas pressure became so high that to regain control of the well and allow parameters to be logged, a barite mud plug with a density of 1.6 had to be injected between 4,300 and 5,519 m.

The logs show:

- A fractured silt-clay zone 600 m thick between 4,200 m and 4,800 m along with some layers of low-porosity sandstone (<10%). Assuming a fracture porosity of 0.005%, this zone would develop a gas potential of 0.024 TCF/km<sup>2</sup>.

| Surface | Useful Height | Volume of Rock | Porosity | Gas Saturation | Volume Factor (bg) | GGIP  | GGIP  |
|---------|---------------|----------------|----------|----------------|--------------------|-------|-------|
| km2     | m             | MM m3          |          |                |                    | MM m3 | TCF   |
| 1       | 600           | 600            | 0.005    | 0.8            | 0.0035             | 685   | 0.024 |

At this stage, seismic interpretation identified a surface area of some 160 km<sup>2</sup>.

- An argillaceous zone intercalated with sandstone layers between 4,800 m and 5,519 m and presenting a sandstone reservoir with a total thickness of 110 m with low matrix porosity (<5%). This zone is in the Lower Cretaceous (Kipatimu formation).

A cement plug was inserted between 5,519 and 5,134 m to hold the well and 7" casing was lowered to 5,115 m and cemented (to 4,250 m) in order to restart 6" drilling.

- 3) 6" drilling was restarted from 4,950 m (a sidetrack from a window at the base of the 7" casing) to 5,519 with a mud density of 1.21 (lower density than used in the 8-1/2" phase at the same depth) causing high losses of mud which was controlled by injecting large volumes of LCM. No gas observed during drilling in this phase.

From 5,519 m and to the final depth of 5,632 m, mud density was increased to 1.26 to contain powerful pockets of gas (saturating the gas detectors). High mud losses were also encountered and controlled by injecting large volumes of LCM. Drilling was halted at 5,632 m as it was technically impossible to continue deeper given the pressures and temperatures reached in the wells.

The logs recorded before inserting 4-1/2" caps could not read below 5,136 m.

The logs show:

- An argillaceous zone intercalated with sandstone sequences between 4,950 m and 5,519 m with a total thickness of 85 m of low-porosity sandstone (<5%) and conforming at all levels with the data from phase 8-1/2" drilling.
- A zone between 5,519 and 5,632 m with a total reservoir thickness of 15 m with low matrix porosity (<5%).

For more information, go to [www.maureletprom.fr](http://www.maureletprom.fr)

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**Next announcements:**

**07/04/2010**

**2009 results, after stockmarket close**

**08/04/2010**

**Presentation to analysts at 10 am**

**20/05/2010**

**Shareholders' Meeting**