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ORAL PRESENTATION

Creative Exploration in a Mature Basin: Jangkrik and Merakes Discoveries (Kutei Basin, Indonesia)

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The Kutei Basin is located on the east coast of Kalimantan Island, in central Indonesia. The prospective sequence is Eocene to Recent in age and is predominantly composed of Mahakam River derived fluvio-deltaic to deep water sediments, deformed by regional compressional tectonic movements.

The Kutei Basin is one of the longest-explored petroleum basins in the world, with 125 years of onshore and offshore hydrocarbon exploration and exploitation and more than 850 exploration wells drilled. It can definitely be considered as an historical, mature basin. From the initial discovery of Sanga Sanga oil field, made in 1896, more than 13 Bboe of recoverable oil and gas resources have been discovered.

Eni (re)entered Indonesia and the Kutei basin in 2000 as a result of the acquisition of Lasmo, who at the time held several assets in the country, including in the Kutei Basin. Eni reinforced its position in the basin with the award of additional blocks, including Muara Bakau PSC in 2002 (Eni operator, presently with ENGIE E&P International SA and Saka Energy Indonesia as partners), where the Jangkrik and Jangkrik NE discoveries were made in 2009-11, and East Sepinggan PSC in 2012 (Eni operator, with Pertamina as partner), where Merakes was discovered in 2014.

The two discoveries are located in the southern part of the Makaham delta, in water depths of 450 m (Jangkrik) and 1350 m (Merakes).

Both discoveries are characterized by creative and innovative exploration thinking associated with the use of state of the art technology.

In the Kutei basin, exploration both in shallow and deep water was historically aimed at Miocene targets, but the Jangkrik gas discovery pursued an innovative exploration play composed of Pliocene slope channels. Jangkrik NE proved a significant extension of this play, confirming the validity of the approach. The Jangkrik complex today comprises Jangkrik Main and Jangkrik NE, cumulatively exceeding 2.5 Tcf GIIP, and is composed of many separated channels, mainly not juxtaposed. The size of each individual channel is relatively modest and even the largest pool would not be able to be individually economically produced. The project's commerciality was generated by a delineation campaign with a 100% drilling Rate of Success, supported by seismic amplitude indications.

The limited lateral extent of each individual channel has required the acquisition of a new dedicated 3D survey and the optimization of drilling trajectories. A multidisciplinary, integrated team effort was essential for the success of the entire project, from the delineation to the development drilling.

The production from the Jangkrik field started in May 2017, three and a half years from sanctioning of the development project. The gas is processed at a dedicated Floating Production Unit, then flows to shore via a 79 km dedicated pipeline to the East Kalimantan Transportation System, finally reaching the Bontang gas liquefaction plant.

The Merakes gas discovery is also within the previously neglected Pliocene sequence, but located in a more basinal environment, where the Pliocene turbidites form a large fan lobe at the base of the slope. Remarkably, the well Gambah-1, drilled by the previous operator in 1999, missed the Merakes fan by few hundred meters. The well, aimed at a deeper Miocene target, was dry and therefore the area was later relinquished. Merakes pre-drill assessment identified that Gambah-1 had drilled a large canyon filled with a mixture of re-sedimented carbonate and shale that had cross-cut and

eroded the previously deposited Merakes Fan. Merakes-1 successfully verified this hypothesis, finding a significant gas accumulation with estimated 2 Tcf GIIP.

Merakes-2, drilled in 2017 to test the part of Merakes lobe on the opposite side of the Gambah mud-filled channel, successfully found gas hydraulically separated from Merakes-1, confirming the quality of the discovery and the model.

The Joint Venture is currently evaluating options for an accelerated development of Merakes discovery.

In summary, Merakes and Jangkrik have again proved that in a mature basin creative ideas and exploration approaches can still lead to discoveries. More than 4.5 Tcf GIIP in excellent quality reservoir sands have been discovered by pursuing a previously neglected sequence (the Pliocene) with innovative ideas (clustering many small channels, pursuing previously drilled areas).

These creative exploration ideas would not have generated the Jangkrik and Merakes successes without the fundamental support and integration of top-class contributions from many disciplines such as sedimentology, geophysics (DHI identification, seismic acquisition and processing), drilling, reservoir modelling and others, and an effective project coordination and management.

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