



## ORAL PRESENTATION

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# 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 the large Kalimantan Island, in central Indonesia. The prospective sequence is Eocene to present in age and is predominantly composed of the Mahakam river 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. Eni then reinforced its position in the Kutei basin with the award of other blocks. Among them, Muara Bakau PSC (2002, Eni operator, today with Neptune Energy and Saka Energy Indonesia as partners), where Jangkrik and Jangkrik NE discoveries were made in 2009-11, and East Sepinggan PSC (2012, Eni operator, with Pertamina), where Merakes was discovered in 2014 and Merakes East in 2018.

The discoveries are located in the Southern part of the Mahakam delta, in a water depth of 450 m (Jangkrik) and 1350-1600 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 the exploration both in shallow and deep water was historically aimed at Miocene targets, with limited attention to the Pliocene, where the only discovery was made on a structural trap (Sadewa field). Jangkrik gas discovery pursued an innovative trapping concept made by Pliocene slope channels and the concept was further validated by Jangkrik NE that proved a significant extension of the discovery. Jangkrik complex (Jangkrik Main & NE) today exceeds 2.5 Tcf as a cumulative OGIP, and is composed of many separated channels, mainly not juxtaposed. The size of each individual channel is relatively modest, and even the largest individual pool would not be able to be economically produced. The project commerciality was generated by a delineation campaign with a 100% drilling Rate of Success, supported by seismic amplitude indications.

The limited lateral extension 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 on a dedicated Floating Production Unit, then flowed 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 a previous operator in 1999 missed the Merakes fan by few hundred meters. The well, aimed also at deeper Miocene targets, was dry and therefore the area was later relinquished. Merakes pre-drill assessment identified that Gambah-1 had

drilled a large canyon filled by 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 OGIP.

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

In December 2018 Merakes East-1 discovered additional volumes in deeper Miocene targets, just 3 km from Merakes. The reservoirs have excellent deliverability of gas and associated condensate.

The FID for Merakes was approved in December 2018, and development activities are in progress.

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 OGIP 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).

The 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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## **SPEAKER BIOGRAPHY**

Lorenzo Meciani has more than 25 years' experience in the industry, entirely spent with Eni exploration in different locations: Milano, London, Cairo, Delhi, Stavanger. He currently is Exploration Strategies Manager, while previous positions were Exploration Manager and Advisor within the Eni peer review team. His list of talks and publications includes more than 20 titles on various exploration related subjects.