

Preparing a Gas Field Development Plan – Tangga Barat Cluster Gas Project

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Abstract

Field development planning is one of the core business processes in the upstream oil and gas industry. Before a discovered field can be developed and its hydrocarbon produced, proper evaluation and planning of the subsurface reservoirs and surface facilities are necessary to ensure that the field development plan is not only economical to undertake, but also flexible enough to cater for any deviation from the original plan during implementation as a result of inherent uncertainties in the reservoirs over the production life span of the field.

This paper describes the approach taken to prepare a Field Development Plan (FDP) for a cluster of gas fields located offshore Peninsular Malaysia. The four gas fields namely Melor, Laho, Tangga and Tangga Barat (“Tangga Barat Cluster” in short) are located within a 25 km radius of each other at a common centre. One common denominator among these fields is the presence of carbon dioxide (CO₂) in its reservoirs. The Tangga Barat Cluster fields will be developed with Tangga Barat as the central processing complex, designed for a peak capacity of 440 MMscf/d of raw gas with an initial blended CO₂ level of 37 mol % prior to CO₂ removal. The raw gas will be processed, pre-treated and CO₂ content reduced to below 8 mol % for evacuation to Peninsular Malaysia via an existing infrastructure. The key areas emphasized in the preparation of the field development plan include the business driver, resource assessment, depletion strategy, development concept and selection, managing uncertainties, appraisal requirements, reservoir management, anticipating production problems and disposal of the excess CO₂.

Introduction

The Tangga Barat Cluster fields are located about 150 to 170 km northeast of Kertih, Terengganu offshore Peninsular Malaysia (Figure 1). The Tangga Barat Cluster consists of four gas fields; Melor, Laho, Tangga and Tangga Barat. In the vicinity are two producing fields, Resak which is a gas development located about 51 km southwest of the Tangga Barat field and Dulang, an oil development situated about 20 km south of Tangga Barat. The Tangga Barat Cluster fields were discovered from 1980 to 1993; they remain undeveloped due to the presence of CO₂ in its reservoirs, the content level of which is beyond the gas specification required for gas sales. Since then, a total of 10 exploration and appraisal wells have been drilled before the final FDP was submitted and approved by PETRONAS, the host authority for upstream oil and gas business in Malaysia.

Key Events and Decisions

The development planning history can be summarized in terms of key events and major decisions as illustrated in Figure 2. Following the relinquishment of the field by the previous Operator in 2001, the responsibility to formulate a field development plan for the Tangga Barat Cluster fields was entrusted to PETRONAS Carigali Sdn Bhd (PCSB). The first FDP was formulated and submitted to PETRONAS in March 2003 based solely on the interpretation of 2D seismic data as the main input to the resource assessment using 2D mapping techniques. The driver for this FDP was the requirement to provide first gas in 2008 as anticipated by the gas demand at that time. Recognizing the need to improve mapping with better techniques, PCSB completed acquiring 3D seismic surveys over the four gas fields in 2004. In the same year, PETRONAS revised the first