PETRONAS

PETRONAS ACTIVITY OUTLOOK 2017-2019

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Release Date: March 2017

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FOREWORD

Samsudin Miskon
Vice President
Group Procurement

Dear Business Partners,

PETRONAS is pleased to present the inaugural edition of the PETRONAS Activity Outlook 2017-2019.

In this Report, we provide the general industry overview and a demand outlook for 8 prioritised categories - 7 in Upstream and 1 in Downstream. These are believed to be good leading indicators for a broad range of activities and are able to provide a general sense of direction, even to players in many adjacent categories.

We recognise that market information can be a strong industry enabler. As such, we have designed and developed this Report with the intention of supporting you in planning your resources and investments more effectively; particularly for project-driven activities that are susceptible to demand spikes.

We believe that signaling the market would help to re-balance the supply-demand dynamics, push for collaboration among players and encourage new players in emerging categories. With this, we hope to build a more efficient and resilient domestic oil and gas industry, and push for a more effective engagement between PETRONAS and our vendors.

While we have put in our best effort to provide a good representation of the market outlook and demand, we advise all industry players to use their own judgment in making business decisions.

We are pleased to inform you that this Report will be released annually, to provide you with timely and relevant information on PETRONAS' requirements moving forward.

Lastly, in support of a true spirit of collaboration, we welcome your comments and feedback towards the continuous improvement of this Report.

Thank you.

INTRODUCTION

The PETRONAS Activity Outlook 2017-2019 Report is produced to improve visibility on future activities within the Oil & Gas industry in Malaysia, with the intention of assisting Oil & Gas Services and Equipment (OGSE) vendors to execute better and more effective planning of their resources and investments, particularly for project-driven activities that are prone to demand spikes.

The mid-to long-term view of the Report promotes diversification, where vendors would have better line of sight on emerging project requirements, and can spot expansion and diversification activities.

This Report comprises two parts:
Section 1: Industry Overview
Section 2: Category-specific Outlook

Figure 1: PETRONAS Activity Outlook 2017-2019 Report Outline

	Sections	Description
Industry Overview	1A Current State-of-the-Industry	• Recap current oil price and market dynamics
	1B Market Outlook	• Outline market expectation • Directional narrative on factors which may vary original assumptions
	1C Strategic Direction	• Outline PETRONAS' focus areas, production outlook & capital expenditure trends
	1D Portfolio Outlook	• Provide high-level portfolio outlook & implication on activities
Category Outlook	2 Category-Specific Outlook	• Outlook for activities related to 8 prioritised categories

OUTLOOK METHODOLOGY

Scope of Coverage

For Upstream-related information, the Report covers the activity outlook for Malaysia. This includes activities from PETRONAS Group of Companies and other Petroleum Arrangement Contractors (PACs). Activities governed under the Malaysia-Thailand Joint Development Area (MTJDA) are excluded from this Report.

For Downstream-related information, this Report covers the activity outlook for PETRONAS Group of Companies in Malaysia only.

Time Horizon

The Report provides information on activities within a 3-year period, from 2017 to 2019. Information is accounted for when a specific activity begins, and not by contract award. For example, for construction related activities, we report the date of first steel-cut instead of the date of Engineering, Procurement, Construction, Installation and Commissioning (EPCIC) contract award.

The Report includes activities which may have been contracted at the time of reporting. Optimisation or sequencing efforts (e.g., impact of contracting strategy or long-term activity sequence) are excluded from this Report. Additionally, multi-year activities are not reflected. For example, an installation project from December 2017 to January 2018 only accounted for once in 2017.

The Report also provides directional narratives for the medium-term (i.e., post-2019), to support outlook analysis.

High & Low Case Scenarios

Outlook for most categories are provided via an upper and lower band based on:

- **Degree of project maturity** e.g., higher certainty on projects under execution vs. projects under study
- **Certainty of requirement** e.g., higher certainty on vessels to support production/operations vs. vessels to support new development projects

SECTION 1

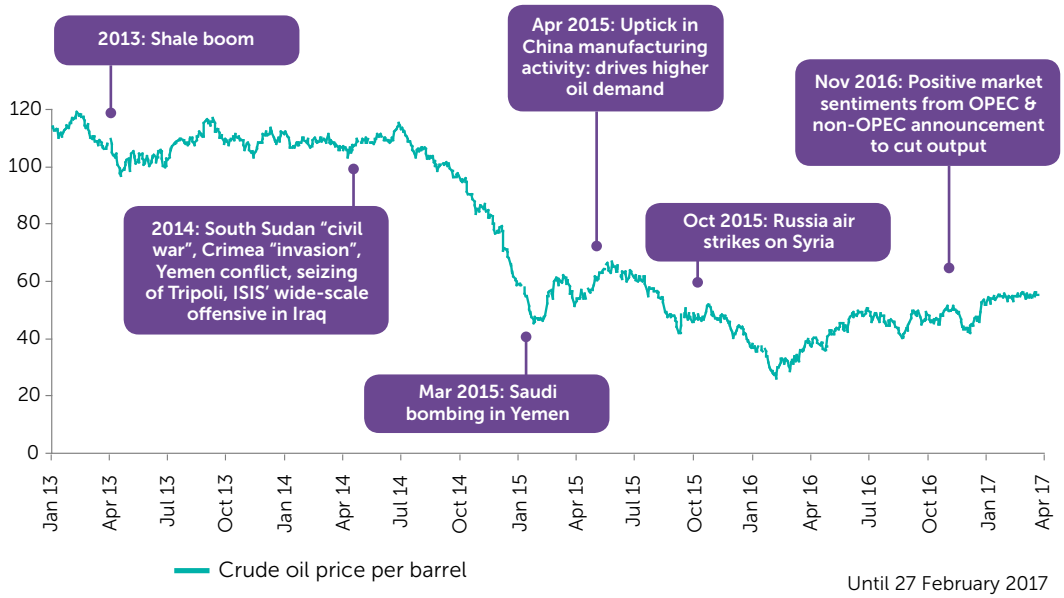
INDUSTRY OVERVIEW

Current State-of-the-Industry

Changing global market conditions have resulted in lower, more volatile oil prices. Before the oil price collapsed in 2014, prices were hovering above US$100 per barrel. Since then, prices took a plunge, reaching a floor of US$26 per barrel in early 2016.

Modest recovery has been observed over the past 12 months. However, most industry analysts do not expect a return to the days of US$100 per barrel oil in the near future. The "new normal" seems to be closer to ~US$50-60 per barrel.

Figure 2: Dated Brent crude oil trend (US$/bbl)[1]



Until 27 February 2017

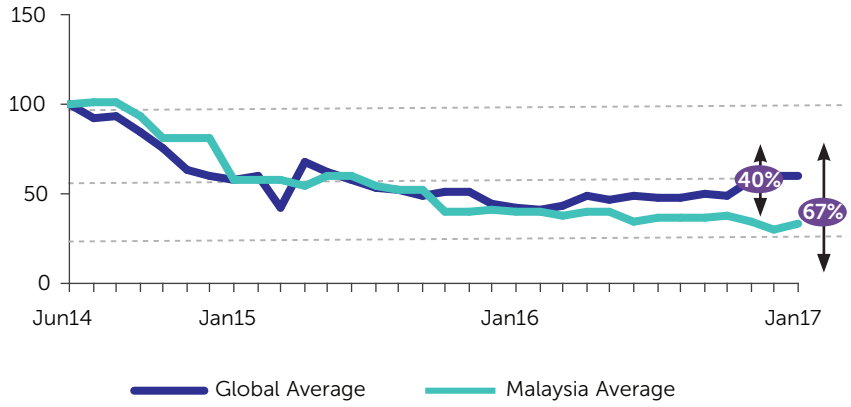
[1] Source: Platts; Bloomberg

In the Upstream sector, projects are becoming unprofitable, with many players facing the brunt of the impact of low oil prices. Many Malaysian projects have been deferred or cancelled altogether.

Upstream projects are also becoming increasingly complex and requiring higher capital expenditure and technical expertise. Projects of this nature are not economic at current prices.

Local Upstream players have seen share prices declined by ~67% on average since June 2014, compared to their global peers which saw an average decline of ~40%

Figure 3: 2014-17 share price comparison between top Malaysian & global OGSE companies[2] (Index=100)



In the Downstream sector, players are actively investing (despite the volatility in refining margins) to prepare for market improvements in the long term. For example, Sinopec Corporation continues expanding its downstream business. Closer to home, Saudi Aramco recently agreed to invest US$7 billion in PETRONAS' RAPID project.

[2] Based on top OGSE companies by market cap – including global companies (e.g., Schlumberger, Halliburton, Baker Hughes) and local companies (SapuraKencana, Bumi Armada, Yinson)

Market Outlook

Based on industry analyst reports, oil prices are expected to average around US$50-60/barrel. However, there are several factors which may cause this outlook to vary.

Figure 4 below outlines the key positive and negative growth drivers for market outlook. However, it is important to note that the following drivers are non-exhaustive; rather, they are used to illustrate factors which may be considered.

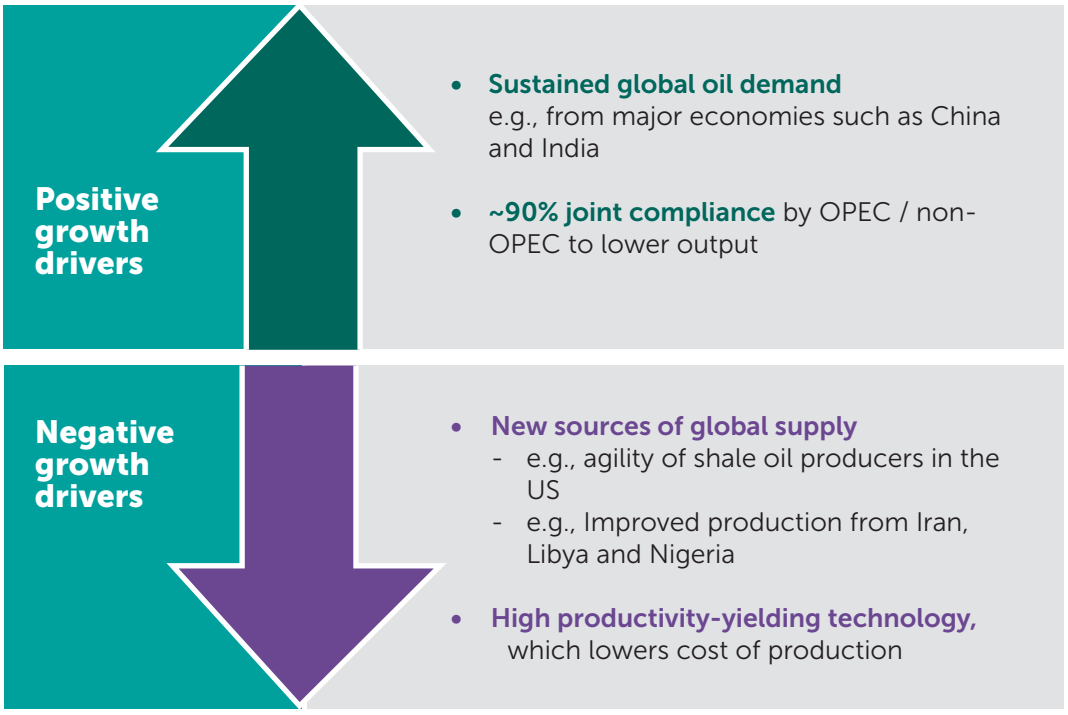


Figure 4

Strategic Direction

PETRONAS is steadfast in its direction and has a clear and robust strategy to weather changes in the external environment. In the Upstream sector, PETRONAS will continue to strive for sustainable value-driven production and operations.

In Downstream sector, PETRONAS' emphasis is on protecting and growing margins from commercial and operational excellence.

As a national oil company, PETRONAS continues to prioritise 3 strategic areas. These are:

- **Maximise domestic value creation**
  - In Upstream, this means pursuing sustainable value-driven production and maximising ultimate recovery through Brownfield developments
  - In Downstream, this means achieving and sustaining world-class plant performance and diversifying into higher value-adding revenue streams (e.g., finding new markets for petrochemical products)

- **Leverage on technology-driven solutions** to enhance efficiency and to unlock value
  - For example, PETRONAS is advancing work in CO_2 gas management, Enhanced Oil Recovery (EOR) & fluid technology solutions

- **Continued emphasis on capability building** to develop the best-in-class talent in the Oil & Gas industry

Portfolio Outlook

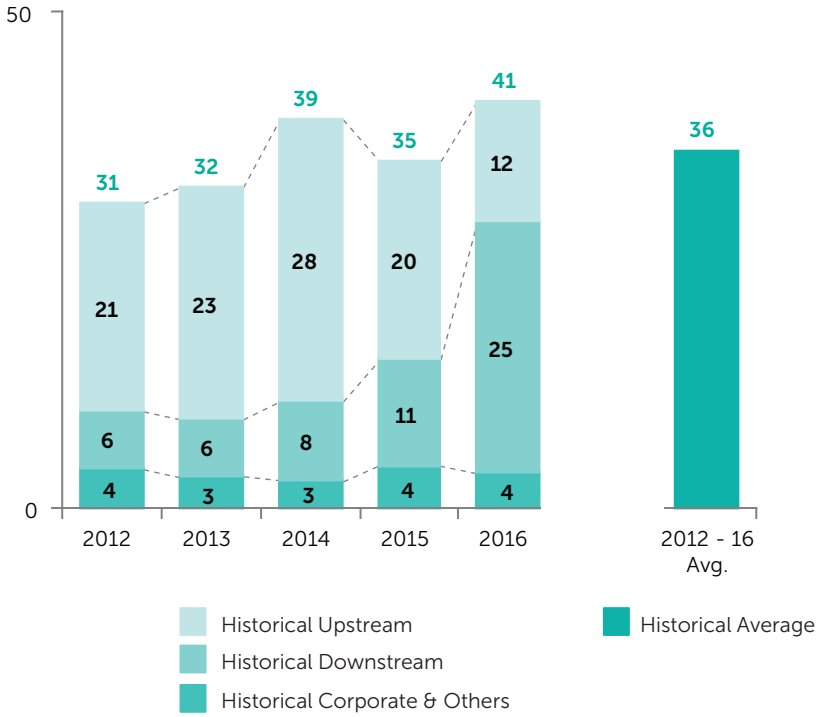
Upstream activities remain a primary focus in domestic spend. However, higher priority will be given to Downstream activities in the short-term.

Average 5-year domestic capital expenditure (CAPEX) for FY 2012-2016 was RM36 Billion per annum, with approximately 60% spent on Upstream activities.

For FY 2017-2021, average domestic capital expenditure is still expected to be invested primarily in Upstream activities, albeit at a lower proportion, in line with lower crude prices and an oversupplied crude market.

It should be noted that in FY 2017-2018, more emphasis will be on Downstream activities, particularly for RAPID project.

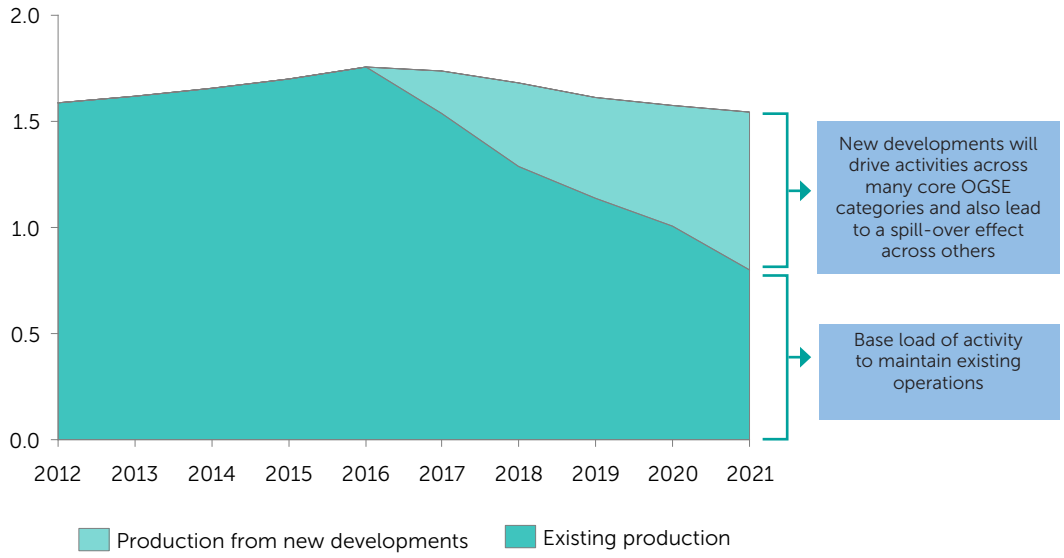
Figure 5: Malaysia CAPEX spend FY2012-2016 (RM Billion)



For Upstream, an average of ~ 1.7Mboe/d production is forecasted over the next five years.

Production volumes are set to fall slightly over the next 3-5 years to around 1.7 Mboe/d, down from a peak of 1.8 Mboe/d in 2016. New developments will drive activities across many core OGSE categories and also lead to a spill-over effect across others.

Figure 6: 2012-2021 Malaysia production (Mboe/d)



We have a steady stream of projects achieving first production in the next 3 years.

Upstream sector has a robust pipeline of projects focused on developing new growth areas or "Greenfield Projects" and maximising ultimate recovery of existing fields or "Brownfield Projects".

Figure 7 below provides an illustration of the type of projects that is expected to achieve first hydrocarbon over the next three years.

	GREENFIELD PROJECTS	BROWNFIELD PROJECTS
Project type & description	• No previous construction/ development of fields	• Expansion/revamping of existing fields • Covers various activities (e.g., infill drilling, rejuvenation, injection facilities)
No. of Projects	• **10-15 projects in 2017-2019** (vs. >20 projects in 2014-2016)	• **20-25 projects in 2017-2019** (vs. >25 projects in 2014-2016)
Sensitivity to Price Volatility	• High degree of change, depending on market conditions	• For most activities, low-to-medium degree of change • However, EOR-related activities are highly sensitive to market conditions as they are less economic during low oil price

Figure 7

SECTION 2

CATEGORY-SPECIFIC OUTLOOK

Introduction

Section 2 of this Report provides an activity outlook for prioritised categories. The selection of these categories is underpinned by 4 guiding principles:

- **Core Oil & Gas activity:** They represent fundamental activities in Oil & Gas operations in Malaysia.
- **Nature of business:** They require advanced planning due to high capital outlay and long-lead times
- **Criticality of market conditions:** They are mostly affected by market uncertainty
- **Benefits Malaysian OGSE players:** Categories selected are mostly provided by local vendors

Based on these guiding principles, 8 categories have been identified and selected. These categories are leading indicators for activities in the Oil & Gas industry; comprise of 7 Upstream categories and 1 Downstream category:

- Drilling Rigs
- Engineering Design & Consultancy (EDC)
- Offshore Fabrication
- Offshore Installation
- Floating Offshore Facilities (Floaters)
- Hook-up & Commissioning and Topside Major Maintenance (HUC and TMM)
- Marine Vessels
- Plant Turnaround

Figure 8 below shows the linkages between the Categories within Upstream sector, whilst Plant Turnaround is on standalone basis for Downstream sector.

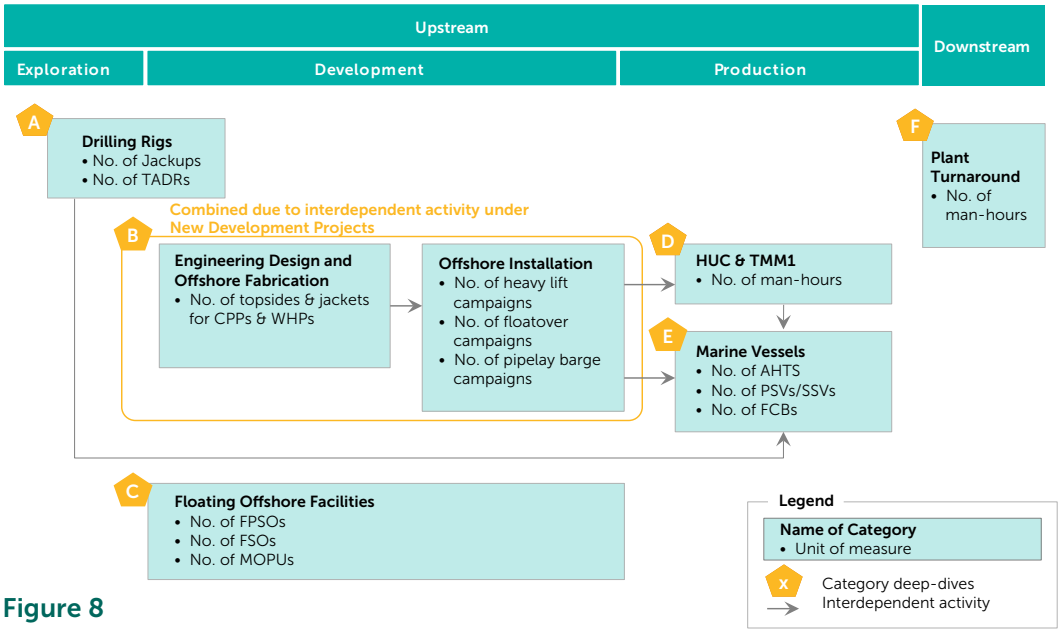


Figure 8

Moving forward, activity outlook of other categories may be included in future releases of the Report.

A. Drilling Rigs

Category Overview

Drilling Rigs are used to drill exploration and development wells, and typically comprise four (4) types:

- Jackup Rigs
- Tender Assisted Drilling Rigs (TADRs)
- Semi-Submersible Rigs
- Drillships

To note, the type of rigs required is driven by water depth.

For the purpose of this Report, activity outlook will be provided for the most widely-used drilling rig types in Malaysia – i.e., Jackup Rigs and TADRs.

Figure 9 below provides a brief overview of its functions and specifications.

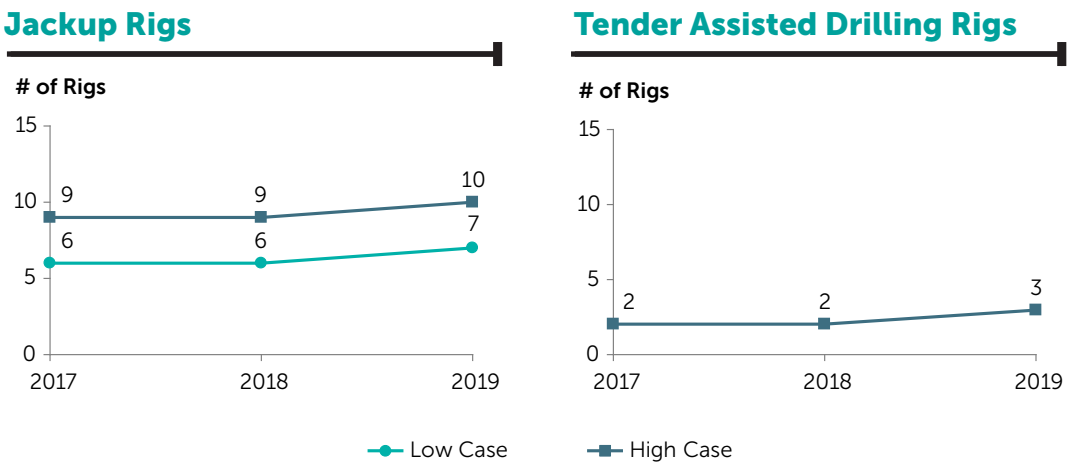
Jackup Rigs		• Used for both exploration and development drilling • Most common type of offshore Drilling Rig, used for a wide range of environments & well-types • Operational in water depths of up to 450 ft
TADRs		• Used for development drilling only • Normally used on platforms with limited load capacity/space

Figure 9

3-year-Outlook

Over the next 3 years, the number of Jackup Rigs and TADRs are expected to remain relatively stable, with an average of ~10 rigs per annum.

Figure 10: Number of Drilling Rigs (2017-2019)



Activity for Jackup Rigs in the low case is supported by expected base load activity, in order to fulfill exploration/commitment well obligations and to meet production targets via new development wells.

The number of TADRs are expected to remain relatively constant over the next 3 years, for the drilling of development wells activitiy. Based on this, no low case is provided.

Note: Outlook includes activities which may have been contracted out at the time of reporting

Medium-term Outlook (post-2019)

Unless a significant uptick in future oil price occur, rig activity for both Jackup Rigs and TADRs is expected to remain at a steady level in the medium-term, sufficient to support PETRONAS' drive for value-driven production.

Figure 11 below outlines growth drivers that could potentially vary medium-term outlook

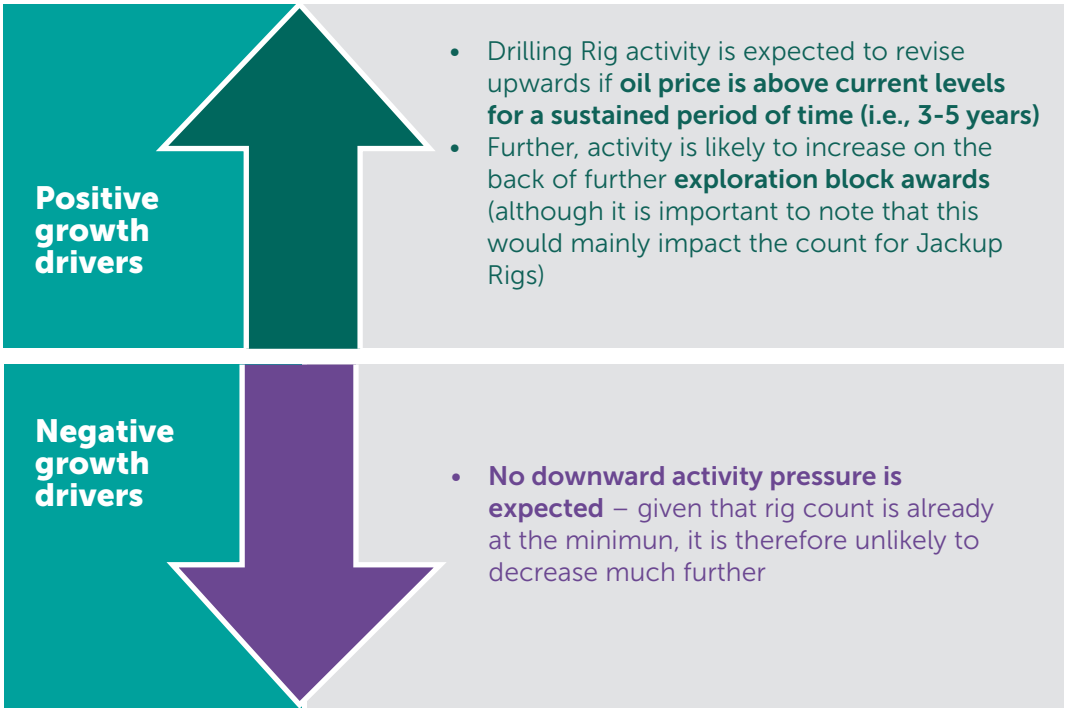


Figure 11

B. New Development Projects

3 categories are grouped under this major area, given that its activity is mainly driven by new development projects (Greenfield):

- **Engineering Design & Consultancy (EDC):** Refers to the Detailed Design phase, post-Conceptual Engineering and Front-End Engineering Design (FEED)
- **Offshore Fabrication:** Refers to construction of offshore structures (e.g., Topsides, Jackets)
- **Offshore Installation:** Refers to installation of structures via heavylift or floatover method and installation of linepipes at offshore locations

To note, HUC (part of EPCIC projects) is captured as a separate category to reflect both Greenfield and Brownfield projects.

Several indicators are used to measure activity:

- Engineering Design and Offshore Fabrication activities are reported together as the indicators are similar, i.e.,:
  - No. of WHP/ CPP Topsides and Jackets
  - Total metric tonnes (MT) of WHP/ CPP Topsides and JTackets
- Offshore Installation activity occurs post-fabrication, reported as:
  - No. of installation campaigns

For the purpose of this Report, please refer to **Subsection B1** for EDC and Offshore Fabrication activity, and **Subsection B2** for Offshore Installation activity.

B1. EDC and Offshore Fabrication

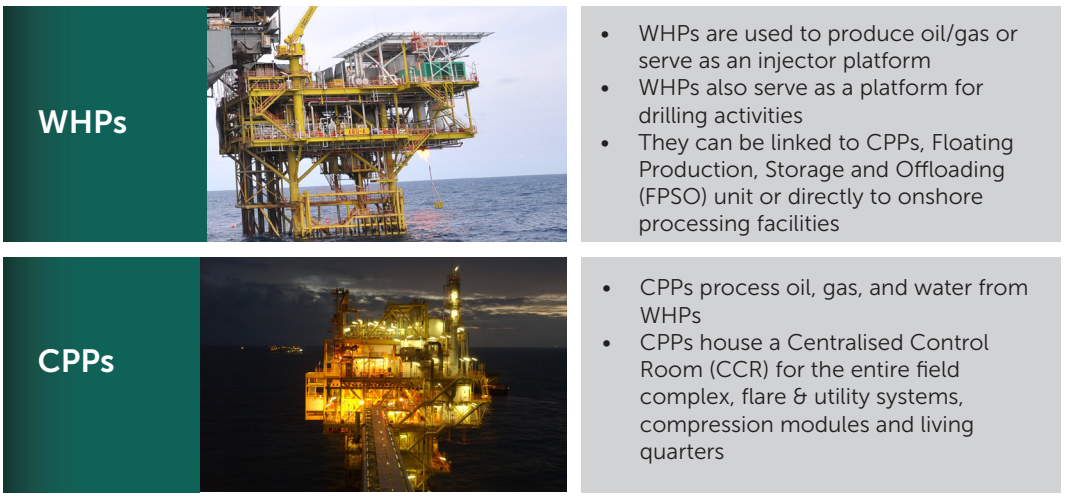
Category Overview

While EDC and Offshore Fabrication are clustered together due to its similar indicators for activity, both categories cover different types of work. The categories are the first stage of EPCIC activities for offshore facilities.

The activities involve engineering, followed by construction (i.e., fabrication) of offshore facilities

- Engineering refers to Detailed Design which is preceded by Conceptual Engineering, & FEED before EPCIC starts
- Fabrication refers to first steel-cut as the commencement of construction activity

Figure 12 below provides a brief overview of Wellhead Platforms (WHPs) and Central Processing Platforms (CPPs).



- WHPs are used to produce oil/gas or serve as an injector platform
- WHPs also serve as a platform for drilling activities
- They can be linked to CPPs, Floating Production, Storage and Offloading (FPSO) unit or directly to onshore processing facilities

- CPPs process oil, gas, and water from WHPs
- CPPs house a Centralised Control Room (CCR) for the entire field complex, flare & utility systems, compression modules and living quarters

Figure 12

Engineering design and fabrication are sequential activities
Each new project will require engineering studies before fabrication

- Therefore, demand for new WHP and CPP topsides and jackets serve as leading indicators for both engineering and fabrication work

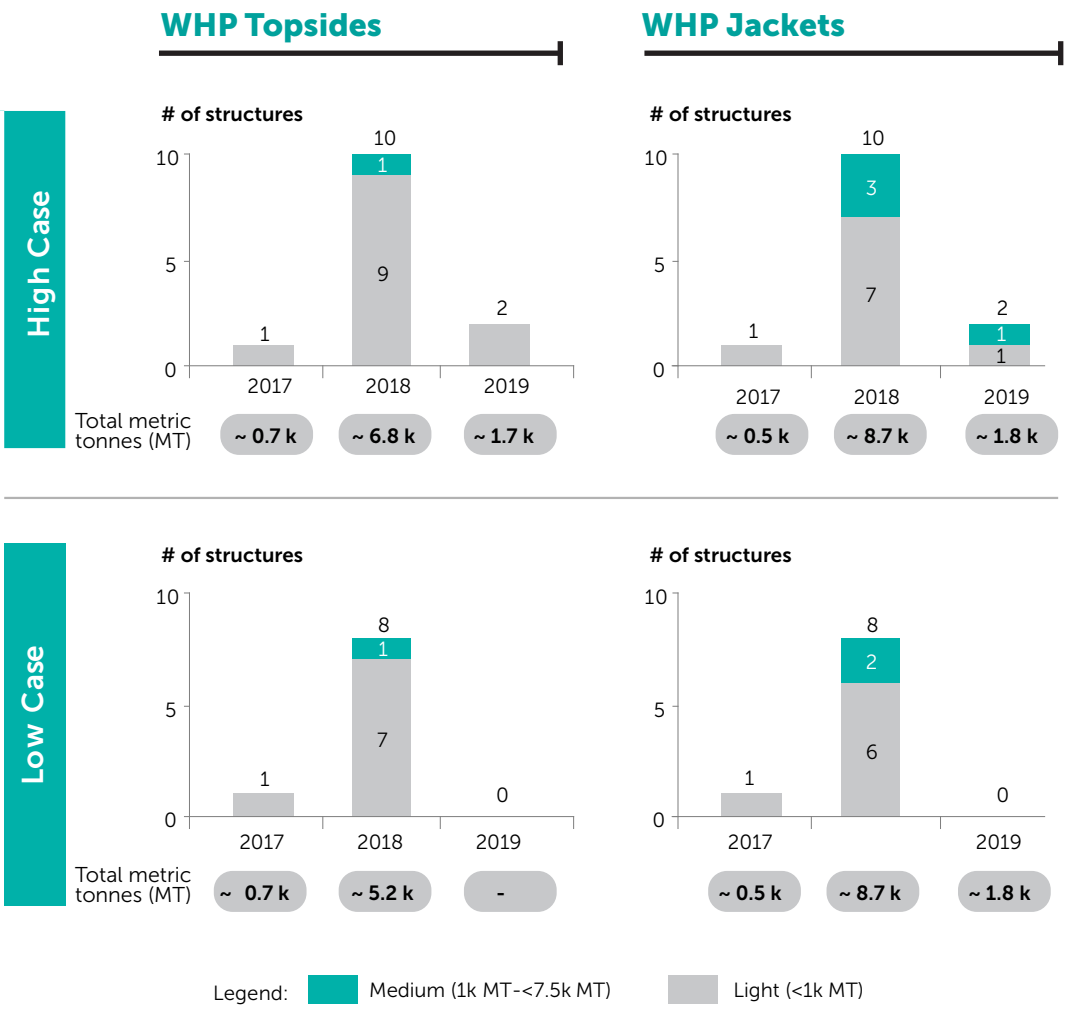
Activities are represented by new-build WHP and CPP fabrication requirements[3]

[3] Our coverage excludes compression modules and other smaller structures (e.g., risers)

3-year-Outlook

Figure 13 below provides the expected number of WHP Topsides and Jackets required in the next 3 years, where offshore fabrication activity for WHP Topsides and Jackets is expected to peak at ~15 000 MT in 2018

Figure 13: Number of WHP Topsides and Jackets (2017-2019)

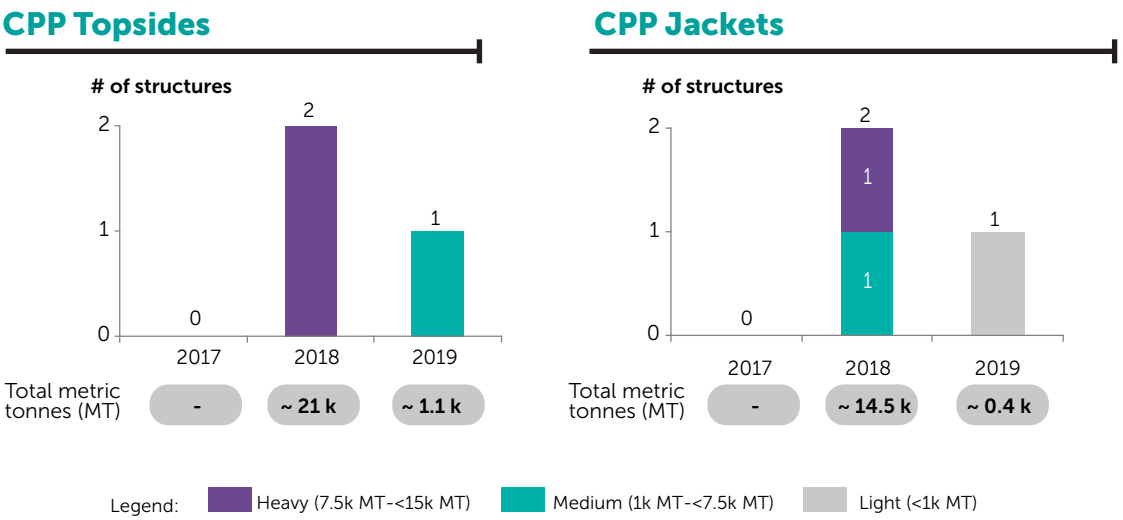


Note:

1. Outlook includes activities which may have been contracted out at the time of reporting
2. Activities in the low case are derived by excluding projects with lower degree of maturity
3. Weight provided above excludes piles and conductors

Figure 14 below provides the expected number of CPP Topsides and Jackets required in the next 3 years, where offshore fabrication activity for CPP Topsides and Jackets is expected to peak at ~35 000 MT in 2018.

Figure 14: Number of CPP Topsides and Jackets (2017-2019)



Note:

1. Outlook includes activities which may have been contracted out at the time of reporting
2. No high / low case is depicted here, given that all projects have a similar degree of maturity
3. Weight provided above excludes piles and conductors

B2. Offshore Installation

Category Overview

Offshore Installation activities involve the installation of Topsides, Jackets and Linepipes using Installation barges.

Category outlook is provided for the 3 types of barges typically used for Offshore Installation.

Figure 15 below provides a brief overview of widely-used installation barges Malaysian and its functions.

Heavy lift barges		• Heavy lift barges utilise cranes and are used for installing WHPs as well as jackets and modular topsides for CPPs
Floatover barges		• Floatover barges are used for installation of heavier or integrated topsides
Pipelay barges		• Pipelay barges are specialised vessels used for installing rigid pipelines • It is to be noted that this Report excludes replacement pipelines

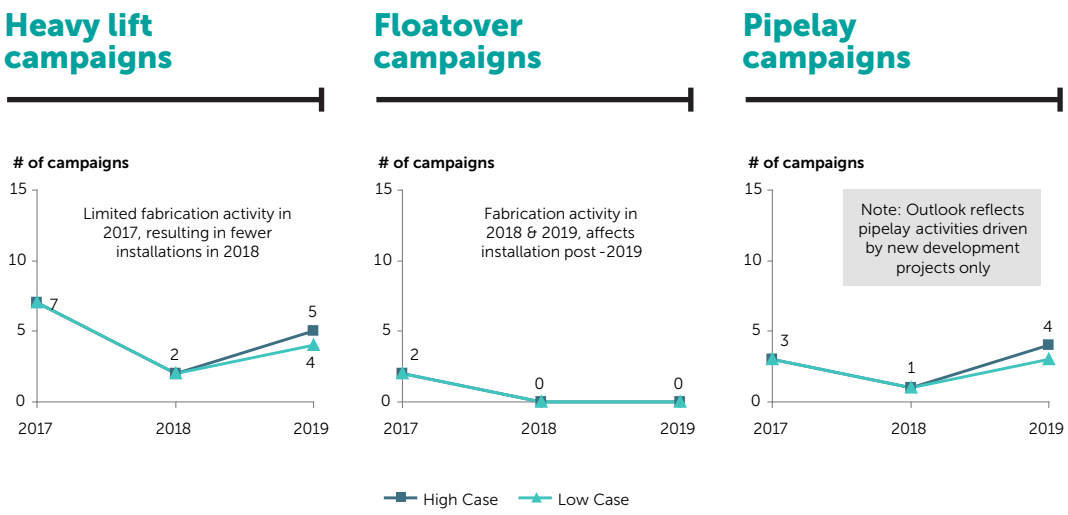
Figure 15

Offshore Installation activity is measured in terms of number of campaign for each type of barge.

- For example, 1 project with 2 WHPs (i.e., 2 Topsides & 2 Jackets) would require 1 heavy lift campaign

3-year-Outlook

Figure 16: Number of heavy lift, floatover and pipelay campaigns (2017-2019)



Note:

1. Outlook includes activities which may have been contracted out at the time of reporting
2. Activities in the low case are derived by excluding projects with lower degree of maturity

Medium-term Outlook (post-2019)

A steady flow of new projects is expected to sustain value-driven production targets. Activities for categories within the new development projects area are expected to remain stable, due to a flow of multiple new projects expected post-2019.

However, the scale of activities per project may be smaller than 2017-2019 (e.g., smaller WHP size), in line with the smaller scale of planned facilities

Figure 17 outlines growth drivers that could potentially vary medium-term outlook

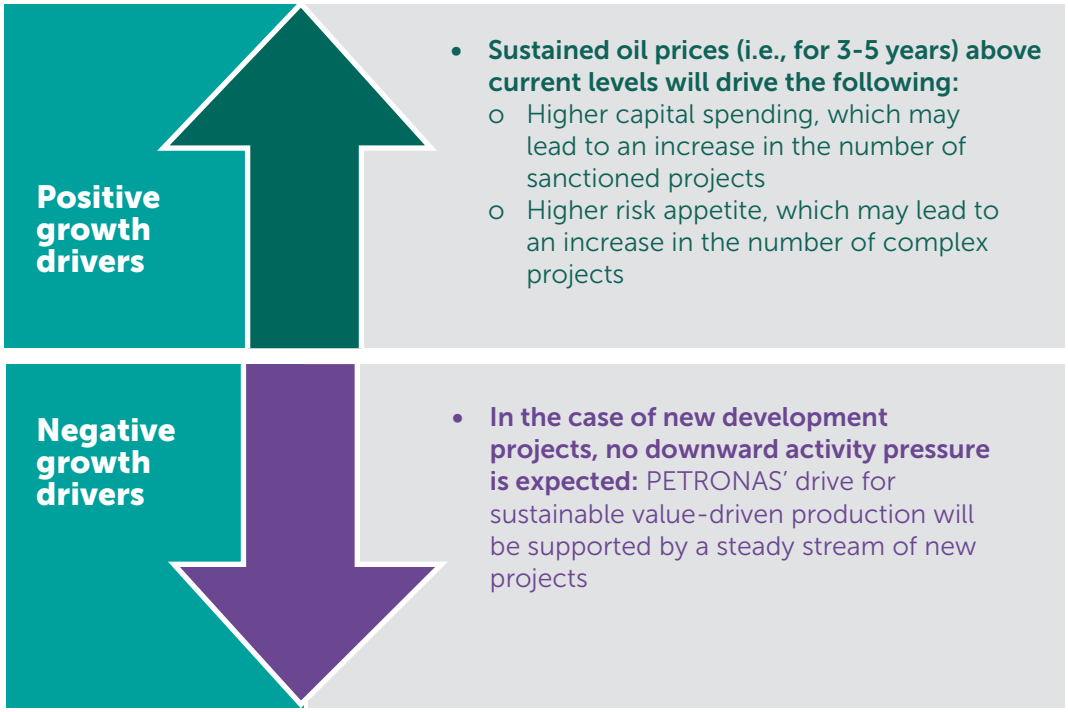


Figure 17

C. Floating Offshore Facilities (Floaters)

Category Overview

Floaters include non-fixed structures, involved in production and/or storage of hydrocarbons. 3 types of floaters widely used in Malaysia are :

- Floating Production, Storage & Offloading (FPSOs)
- Floating Storage & Offloading (FSOs)
- Mobile Offshore Production Units (MOPUs)[4]

Figure 18 outlines the overview of widely-used Floater types in Malaysia

FPSOs		• Floating vessels used in the offshore Oil & Gas industry for the production & processing of hydrocarbons, storage and offloading (to a tanker)
FSOs		• Floating vessels used in the offshore Oil & Gas industry for storage & offloading (to a tanker)
MOPUs		• Relocatable offshore units used for early production system or enhanced oil recovery

Figure 18

Floater types are selected on a case-by-case basis, depending on operating field conditions (e.g., marginal and short-lived fields with limited production, stranded fields where infrastructure is lacking, projects requiring quick / early production).

Additionally, FPSOs and FSOs may be used in deepwater activities (when economic thresholds are met).

[4] MOPUs are considered floaters due to its ability to be towed to the oilfield without the use of barges

In Malaysia, vendors involved in the Floater categories mainly cover the following services:

- Supply of Floaters: Sold or leased (with an option to buy) to Petroleum Arrangement Contractors (PACs). Floaters are fabricated via 3 main methods - conversions[5], retrofitting/refurbishment and newbuilds (i.e., purpose-built)
- Operations & Maintenance (O&M) Services: Covers technical activities (e.g., systems & equipment maintenance, crew competency and safety training, offshore oil storage, offloading and shuttle tanker management)

This Report only focuses on the supply of Floaters, as it comprises the bulk of Floater contracts (O&M services often contracted as an additional bolt-on[6]).

[5] Conversions (typically converted from oil tankers for FPSOs/FSOs, & Jackup Rigs for MOPUs)
[6] PACs usually outsource O&M services to a third party (e.g., EPOMs)

3-year-Outlook

Figure 19: Number of Floaters (2017-2019)

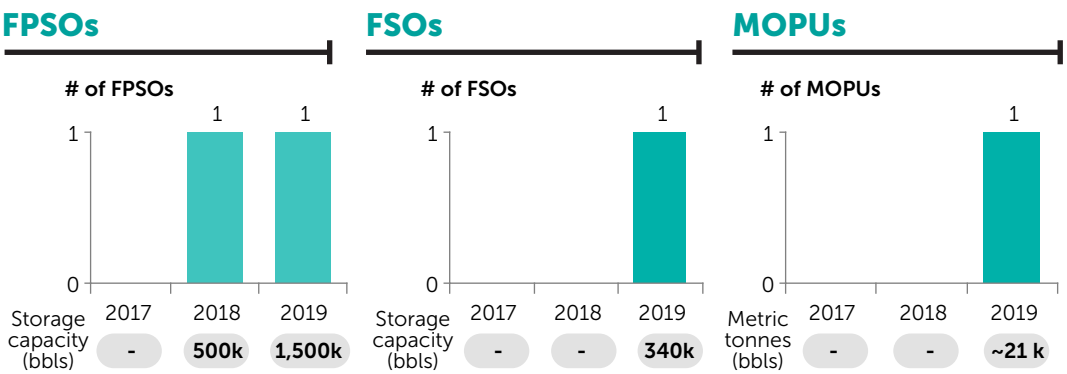


Figure 19

Note:

1. Outlook includes activities which may have been contracted out at the time of reporting
2. No high / low case is depicted here, given that all projects have a similar degree of maturity.

[7] Conversions (typically converted from oil tankers for FPSOs/FSOs, & jackup rigs for MOPUs)

Medium-term Outlook (post-2019)

In view of current market conditions, limited growth prospects are expected for Floater.

Figure 20 outlines growth drivers that could potentially vary medium-term outlook

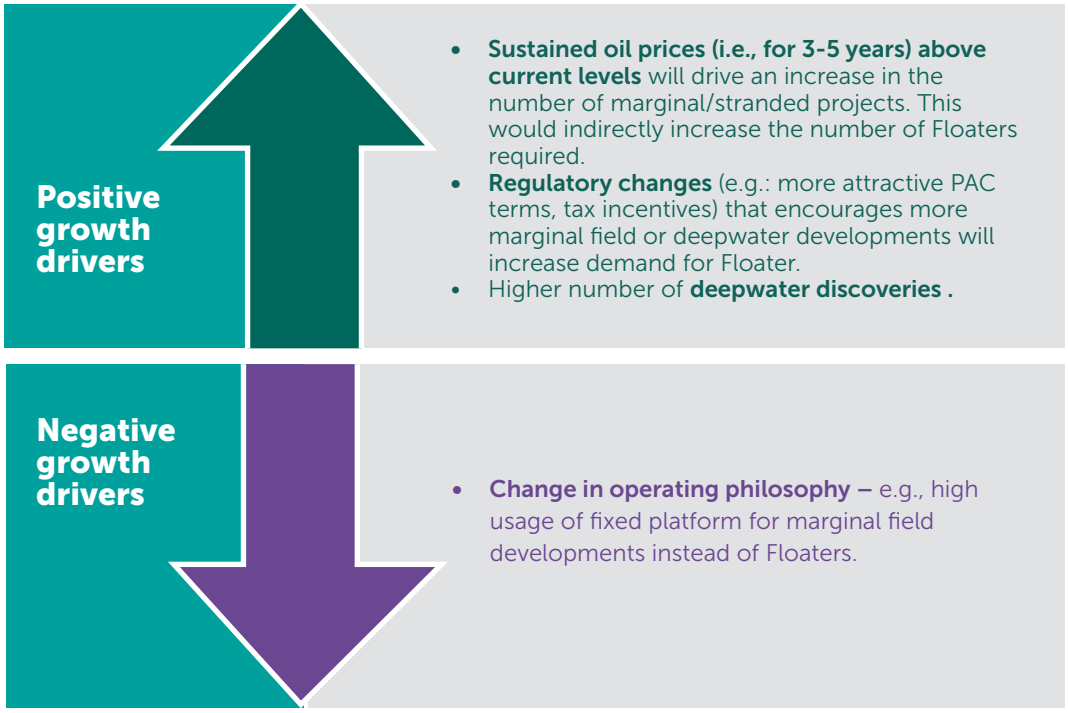


Figure 20

D. Hook-up & Commissioning and Topside Major Maintenance (HUC and TMM)

Both HUC and TMM are grouped under the same category, as both generally have similar manpower and equipment requirements.

Notwithstanding the above, HUC and TMM can be distinguished by the type of activities it covers, as illustrated in **Figure 21** below.

HUC Activities

- Interconnection, testing & commissioning of equipment's
- Bulk of activity comprises HUC activities on brownfield projects

TMM Activities

- Repair & maintenance work on existing facilities
- Bulk of activity comprises scheduled maintenance work

Figure 21

Given that both HUC and TMM activities are labour intensive, activity outlook is stated in man-hour units.

For the purposes of this Report, please refer to **Subsection D1** for HUC activity and **Subsection D2** for TMM activity

D1. Hook-up & Commissioning

Category Overview

HUC covers activities involving the interconnection, inspection & testing and commissioning of equipment's/systems once they are positioned and installed. This can be classified under 2 activity types:

- **Greenfield HUC:** Involves works on newly installed platforms; e.g.,
  - Physical interconnection between Jacket and Topside and between wellhead and facilities .
  - Testing and pre-commissioning
  - Facility commissioning
- **Brownfield HUC:** Involves works on existing offshore facilities & equipment

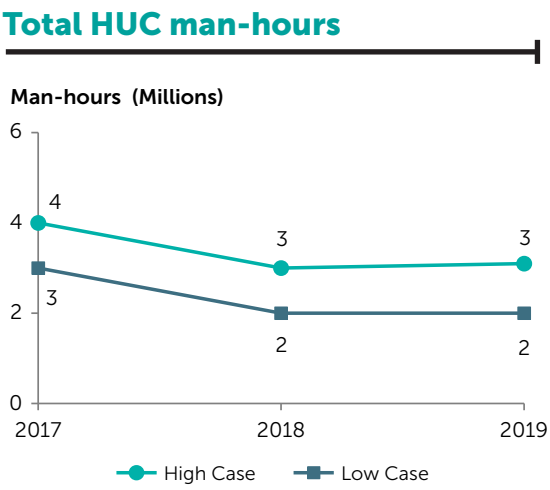
This Report will focus on a defined set of Greenfield & Brownfield HUC activity, as per **Figure 22** below.

Greenfield HUC	• HUC-related activities for newly installed WHPs & CPPs
Brownfield HUC	• Rejuvenation – "like-for-like" restoration work on ageing platforms to extend asset/facilities design life (e.g., 15-25 yrs) • General Topside Modification/Redevelopment e.g., platform deck extension, re-routing of piping, addition of new equipment (minor & major) on topside facilities • Infill drilling – addition of wells within existing production zones to accelerate & optimise recovery. HUC-related activities here includes preparatory work to receive rig interconnection between rig and topside, pre-fabrication of pipe spool, structure) etc.

Figure 22

3-year Outlook

Figure 23: Number of HUC man-hours (Millions, in 2017-2019)



To note, activities in the low case take into account the following assumptions:

- **Greenfield HUC:** Excludes platforms with lower probability of being fabricated.
- **Brownfield HUC:** Assumes lesser man-hour requirements on the back of tighter cost-cutting measures (i.e., lesser number of days required per campaign / activity, fewer number of people hired / contracted).

- **Brownfield HUC activity makes up the bulk of total PETRONAS HUC activity**
  - Specifically, this is driven by HUC-related works associated with general topside modification
- **Greenfield HUC activity mainly takes place in 2017**
  - This is driven by work associated with relatively high number of newly fabricated platforms in 2015-16

Note: Outlook includes activities which may have been contracted out at the time of reporting

Medium-term Outlook (post-2019)

HUC activity is projected to gradually increase in line with oil prices, where the bulk is expected to be driven by development activity.

- **Brownfield activity** should continue on current trajectory
- **Greenfield activity** should rebound as new platfoms are installed

Figure 24 below outlines growth drivers that could potentially vary medium-term outlook

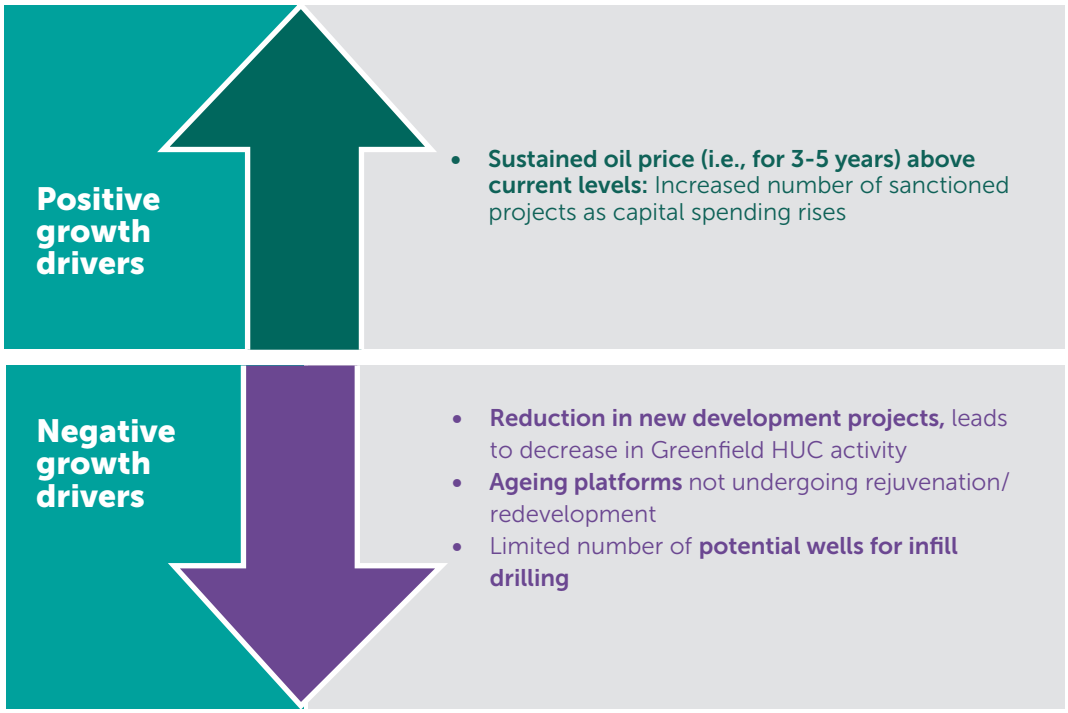


Figure 24

D2. Topside Major Maintenance (TMM)

Category Overview

TMM covers activities related to the repair and maintenance of existing topside facilities.

TMM involves repair and maintenance work on existing topside facilities:

- Unlike HUC, TMM activities focus on maintenance work

TMM contracts cover an accumulated set of activities that can be executed within a single campaign:

- Such accumulation of activities is driven by financial & operational efficiency reasons

Typically, a TMM campaign will be executed every 5-8 years.

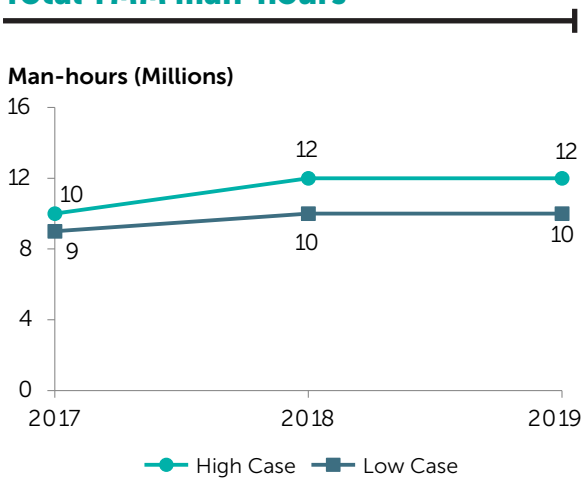
Generally, there are two types of TMM activities, as illustrated in **Figure 25** below.

Scheduled Maintenance	• Scheduled maintenance involves activities that have been planned prior to execution. This involves : - Preventive maintenance ensure the general upkeep of the facility - Pre-emptive maintenance help to work on targeted areas that have been identified through predictive analysis (e.g., corrosion rate analysis)
Corrective Maintenance	• Corrective maintenance involves unscheduled works that arises due to unforeseen circumstances (e.g., leaked pipeline)

Figure 25

3-year-Outlook

Figure 26: Number of TMM man-hours (Millions, in 2017-2019)



- TMM activity is sustained by the need to maintain asset uptime, to ensure production levels can be maintained
- Additional activity is expected to be driven by the increasing number of ageing platforms
  - ~30-40% of existing platforms are >25 years old, which necessitates frequent TMM campaigns for upkeep purposes
- TMM activities in the low case assumes a higher level of productivity and asset life (e.g., lower number of scheduled TMM activities required)

Note: Outlook includes activities which may have been contracted out at the time of reporting

Medium-term Outlook (post-2019)

TMM activities are projected to continue its steady increase, on the back of the increasing average age of platforms

Notwithstanding the above, several factors will cause this outlook to revise upwards/ downwards:

Figure 27 outlines growth drivers that could potentially vary medium-term outlook

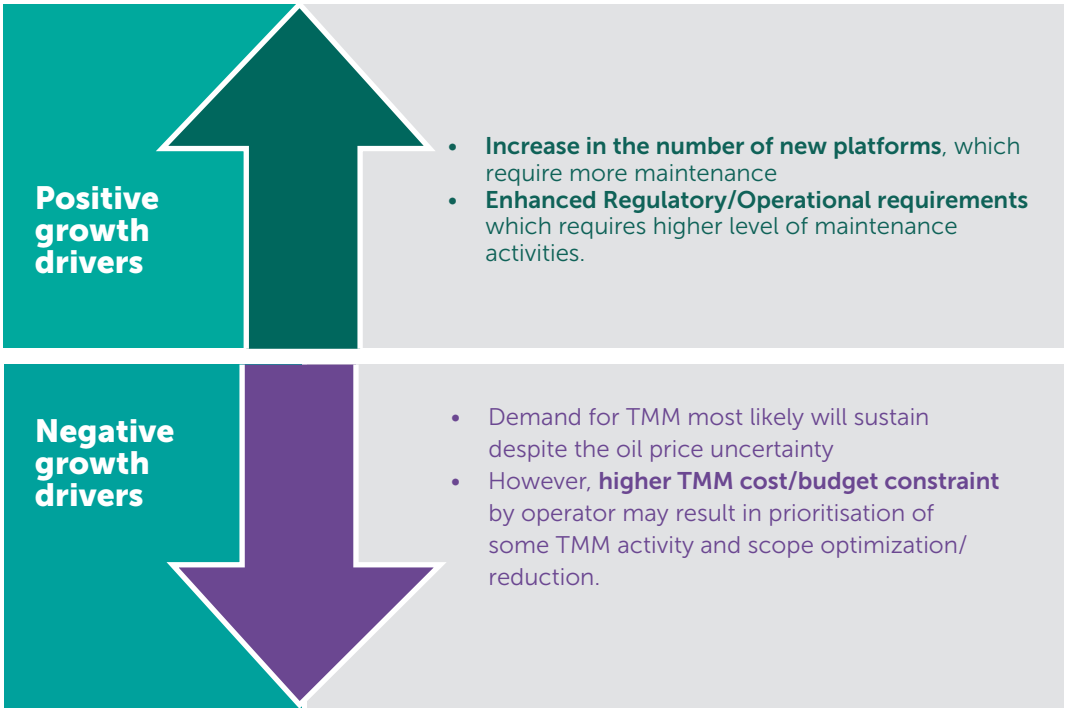


Figure 27

E. Marine Vessels

Category Overview

Marine Vessels offer a wide range of support services for exploration and development drilling, installation, HUC & production operations. The following list of vessels is covered within this category:

- Anchor Handling Tug Supply (AHTS) vessels
- Platform Supply Vessels (PSVs), Straight Supply Vessels (SSVs)
- Fast Crew Boats (FCBs)
- Standby Safety Vessels, General Purpose Vessels, Utility Vessels

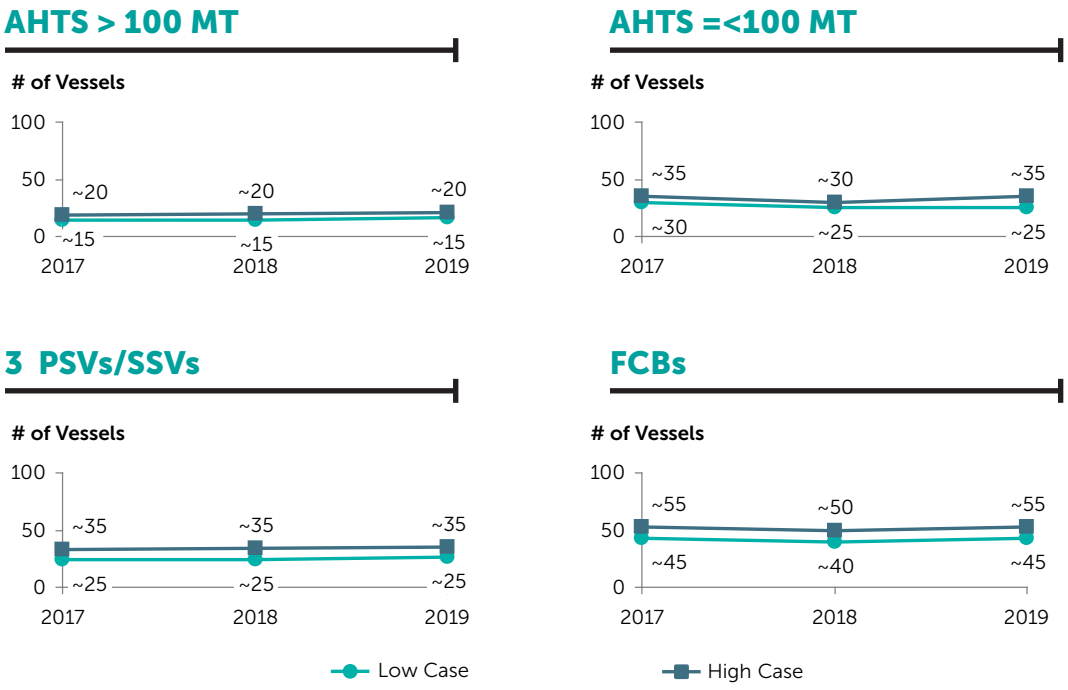
AHTS, PSVs/SSVs and FCBs are the 3 most widely-used vessel types. **Figure 28** below provides a brief overview of its functions.

AHTS		• An offshore tug/supply ship equipped with a high bollard pull and a stern roller for anchor handling • Also used to transport supplies to and from offshore platforms/ drilling rigs
PSVs, SSVs		• Vessels that carry equipment & supplies to offshore sites
FCBs		• A high speed vessel for the transportation of crew to offshore facilities

Figure 28

3-year-Outlook

Figure 29: Number of vessels by type



Note:

1. Outlook includes activities which may have been contracted out at the time of reporting
2. Low case reflects the level of uncertainty in rig, installation and HUC activity.

Medium-term Outlook (post-2019)

The number of Marine Vessels is expected to remain stable, in order to cater for existing operations:

- ~50-70% of activity required to support existing facilities is expected to remain constant
- While the level of activity required to support new development projects may increase, it is unlikely for it to recover to historical high levels

Figure 30 outlines growth drivers that could potentially vary medium-term outlook

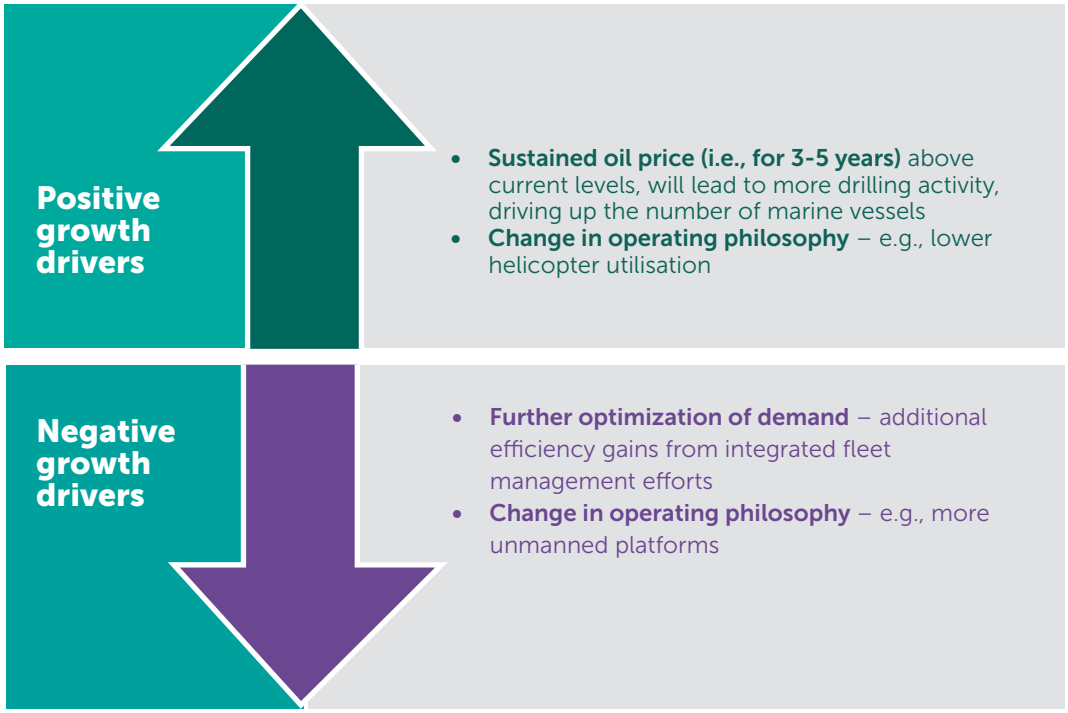


Figure 30

F. Plant Turnaround

Category Overview

Plant Turnaround comprises major periodic maintenance of Downstream facilities. It is defined as a major engineering event, during which a plant is shut down for equipment overhaul and inspection. This covers the following activities:

- Inspection and testing
- Debottlenecking and revamping
- Catalyst regeneration projects

Turnarounds are scheduled periodically and are important for the following reasons:

- To ensure timely renewal of Certificate of Fitness (CF) by authorities
- To maximise plant efficiency and capacity
- To ensure that the plant and its equipment are reliable & safe to operate, in line with health and safety industry best practices

Turnaround comprises the following types of activities:

- Main mechanical work, which constitutes the bulk of total activities (~60%)
- Other disciplines (e.g., electrical, instrument, inspection and rotating equipment maintenance)

Turnaround activities are driven by Downstream businesses – e.g.,

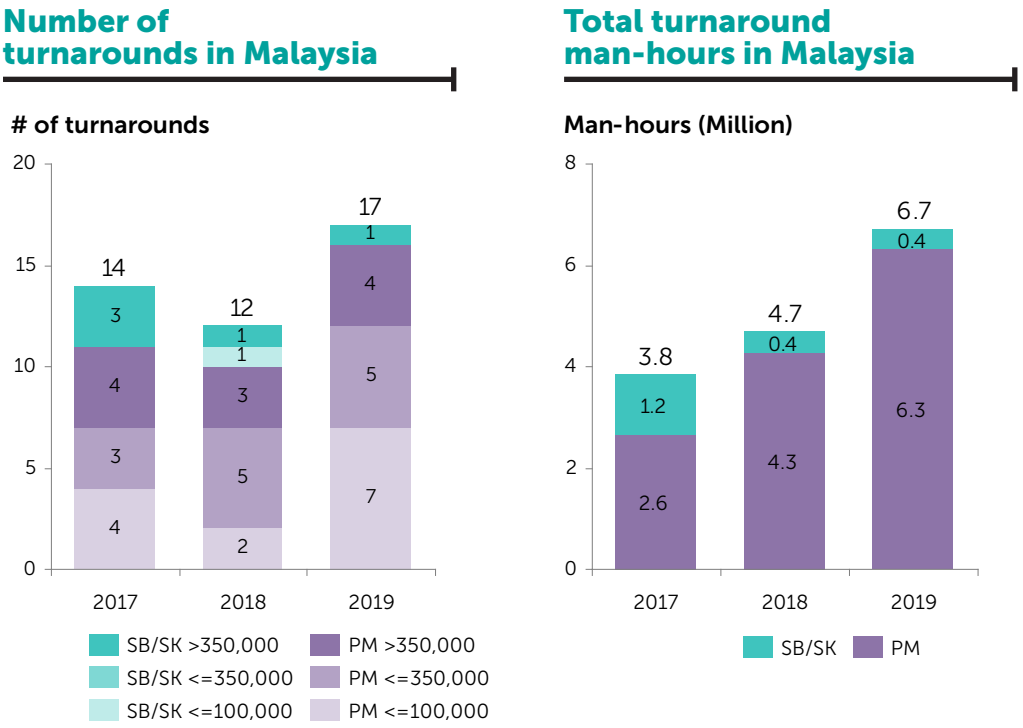
- Petrochemical plants
- Refineries
- Gas processing plants
- Liquefied Natural Gas (LNG) plants

To note, this Report refers to activities driven by PETRONAS Group of Companies only.

3-year-Outlook

Strong demand is expected for turnaround across Malaysia, with 12-17 total turnarounds per year, as indicated in Figure 31 below.

Figure 31: Number of turnarounds and total man-hours (Millions)



Turnaround demand in Malaysia is expected to increase, where the majority of turnarounds in Malaysia are above 100,000 man-hours, due to the relatively large size of facilities.

Please note that RAPID is not included in the 3-year outlook, as its first turnaround is expected to occur post-2019.

While turnaround schedules are compliant with industry regulations, there remains a slight possibility of deferment/rescheduling[7], depending on operational requirements.

Note: Outlook includes activities which may have been contracted out at the time of reporting

[7] Any rescheduling or deferment of turnaround will most likely occur within a year, therefore minimal/no impact on our model figures, which are calculated annually

Medium-term Outlook (post-2019)

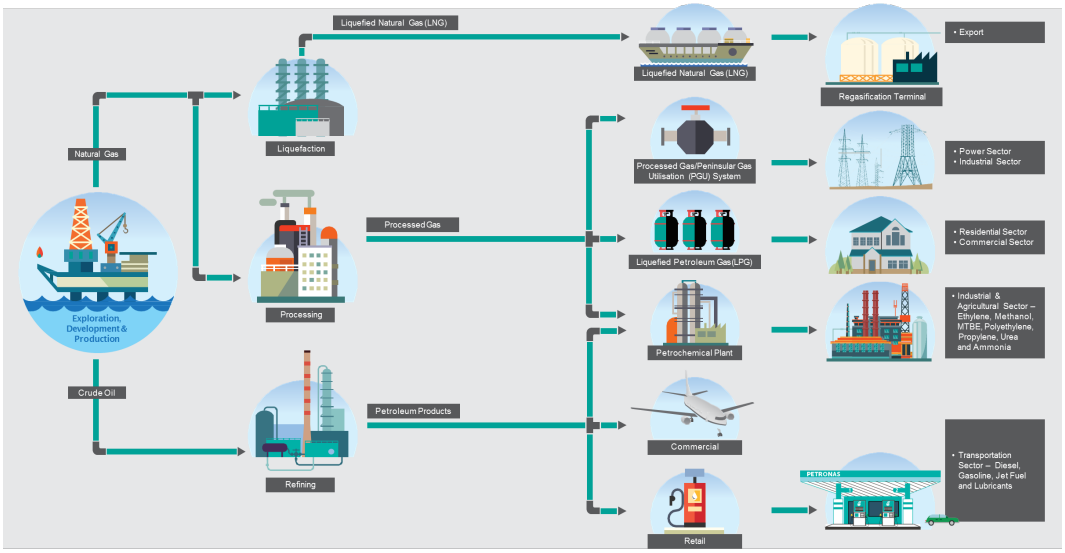
Post-2019, RAPID will cause a significant increase in turnaround activities, due to the size of its operations. The RAPID project is scheduled to come online by 2019, and thus will require turnaround work between 2020-2022.

To note, no factors are expected to contribute to either upward / downward demand pressure. While turnaround activity levels may vary from year-to-year (due to cyclicality), absolute levels are expected to remain constant, given that these are mandated by regulations.

Inclusive of RAPID, turnaround activity is close to its upper bound.

Glossary

PETRONAS is a fully integrated business. We maximise and add value to Oil & Gas assets



Industry Terms used in this Report

Term	Definition
Barrel	A standard unit of measurement for oil production. One barrel contains 159 litres of oil.
Barrels of Oil Equivalent (boe)	A unit of measurement to quantify the amount of crude oil, condensates and natural gas. Natural gas volumes are converted to barrels on the basis of energy content.
Brent Price	The benchmark crude oil price in Europe, as traded on the International Petroleum Exchange in London. Brent crude refers to a particular grade of crude oil, which is slightly heavier than WTI crude. See WTI price.
CO_2	Carbon dioxide, one of the primary greenhouse gases.
Deepwater	We define deepwater projects as those in water depths exceeding 450 ft. Unique methods are required to produce the oil and gas from the ocean bed at such depths. See Floating Production Unit.
Development	Drilling, construction and related activities following discovery that are necessary to begin production and transportation of crude oil andnatural gas.
Downstream	All segments of a value chain that add value to the crude oil and natural gas produced, for example, oil refining, gas processing, gas liquefaction, petrochemical manufacturing, marketing of petroleum and petrochemical products, storage and transportation.

Glossary

Term	Definition
Enhanced Oil Recovery (EOR)	Any method(s) applied to productive reservoirs in order to increase production rates and to improve the overall recovery factor.
Exploration	The search for crude oil and/or natural gas by geological and topographical studies, geophysical and seismic surveys, and drilling of wells.
Field	A geographical area overlying a hydrocarbon reservoir.
Floating Production, Storage and Offloading (FPSO)	A converted or custom-built ship-like structure, with modular facilities to process oil and gas and for temporary storage of the oil prior to transfer to carriers/tankers.
Floating, Storage and Offloading (FSO)	A converted or custom-built ship-like structure for temporary storage of the oil prior to transfer to tankers.
Mobile Offshore Production Unit (MOPU)	It is a self-installing and re-usable production jack-up
Petrochemicals	Organic and inorganic compounds and mixtures derived from petroleum, used principally to manufacture chemicals, plastics and resins, synthetic fibres, detergents, adhesives and synthetic motor oils.
Reserves	Hydrocarbons which are anticipated to be recovered from known accumulations of hydrocarbons.
Resources	Resources are defined as the total estimated quantities of petroleum at a specific date to be contained in, or that have been produced from known accumulations of hydrocarbon.
Upstream	The segment of value chain pertaining to finding, developing and producing crude oil and natural gas. These include oil and gas exploration, development and production operations; also known as Exploration & Production (E&P).
WTI Price	Stands for West Texas Intermediate, the benchmark crude oil price in the US, measured in USD per barrel, which refers to a type of high quality light crude oil

Contact Us

We want to hear from you. Please share your feedback/enquiries with our team via **pdtcorporateprojects@petronas.com.my**

Thank you for showing your interest to PETRONAS Activity Outlook 2017-2019