

1. Policy and Business Operations Overview

1.1 Vision, Mission, Objective and Strategy

PTTEP Group is one of the leading E&P companies in Thailand, exploring for sustainable sources of petroleum supply for the country and other countries in which the Company operates or invests in, and generating return that would satisfy the shareholders and stakeholders. In the midst of external complexities, rapidly changing environment, depleting petroleum resources, and geographical complexity, a more advanced technology with a greater capability is required, and so is the need to maintain environmental and social equilibrium. The Company's mission and vision have then been reviewed and identified.

Mission: PTTEP operates globally to provide reliable energy supply and sustainable value to all stakeholders.

Vision: Energy Partner of Choice through Competitive Performance and Innovation for Long-term Value Creation

Goal and Objective: PTTEP Group continuously and consistently monitors domestic and global economies to conduct energy trend and situation analysis in order to develop effective strategy and execution plan. The Company's objective is to create the balance between strong performance and business sustainability aspects to the following goals:

Strong Performance: Target to have a Return on Capital Employed (ROCE) at a level higher than that the industry's average and the unit cost in the top quartile of our Asian peer companies

Business Sustainability: Target to maintain the proved reserves to production ratio (R/P Ratio) of no less than 7 years by 2025 as well as to achieve a production target of 5% Compound Annual Growth Rate (CAGR) during 2018-2030

Strategy: To attain the above, we have formulated our strategic directions as follows:

(1) **RESET:** To increase production growth and sustain competitive performance by supplying more gas from current level, implementing digitalization to improve productivity and sustain cost competitiveness, increasing reserves through development project execution, divesting non-core assets, and accelerating and/or de-risking exploration projects

(2) **REFOCUS:** To expand core business from two dimensions

(2.1) **Coming-Home Strategy:** PTTEP aims to focus the investments in Thailand and South East Asia where the company designated as strategic investment areas. This includes the plan to accelerate activities in exploration projects located in Myanmar and Malaysia in order to improve petroleum reserves. Moreover, PTTEP is also looking to further expand our business into opportunities such as the Gas Value Chain business in Myanmar in the form of Gas-to-Power projects.

(2.2) **Strategic Alliance:** PTTEP captures new investment opportunity in other petroleum prolific areas with strategic alliances by mainly focusing on the Middle-East where considered as low cost barrel region.

(3) **RENEW:** The Company has transformed the organization and invested in new business focusing on technology and innovation as well as R&D capability to support core E&P business and future investment opportunity related to energy industry. In 2018, PTTEP has re-organized the structure and business operations to improve our agility and efficiency to be in line with our growth strategy. The new organization structure came into effect in January, 2019.

Procedure to Set the Company's Vision and Mission

PTTEP Board of Directors (Board) reviews and approves the vision and mission of the Company annually, being accompanied generally by the management, through a systematic planning process. The process is started by updating the current business environment and the E&P industry trend, and their implications on the Company regarding opportunities and risks. The role of the Company as a national oil company to provide a reliable and sustainable energy supply for Thailand is also reviewed. In addition, the Company's investment portfolio is reviewed and assessed on returns and risks to identify the vision, mission, and short-term and long-term strategic directions. These allow the Company to achieve sustainable growth as well as to be able to cope with business changes. The management will then develop the Company's work plan, budget, and Key Performance Indicators (KPIs), based on the given strategic directions and policies, to be presented to the Board for approval prior to the implementation.

After the Board approves the vision, mission, and corporate strategy, the management will cascade down the approved strategic directions and corporate targets to promote a better understanding among all of the Company's employees. In principles, this will subsequently lead to sub-work plan development and implementation which are in line with the corporate target, work plan, and core values to achieve the Company's goals at the end. However, the Board also regularly supervises and monitors management's implementation of stated strategic plans in accordance with business directions and strategies. The management is responsible for reporting its performance in comparison to the strategic plans to the Board of Directors for acknowledgement on a quarterly basis.

1.2 PTTEP Sustainability Management

1.2.1 Sustainability Management Overview

PTTEP's Sustainability Management is an integration of environmental and social responsibility into our business decisions to meet the expectations of our stakeholders, investors, shareholders, business partners, host governments, various communities, and employees. We continuously emphasize effective management of the three pillars of sustainability to reflect all ongoing concerns regarding any environmental and social issues as well as to create value for the Company and our stakeholders. Sustainability targets and strategies, and their implementation are driven by efficient business processes, funding, Governance, Risk and Compliance (GRC) management, innovation and technology, cost reduction, and human capability development to enhance production and to achieve work efficiency. To accomplish this, we have adopted His Majesty King Bhumibol Adulyadej's (Rama IX) Sufficiency Economy Philosophy (SEP) as the guideline for our business operations and have aligned our sustainability management with the United Nations Sustainable Development Goals (UN SDGs), focusing on Goals 3, 4, 7, 8, and 16, while continuing our support for the rest of the SDGs in our routine operations. Further, we use the Dow Jones Sustainability Indices (DJSI) to measure our sustainability performance at the international level.

In 2018, PTTEP was selected as a DJSI member in the World Oil and Gas Upstream & Integrated Industry for the fifth consecutive year. In addition, we were chosen as a member of the FTSE4Good Index Series for the FTSE4Good Emerging Index category for the third consecutive year. Additionally, in 2018, we received the SET Sustainability Awards 2018 – Outstanding Category from the Stock Exchange of Thailand (SET) for the first time.

1.2.2 Materiality Assessment

PTTEP's materiality assessment review process engages both internal and external stakeholders by using international standards, such as the Global Reporting Initiative (GRI Standards) Sustainability Reporting Guideline: Oil and Gas Sector Disclosures (OGSD) framework – core level, IPIECA's Oil and Gas Industry Guidance on Voluntary Sustainability, Dow Jones Sustainability Indices (DJSI), AA1000 AccountAbility Principles Standard (2008) (AA1000APS), and SASB Materiality Map™ by Sustainability Standards Board (SASB). This includes a thorough review of the current and future business risks and opportunities in the business, social and environmental dimensions, so as to identify and prioritize the Company's material sustainability issues which are significant issues to our business and stakeholders. These are then used to develop the Sustainable Development Master Plan and are integrated into our short-term and long-term strategy.

In 2018, 16 material sustainability issues of importance were identified and prioritized from the process of engaging with our stakeholders and top management through the standard materiality assessment process. They are arranged into 10 groups of issues for sustainability reporting, some of which are also used for the Company's KPIs. The 10 issues are listed below:

Business Dimension

- GRC – Governance, Risk Management and Compliance
- Human Capital Management
- Increasing Petroleum Reserve
- Technology and Innovation
- Supply Chain Management

Social Dimension

- Occupational Health and Safety
- Social Development

Environmental Dimension

- Climate Change
- Environment Management
- Spills

The Company's process for identifying the material sustainability issues for 2018 includes a structured and systematic review of the issues with significant business, environmental and social impact on the Company as well as those issues which are important to our internal and external stakeholders. The review is conducted by identifying and assessing the material issues from the Company's and the stakeholder's perspectives, defining reporting boundaries, and prioritizing the issues from their level of significance using agreed criteria and stakeholder engagement. The result is subsequently submitted to the Sustainable Development Working Team and the Sustainable Development Council for content review and approval. Additional details can be found at: <https://www.pttep.com/en/Sustainabledevelopment/Disclosure/Approachtoreporting.aspx>.

1.2.3 Environmental and Social Contribution

PTTEP's sustainable development targets and plans include environmental and social programs. New and ongoing key environmental projects in 2018 were: the flash & flare gas recovery and utilization, methane (CH₄) survey and leak reduction (in process), energy efficiency improvement by implementing optimization of the heat recovery steam generators and seawater cooling water pump, and the logistics fleet management projects. In 2018, these projects (combined) contributed to the reduction of greenhouse gas emissions of more than 269,412 tonnes carbon dioxide equivalent (CO₂e) per year, while generating revenue and saving cost of approximately THB 765 from hydrocarbon recovery and energy efficiency improvement.

We also carry out other programs which create socio-economic value such as the Crab Hatchery Learning Center Project, which is a joint initiative between PTTEP and the community in Hua Khao Sub-district, Songkhla Province. Most of the locals are fishermen who experienced the problem of declining number of crabs due to overfishing. We collaborated with the National Institute of Coastal Aquaculture (NICA) and the network of local fishermen to establish the Crab Hatchery Learning Center in 2013, with the objective of developing the knowledge base on crab hatcheries. This in turn helped to replenish marine resources, safeguard the livelihoods of local fishermen and promote sustainable fishery practices. Since then, the project has been replicated in other areas and there were 3 learning centers by the end of December 2018, leading to the establishment of 31 conservation networks and 8 marine conservation zones. The Crab Hatchery Learning Center is one of our social development initiatives that demonstrate the Company's intention to combine our expertise with local wisdom to solve problems and to strengthen local communities in a sustainable way. We believe that these efforts will earn us the social license to operate our business, prevent potential significant impacts on the environment and communities, and indirectly reduce our operating costs.

1.3 Development and Significant Changes in 2018

During 2018, PTTEP operated our business in accordance with the strategy which is in line with changing energy industry landscape. The Company has transformed the organization and applied new appropriate technology. Recently, the Company has established "AI and Robotics Ventures Company Limited" (ARV) in order to support future investments in Artificially Intelligence (AI) and Robotics which could enhance operational efficiency, safety and environmental impact from exploration and production activities. In addition, the Company continued to rationalize the investment focusing in strategic areas where the Company has full range expertise, namely "Coming-Home Strategy" including Thailand and South East Asia. The following are the highlights of these developments and changes by region.

Thailand

In June 2018, the Company has completed the acquisition of 22.2222% participating interest in the Bongkot Project, consisting of Blocks B15, B16 and B17 from Shell Integrated Gas Thailand Pte. Limited (Shell) and Block G12/48 from Thai Energy Company Limited (a subsidiary of Shell). After the completion of the transaction, the Company holds 66.6667% of participating interest in Bongkot Project.

In December 2018, the Company has been awarded the rights of petroleum exploration and production and as the operator for Exploration Block No. G1/61 (Erawan field) and G2/61 (Bongkot field) with participating interest of 60% and 100% respectively. For the exploration block no. G1/61, the partner is MP G2 (Thailand) Limited, a subsidiary of Mubadala Petroleum (Thailand) Holdings Limited. The Production Sharing Contracts (PSC) are expected to be signed within the first quarter of 2019. According to the Term of Reference (TOR), the minimum production volume of Erawan and Bongkot fields are committed at 800 and 700 MMSCFD respectively while the production would begin from 2022-2023.

South East Asia

In March 2018, the Company has successfully expanded our business into the strategic investment area as the Company has won the bidding and obtain the right for exploration and production of 2 blocks, consisting of Sarawak SK417 Project and Sarawak SK438 Project, which are located in the shallow water of Malaysian offshore. PTTEP is the operator with participating interests of 80%.

Indonesia Malunda Project and Indonesia Semai II Project received approval from the Government of Indonesia to terminate and return the exploration block after completed requirement under PSCs. The termination of Indonesia Malunda Project and Indonesia Semai II Project are effective from April 10, 2018 and May 9, 2018 respectively.

North America and South America

In January 2018, the Company and the consortium have been selected as the successful bidders of 2 exploration blocks from the Mexico Bidding Round comprising of Block 12, located in Mexican Ridges (Western Gulf of Mexico) and Block 29, located in Campeche (Southern Gulf of Mexico) with participating interests of 20% and 16.67% respectively. The concession agreement signing was completed on May 7, 2018.

Australasia

On May 7, 2018, the Company received approval from the Government of Commonwealth of Australia to terminate and return Block AC/L1 and AC/L2, which are a part of PTTEP Australasia Project, due to no commercial discovery.

In September 2018, the Company completed divestment of the Montara field to Jadestone Energy (Eagle) Pty Ltd, to rationalize investment portfolio in non-core areas. However, the operatorship transfer is awaiting for approval from the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) which is expected to complete within 2019.

1.4 Shareholding Structure of PTTEP Group

1.4.1 Business Overview

PTTEP's core business is exploration and production of petroleum in Thailand and foreign countries. As of December 31, 2018, PTTEP Group had 40¹ petroleum exploration and production projects in 11 countries. 18 projects were under the exploration phase and 22 projects were under the commercial production phase.

No.	Project Name	Phase	Location	Participation Interest	Operator
Thailand: 14 projects					
1.	Bongkot Project	Production	Gulf of Thailand	66.6667% ²	PTTEP
2.	S1 Project	Production	Upper Central	100%	PTTEP
3.	PTTEP 1 Project	Production	Central	100%	PTTEP
4.	B6/27 Project	Production	Gulf of Thailand	100%	PTTEP
5.	Arthit Project	Production	Gulf of Thailand	80%	PTTEP
6.	L22/43 Project	Production	Upper Central	100%	PTTEP

¹ Excluding Indonesia Malunda and Indonesia Semai II projects in which PTTEP had submitted relinquishment documents to the Governments of Indonesia and was granted the approval on April 10, 2018 and May 9, 2018 respectively.

² PTTEP successfully completed the acquisition of additional 22.2222% stake in Bongkot Project from Shell on June 21, 2018, resulting the current working interest of 66.6667%.

No.	Project Name	Phase	Location	Participation Interest	Operator
7.	L53/43 & L54/43 Project	Production	Central	100%	PTTEP
8.	E5 Project	Production	North East	20%	ExxonMobil
9.	Contract 3 Project	Production	Gulf of Thailand	5%	Chevron
10.	Contract 4 Project	Production	Gulf of Thailand	60%	Chevron
11.	G4/43 Project	Production	Gulf of Thailand	21.375%	Chevron
12.	Sinphuhorm Project	Production	North East	55%	PTTEP
13.	B8/32 & 9A Project	Production	Gulf of Thailand	25.001%	Chevron
14.	G4/48 Project	Production	Gulf of Thailand	5%	Chevron
Overlapping Area: 2 projects					
1.	G9/43 Project	Exploration	Thailand-Cambodia	100%	PTTEP
2.	MTJDA Project	Production	Thailand-Malaysia	50%	CPOC
Overseas: 24 projects					
Myanmar					
1.	Myanmar M3 Project	Exploration	Gulf of Moattama	80%	PTTEP
2.	Myanmar M11 Project	Exploration	Gulf of Moattama	100%	PTTEP
3.	Zawtika Project	Production	Gulf of Moattama	80%	PTTEP
4.	Yadana Project	Production	Gulf of Moattama	25.5%	TOTAL
5.	Yetagun Project	Production	Gulf of Moattama	19.31784%	Petronas
6.	Myanmar MD-7 Project	Exploration	Andaman Sea	50%	PTTEP
7.	Myanmar MOGE 3 Project	Exploration	Onshore	75%	PTTEP
Vietnam					
8.	Vietnam 9-2 Project	Production	Offshore	25%	HV JOC
9.	Vietnam 16-1 Project	Production	Offshore	28.5%	HL JOC
10.	Vietnam B & 48/95 Project	Exploration	Offshore	8.5%	Petrovietnam
11.	Vietnam 52/97 Project	Exploration	Offshore	7%	Petrovietnam
Indonesia					
12.	Natuna Sea A Project	Production	Offshore	11.5%	Premier Oil
Malaysia					
13.	Sarawak SK410B Project	Exploration	Offshore	42.5%	PTTEP
14.	Sarawak SK417 Project ³	Exploration	Offshore	80%	PTTEP
15.	Sarawak SK438 Project ³	Exploration	Offshore	80%	PTTEP

³ On March 30, 2018, PTTEP signed the Production Sharing Contracts for exploration and production rights of the 2 blocks in Malaysia: Sarawak SK417 and Sarawak SK438 projects.

No.	Project Name	Phase	Location	Participation Interest	Operator
Algeria					
16.	Algeria Hassi Bir Rekaiz Project	Exploration	Onshore	24.5%	PTTEP
17.	Algeria 433a & 416b Project	Production	Onshore	35%	GBRS
Australia					
18.	PTTEP Australasia Project ⁴	Exploration	Offshore	90 - 100%	PTTEP
Canada					
19.	Mariana Oil Sands Project	Exploration	Onshore	100%	PTTEP
Mozambique					
20.	Mozambique Rovuma Offshore Area 1 Project	Exploration	Offshore	8.5%	Anadarko
Brazil					
21.	Barreirinhas AP1 Project	Exploration	Offshore	25%	Shell Brasil
22.	Brazil BM-ES-23 Project	Exploration	Offshore	20%	Petrobras
Mexico					
23.	Mexico block 12 (2.4) Project ⁵	Exploration	Offshore	20%	PC Carigali Mexico
24.	Mexico block 29 (2.4) Project ⁵	Exploration	Offshore	16.67%	Repsol Exploración México

Principal Projects in Operation

The following is a summary of project activities undertaken during 2018. Production and sales figures described hereunder are total production and sales figures for the respective projects.

(1) Highlights of Project Activity in Thailand

PTTEP has 16 projects in Thailand including projects in the overlapping claims area. Most projects are in the production phase, located both in the Gulf of Thailand and onshore. The following are highlights of key project activities in Thailand during 2018.

Bongkot Project

The Bongkot Project is located in the southern part of the Gulf of Thailand, consisting of Bongkot North and Bongkot South fields (Blocks B15, B16 and B17). The Company currently holds 66.6667% interest after the completion of additional stake of 22.2222 in Blocks B15, B16 and B17 from Shell Integrated Gas Thailand Pte. Limited (Shell) and Block G12/48 from Thai Energy Company Limited (a wholly-owned subsidiary of Shell) on June 21, 2018. The Company is the operator. The project has been in production since 1993. All of the natural gas and condensate produced from the Bongkot Field are sold to PTT, under a Take-or-Pay basis pursuant to long-term Gas Sales Agreements (GSA).

⁴ On September 28, 2018, PTTEP completed the divestment of Montara field (one of the blocks in PTTEP Australasia Project). Apart from the divestment, PTTEP Australasia Project holds many petroleum blocks which have varying participation interests ranging from 90 – 100%.

⁵ PTTEP and the consortium have been selected as the successful bidders of 2 exploration blocks in Mexico: Block 12 and Block 29; with the concession agreement signed on May 7, 2018.

During the year 2018, the project continuously drilled production wells, installed wellhead platforms and constructed gas pipeline in order to maintain its production plateau. The Block G12/48, located adjacent to the east of Bongkot South field and is held and operated by the Company with 66.6667% working interest, was approved the production area and development plan by the Department of Mineral Fuels, Thailand, in March 2015, and started production since October 20, 2018 through Bongkot South field's Central Processing platform with the natural gas being sold to PTT under the field's sales contract. Overall, the average sales volume of the project in year 2018 was 752 million standard cubic feet per day (MMSCFD) for natural gas (equivalent to 122,357 barrels of oil equivalent per day (BOED)) and 24,703 barrels per day (BPD) of condensates.

On December 13, 2018, as announced in the bidding result of the expiring concessions in 2022-2023 in the Gulf of Thailand, the Company was solely awarded the rights of petroleum exploration and production and as the operator of Block G2/61 (Bongkot field, consisting of Blocks B15, B16 and B17). The Production Sharing Contract is expected to be signed within first quarter of 2019.

S1 Project

The S1 Project is the largest onshore oil field in Thailand, with an area covering parts of Kamphaeng Phet, Sukhothai and Phitsanulok provinces. PTTEP is the sole owner and operator. Product from the S1 Project consists of crude oil, natural gas, and liquefied petroleum gas (LPG). Crude oil produced at S1 is sold to PTT which is transported via truck and rail to the refineries of Thai Oil Public Company Limited, Bangchak Corporation Public Company Limited (Bangchak) refineries, PTT Global Chemical Public Company Limited, and IRPC Public Company Limited. Part of produced gas from the project undergoes to a gas plant to separate LPG, before being sold to PTT and another part is subsequently directed to EGAT as fuel for power generation and used for production of CNG for natural gas vehicles (NGV).

During the year 2018, the project continuously drilled additional production wells with exploration drilling plan in 2019 to maintain its production level. Environmental impact assessments were also undertaken in both existing and new production areas. The project's average crude oil sales volume for the year was 26,982 BPD, while sales volume of natural gas averaged 14 MMSCFD (equivalent to 2,758 BOED), and average LPG sales volume was 204 metric tons per day (equivalent to 1,687 BOED).

PTTEP 1 Project

The PTTEP 1 Project is located in Suphan Buri and Nakhon Pathom provinces. PTTEP is the sole owner and operator. Crude oil produced at the project is sold to PTT and is transported via truck to the Bangchak refinery.

During the year 2018, the project carried on the production wells drilling activities to maintain production plateau with average crude oil sales volume of 252 BPD.

B6/27 Project

The B6/27 Project is located in the Gulf of Thailand, off the coast of Chumphon Province. PTTEP is the sole owner and operator. The project continues to focus on the geological and geophysical study for future development.

Arthit Project

The Arthit Project is located in the southern part of the Gulf of Thailand. The Company has 80% participating interest in the project and is the operator. The project entered into long-term GSA and condensate agreement with PTT on a take-or-pay basis.

During the year 2018, the project continued to drill production wells as well as constructed and installed wellhead platforms and gas pipelines in order to maintain production levels. The Block G8/50, located adjacent to the north of Arthit Project and is held and operated by the Company with 80% working interest, has production through Arthit Project's Central Processing platform with the natural gas being sold to PTT under Arthit Project's sales contract. The average natural gas sales volume for the project in 2018 was 215 MMSCFD (equivalent to 34,776 BOED) and average condensate sales volume was 10,393 BPD.

L22/43 Project

The L22/43 Project is located in Phitsanulok and Pichit provinces. The Company is the sole owner and operator. Crude oil produced from the project is sold to PTT which is transported via truck to Bangchak refinery.

In 2018, the average crude oil sales volume of the project was 22 BPD. The project has temporarily shut down from June 2018 to December 2019 with the plan to replace appropriate producing equipment for the field and transfer mobile production facility to support S1 Project.

L53/43 and L54/43 Project

The L53/43 and L54/43 Project are located in Suphan Buri, Kanchana Buri, Ayutthaya and Ang-Thong provinces. The Company owns 100% interest in the project and is the operator. Crude oil produced from the project is sold to PTT which is transported via truck to the Bangchak refinery.

During the year 2018, the project carried out the exploration and development drilling activities to uphold production level. The project's average crude oil sales volume was 1,042 BPD.

E5 Project

The E5 Project is located in Khon Kaen Province. The Company holds 20% participating interest in the project with ExxonMobil as the operator. All of the natural gas produced by the E5 Project is sold to PTT on a take-or-pay basis pursuant to a long-term GSA. PTT then transports the gas via pipelines to EGAT power plant.

In the year 2018, average natural gas sales volume for the project amounted to 8 MMSCFD (equivalent to 1,340 BOED).

Contract 3 Project

The Contract 3 Project is located in the Gulf of Thailand, off the coast of Surat Thani Province. The Company holds a 5% interest in the project with Chevron as the operator. All of the natural gas and condensate produced from the project is sold to PTT on a take-or-pay basis pursuant to long-term gas and condensate sales agreements, whilst the produced crude oil is under annual sales agreement and spot cargo with other purchasers.

In the year 2018, the project continued to carry out development drilling activities in order to maintain production levels. The average sales volume of the project in 2018 was 612 MMSCFD (equivalent to 103,757 BOED) for natural gas, 22,573 BPD for crude oil and 20,309 BPD for condensates.

Contract 4 Project

The Contract 4 Project and Block G7/50, is located in the Gulf of Thailand. The Company holds a 60% interest in the project, with Chevron as the operator. All of the natural gas and condensate produced from the project is sold to PTT under a long-term gas and condensate sales agreements.

In the year 2018, the project sold natural gas at an average rate of 407 MMSCFD (equivalent to 67,546 BOED) and condensates at an average rate of 17,455 BPD. The project continued to drill additional development wells aiming to maintain production plateau and decided to develop Block G7/50 with the production through Contract 4 Project's facilities in order to be commercialized.

In addition, the project has continued to accelerate the development of Ubon Oil Field, a part of the Contract 4 Project and is currently in the planning process with operator on the field development with the target first production by 2023 at planned capacity of 25,000 BPD for crude oil and 50 MMSCFD for natural gas (approximately 8,300 BOED).

G4/43 Project

The G4/43 Project is located in the Gulf of Thailand. The Company holds a 21.375% interest in the project with Chevron as the operator. The project has mutual long-term GSA and crude oil sale agreements with the B8/32 & 9A Project.

In the year 2018, the project continued to carry out development drilling activities to sustain production level. The sales volume of crude oil and natural gas averaged 3,701 BPD and 1 MMSCFD (equivalent to 264 BOED) respectively.

Sinphuhorm Project (EU-1 and E5-North)

The Sinphuhorm Project is located in Udon Thani and Khon Kaen provinces. The Company owns a 55% interest in the project and is the operator. The project has long-term gas sales agreement with PTT.

In the year 2018, sales volume of the project averaged 79 MMSCFD for natural gas (equivalent to 12,927 BOED) and 246 BPD for condensates.

B8/32 & 9A Project

The B8/32 & 9A Project is located in the Gulf of Thailand, off the coast of Chumphon Province. The Company holds a 25% interest in the project with Chevron as the operator. The project currently has long-term GSAs with PTT and annual crude sales agreement with other purchasers for spot cargo.

During the year 2018, the project continued to carry out development drilling and waterflood operations in order to maintain the crude oil production levels. Sales volume averaged 18,563 BPD for crude oil and 71 MMSCFD for natural gas (equivalent to 12,892 BOED).

G4/48 Project

The G4/48 Project is located in the Gulf of Thailand, offshore from Surat Thani Province. PTTEP holds 5% interest in the project with Chevron as the operator. The project has mutual long-term gas sales agreements and crude oil sale agreements for spot cargo with the Contract 3 Project.

In the year 2018, sales volume from the G4/48 Project averaged 6 MMSCFD for natural gas (equivalent to 912 BOED) and 1,527 BPD for crude oil.

Projects located in overlapping claims areas

G9/43 Project

The G9/43 Project is located in the Gulf of Thailand with PTTEP as a sole owner and operator. At present, all activities for this project have been suspended awaiting for the resolution of the boundary dispute between the governments of Thailand and Cambodia.

MTJDA Project

PTTEP has a 50% participating interest in the MTJDA Project with Carigali PTTEPI Operating Company Sdn. Bhd. as the operator. PTTEP, PC JDA Ltd. (a subsidiary of Petronas, Malaysia's Natural Oil Company) and the Malaysia-Thailand Joint Authority (MTJA) executed a GSA for the sales of the natural gas from the MTJDA Project to PTT and Malaysia. Whilst, crude oil and condensates produced from the project were sold through auction.

During the year 2018, the project completed the drilling of 11 production wells and is currently in the process of drilling additional production wells in according to the phase 4 of the development plan, in order to maintain production level. The project has average sales volume for 2018 of 330 MMSCFD (equivalent to 52,599 BOED) for natural gas and 7,633 BPD for condensates.

(2) International Projects: PTTEP has 24 projects overseas, separated into the following regions.

(2.1) Project Activity Highlights in South East Asia: PTTEP has 15 projects in this region which are located in the Republic of the Union of Myanmar (Myanmar), Socialist Republic of Vietnam (Vietnam), Malaysia and Republic of Indonesia (Indonesia). The following section highlights the project activities.

Myanmar M3 Project

The Myanmar M3 Project is located in the Gulf of Moattama, Myanmar. The Company owns 80% participating interest in the project and is the operator. The project is awaiting approval for the Field Development Plan that was proposed in the fourth quarter of 2018, from the Government of Myanmar.

Myanmar M11 Project

The Myanmar M11 Project is located in the Gulf of Moattama, Myanmar. The Company owns 100% participating interest in the project and is the operator. In 2018, the Government of Myanmar approved the additional extension of exploration period for the project to 5 years (October 23, 2014 to October 22, 2019).

The project is currently in preparation for drilling plan of an exploration well in the first quarter of 2019 and is seeking partner to manage the project's risk.

Zawtika Project

The Zawtika Project is a gas project located in the Gulf of Moattama, Myanmar. The Company holds 80% participating interest and is the operator, with Myanmar Oil and Gas Enterprise (MOGE) holding the remaining 20% interest. The gas produced from this project is sold to PTT, supplying Thai market under long-term GSA on a take-or-pay basis; and sold to MOGE for domestic consumption in Myanmar under the long-term sales contract. To transport natural gas from Zawtika Project to Thailand, the Company and the joint venture partners established a gas transportation company called Andaman Transportation Limited (ATL) to construct and operate an offshore and onshore pipeline from the project to the Thai border. The project commenced its gas sales in Myanmar in March 2014 and began delivering natural gas to PTT in August 2014.

During the year 2018, the project completed the construction of 4 production platforms in Phase 1C and continues to carry out drilling activities in order to maintain production plateau. The average sales volume of natural gas for the project in 2018 was 298 MMSCFD (equivalent to 47,569 BOED).

Yadana Project

The Yadana Project is a large gas project located in the Gulf of Moattama, Myanmar. The Company holds a 25.5% interest with Total E&P Myanmar (TEPM) as the operator. Natural gas produced from the project is sold to PTT on a take-or-pay basis pursuant to long-term GSA, and a certain portion is sold to MOGE for domestic use in Myanmar. To transport natural gas from Yadana to Thailand, the Company and our joint venture partners established a gas transportation company, called Moattama Gas Transportation Company (MGTC), to construct and operate an offshore and onshore pipeline from the Yadana Project area to the Thai border. Consequently, PTT completed an onshore pipeline section from the Thai border to the EGAT power generation plant in Ratchaburi Province.

During the year 2018, the project had evaluated the field's resource potential from 3D and 4D seismic survey on Block M5 and Yadana-Sein respectively, in order to prepare exploration drilling plan. Overall, the project has average gas sales volume of 779 MMSCFD (equivalent to 96,099 BOED).

Yetagun Project

The Yetagun Project is a natural gas and condensates producing project located in the Gulf of Moattama, Myanmar. The Company holds a 19.31784% interest in the project with PC Myanmar (Hong Kong) Limited as the operator. All natural gas from the Yetagun Project is sold to PTT on a take-or-pay basis pursuant to long-term GSA. To transport natural gas from Yetagun Project to Thailand, the Company and the joint venture partners established a gas transportation company called Taninthayi Pipeline Company (TPC) to construct and operate an offshore pipeline and an onshore pipeline (parallel to the Yadana pipeline) from the project to the Thai border.

During the year 2018, the project was in the process of evaluating result from 3D seismic survey with the plan to drill 2 exploration wells and 3 production wells in 2019 and perform production wells intervention in order to maintain production plateau. The project's total sales volume averaged 149 MMSCFD (equivalent to 23,535 BOED) for natural gas and 2,768 BPD for condensates.

Myanmar MD-7 Project

The MD-7 Project is located in deep waters of the Gulf of Moattama, Myanmar. The Company has a 50% interest in the project and is the operator. TOTAL E&P Myanmar (TEPM) joined the consortium with 50% participating interest in 2017.

The project is currently in the process of evaluating the fields' resources potential in order to prepare for an exploration well drilling in 2019.

Myanmar MOGE 3 Project

The Myanmar MOGE 3 Project is an onshore project located in Myanmar. PTTEP holds a 75% interest and is the operator of this project.

In the year 2017, the project officially received the approval to extend exploration period for additional two years (21 August 2015 to 20 August 2020). The project drilled an exploration well in December 2018 and is under drilling preparation of 3 exploration wells in 2019.

Vietnam 9-2 Project

The Vietnam 9-2 Project is located offshore southeast of Vietnam, and PTTEP has a 25% interest in the project with Hoan Vu Joint Operating Company as the operator. The crude oil produced from the project is sold to domestic refineries while the produced natural gas is sold to PetroVietnam Gas, a state own enterprise, for domestic consumption.

In the year 2018, the project drilled an additional production well in order to maintain production plateau. The project's sales volume of crude oil averaged 4,110 BPD, while sales volume of natural gas averaged 13 MMSCFD (equivalent to 2,740 BOED).

Vietnam 16-1 Project

The Vietnam 16-1 Project is located offshore of Vietnam, with PTTEP holding a 28.5% interest, with Hoang-Long Joint Operating Company as the operator. Crude oil production of the project is sold to domestic Vietnamese refineries as well as to an international market through a bidding process. Natural gas is sold to the Vietnam Oil and Gas Group, a state-owned enterprise, for domestic consumption.

During the year 2018, the project started production from 2 wells and is in process of drilling an additional production well in Q1/2019 in order to maintain the production levels. The sales volume from the project for 2018 averaged 17,238 BPD of crude oil and 6 MMSCFD of natural gas (approximately 1,353 BOED).

Vietnam B & 48/95 Project

The Vietnam B & 48/95 Project is located offshore of Vietnam. The Company holds 8.5% of participating interest in the project with Petrovietnam as the operator. The project has been granted approval for the Field Development Plan and is currently in the negotiation process on commercial terms in order to push forward the Final Investment Decision (FID) with targeted first production of 490 MMSCFD (including the production from Vietnam 52/97 Project) by the end of 2022.

Vietnam 52/97 Project

The Vietnam 52/97 Project is located offshore of Vietnam. The Company holds 7% of participating interest in the project with Petrovietnam as the operator. The project has been granted approval for the Field Development Plan and is currently in the negotiation process on commercial terms in order to push forward the Final Investment Decision (FID) with targeted first production of 490 MMSCFD (including the production from Vietnam B & 48/95 Project) by the end of 2022.

Natuna Sea A Project

The Natuna Sea A Project is located in the west of the Natuna Sea in Indonesia. In 2013, PTTEP Netherlands Holding Coöperatie U.A. (PTTEP NH), a subsidiary of PTTEP, jointly signed a share purchase agreement with Pertamina Hulu Energy, a subsidiary of Pertamina, on a 50:50 basis, to acquire subsidiaries of Hess Corporation holding 23% interest in the Natuna Sea A Project. As a result, PTTEP holds 11.5% interest in the project, with Premier Oil as the operator. The crude oil and condensate produced are sold through auction, while natural gas produced is sold in Singapore for domestic consumption.

During the year 2018, the project has accelerated the development plan to maintain production plateau. The sales volume of natural gas at an average rate of 221 MMSCFD (equivalent to 38,878 BOED) and condensates at averaged at 1,299 BPD.

Sarawak SK410B Project

The Sarawak SK410B Project is located in offshore Sarawak, Malaysia. The Company holds participating interest of 42.5% in the project and is the operator. In the year 2018, the project was in the process of evaluating field's resources potential in order to prepare for an exploration well drilling in 2019.

Sarawak SK417 Project

The Sarawak SK417 Project is a shallow-water project and is located in the offshore Sarawak, Malaysia. The Company holds participating interest of 80% in the project and is the operator. On March 30, 2018, the Company signed the Production Sharing Contracts with Petroliaam Nasional Berhad (PETRONAS) for exploration and production rights.

In the year 2018, the project was in the process of evaluating field's resources potential in order to prepare for drilling.

Sarawak SK438 Project

The Sarawak SK438 Project is a shallow-water project and is located in the offshore Sarawak, Malaysia. The Company holds participating interest of 80% in the project and is the operator. On March 30, 2018, the Company signed the Production Sharing Contracts with Petroliaam Nasional Berhad (PETRONAS) for exploration and production rights.

In the year 2018, the project is in the process of evaluating field's resources potential in order to prepare for drilling of 2 exploration wells in 2019.

(2.2) **Project Activity Highlights in Africa:** PTTEP has 3 projects in this region, located in the People's Democratic Republic of Algeria (Algeria), and the Republic of Mozambique (Mozambique) with the following as key highlights:

Algeria Hassi Bir Rekaiz Project

The Algeria Hassi Bir Rekaiz Project is located onshore in eastern Algeria. The Company holds a 24.5% interest and is the operator.

The project's development plan has been approved by the Algerian government (ALNAFT) in April 2018 and is divided into 2 phases. The first phase capacity of around 10,000-13,000 BPD is expected to start production within 2020 with a plan for the second phase production capacity ramping up to around 50,000-60,000 BPD in 2024.

Algeria 433a & 416b Project

The Algeria 433a & 416b Project is located onshore in the eastern Algeria. The Company holds a 35% interest in the project, with Groupement Bir Seba (Joint Operating Company) as the operator. The project had average production for crude oil in 2018 of 17,350 BPD.

Mozambique Rovuma Offshore Area 1 Project

The Mozambique Rovuma Offshore Area 1 Project is a large natural gas project located offshore of Mozambique. The Company owns an 8.5% interest with Anadarko as the operator.

During the year 2018, the project made a significant progress which includes the government approval of Plan of Development (POD) in Golfinho-Atum area in February; negotiation on construction agreement of onshore LNG liquefaction plant; the completion of contract selection for offshore installation.

In addition, the project has fully executed two Sale and Purchase Agreements (SPAs): EDF, a French company (1.2 MTPA) and Tohoku Electric Co., Inc., a Japanese company (0.28 MTPA); and is now under the finalization and signing of long term LNG Sale and Purchase Agreements (SPAs) with potential buyers including Tokyo Gas Co., Ltd. and Centrica LNG Co., Ltd. with the total capacity of 2.6 MTPA. In parallel, the project is negotiating for project finance with financial institutions in order to support the Final Investment Decision (FID) in the first half of 2019, with planned first phase of production at 12 MTPA starting in 2024.

(2.3) Project Activity Highlights in Australasia: PTTEP has 1 project in this region which is located in the Commonwealth of Australia (Australia) comprising of 8 concession permits with the following as key highlights:

PTTEP Australasia Project

In 2009, the Company acquired 100% of the ordinary shares of Coogee Resources Limited, which was later renamed to PTTEP Australasia Pty Ltd. (PTTEP AA). PTTEP AA owns exploration and development fields located in the Timor Sea, in Australia and currently holds concessions to 8 permits with two key oil and gas fields, including Cash-Maple field, which is under the feasibility studies, and Orchid field (Block AC/P54), which will drill an exploration well in Q1/2019. The rest of the concessions are primarily in the exploration phase.

Montara Field

The Montara Field is located in the Timor Sea in Australia. The Company holds 100% interest in the project. On September 28, 2018, PTTEP completed the divestment of Montara field (one of the blocks in PTTEP Australasia Project) to Jadestone Energy (Eagle) Pty Ltd with the pending approval of operatorship transfer from the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), expected to be within 2019. The project has average sales volume for the year 2018 of 5,368 BPD.

Cash-Maple Field

The Company holds 100% interest in the Project. The field completed Pre-FEED study and is under the evaluation of appropriated development plan.

For other concessions, PTTEP has interests ranging from 90% to 100%, all of which are undergoing geological and geophysical studies to determine potential for petroleum.

(2.4) Project Activity Highlights in North and South America: PTTEP has 5 projects in this region which located in Canada, the Federative Republic of Brazil (Brazil) and the United Mexican States (Mexico). The following are significant activities in this region:

The Mariana Oil Sands Project

The Mariana Oil Sands Project is located in Alberta, Canada. The Company holds 100% participating interest and is the operator of the Thornbury, Hangingstone, and South Leismer fields. The project submitted the development proposal for Thornbury Phase 1 to the government of Alberta in May 2015 and was granted the approval in May 2018. Currently, the project is under the evaluation of appropriate project development plan.

Barreirinhas AP1 Project

The Barreirinhas AP1 Project is located in the Barreirinhas Basin, offshore to the east of Brazil. The Company holds participating interest of 25% in the project, with Shell Brasil Petroleo Ltda. as the operator. The project comprises of 4 exploration blocks: BAR-M-215, BAR-M-217, BAR-M-252 and BAR-M-254. The project is currently evaluating the petroleum potential.

The Brazil BM-ES-23 Project

The Brazil BM-ES-23 Project is located in the Espirito Santo Basin, offshore to the east of Brazil. The Company holds 20% stake in the project, with Petrobras as the operator. The project is currently evaluating the petroleum potential.

The Mexico block 12 (2.4) Project

The Mexico block 12 (2.4) Project is located in the Mexican Ridges, western Gulf of Mexico. The Company holds 20% participating interest in the project, with PC Carigali Mexico, S.A. de C.V. as the operator. The Company and consortium was selected as the successful bidders of exploration block 12 on January 31, 2018 and signed the concession agreement in May 2018.

The project submitted the exploration plan to the National Hydrocarbons Commission in Mexico in Q4/2018, expecting the approval within Q1/2019.

The Mexico block 29 (2.4) Project

The Mexico block 29 (2.4) Project is located in the Campeche, southern Gulf of Mexico. The Company holds 16.67% participating interest in the project, with Repsol Exploración México, S.A. de C.V. as the operator. The Company and consortium was selected as the successful bidders of exploration block 29 on January 31, 2018 and signed the concession agreement in May 2018.

The project submitted the exploration plan to the National Hydrocarbons Commission in Mexico in Q4/2018, expecting the approval within Q1/2019.

Projects Divestment and Relinquishment in 2018

Indonesia Malunda Project

The Indonesia Malunda Project was an offshore exploration block, located in Indonesia. In May 2015, the Company had submitted a request to terminate and return the exploration block after the fulfillment of the requirements of the Production Sharing Contract. On April 10, 2018, the Company received the approval from the Government of Indonesia to terminate and return the exploration block.

Indonesia Semai II Project

The Indonesia Semai II Project was an offshore exploration block, located southwest of West Papua Island in Indonesia. On November 7, 2014, the Company and its joint operation partners had submitted a request to terminate and return the exploration block after the fulfillment of the requirements of the Production Sharing Contract. On May 9, 2018, the Company received approval from the Government of Indonesia to terminate and return the block.

PTTEP Australasia Project

The PTTEP Australasia Project received approval from the Government of Commonwealth of Australia to terminate and return blocks AC/L1 and AC/L2 on May 7, 2018 as the project completed the exploration program with no commercial discovery.

1.4.2 Operational Policy of PTTEP Group

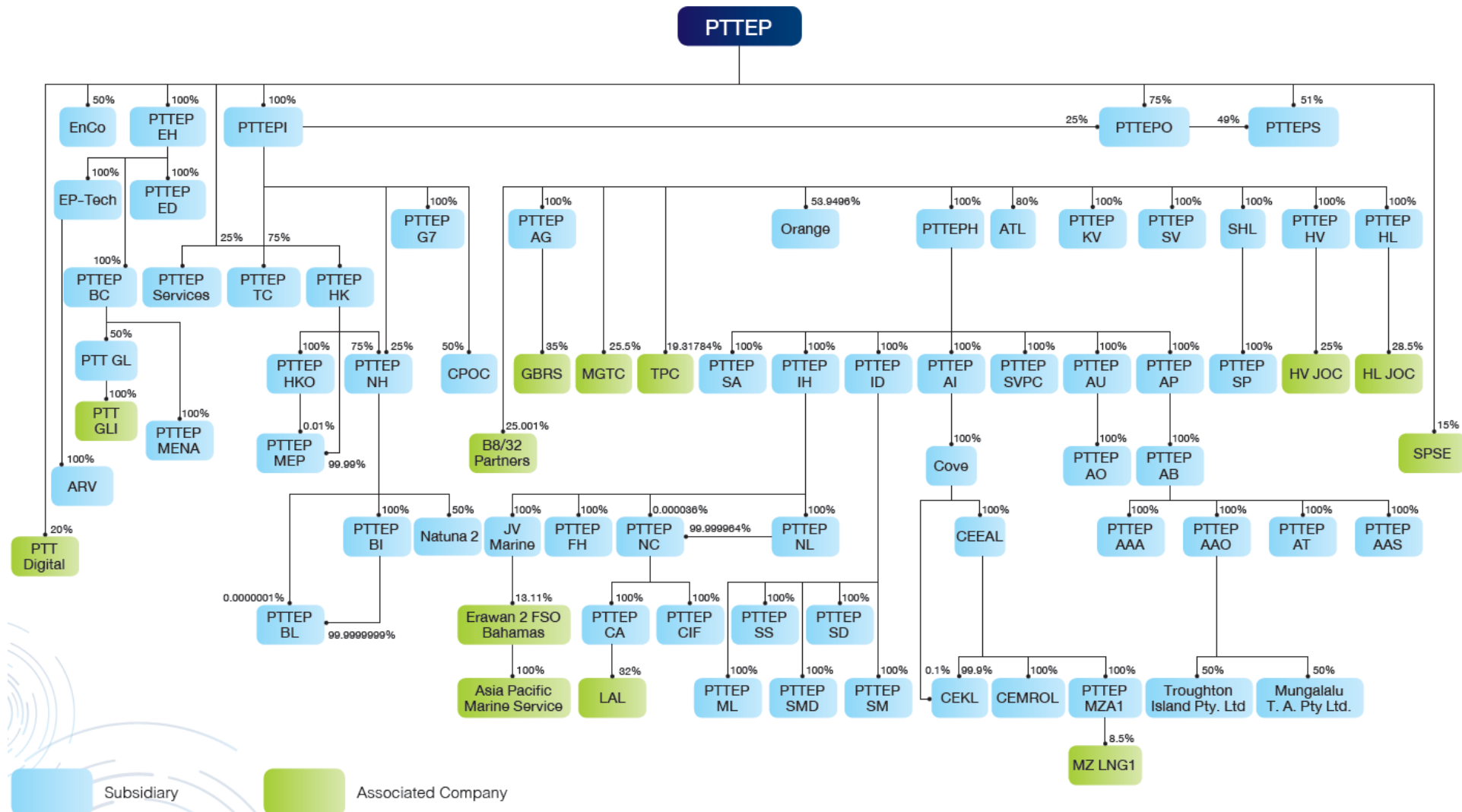
PTTEP has continuously expanded our E&P business, including in related and new businesses, domestically and internationally. The establishment of subsidiaries and/or associated companies in various regions is necessary for investment purposes, improving our operational efficiency, competing with other international oil companies, operational flexibility, and adjusting to global economic changes. Several factors, such as laws and regulations, financial structures, tax regimes, business and investment conditions, and risk management, should be taken into consideration in any decision to set up a subsidiary or an associated company.

It is our policy to manage PTTEP's subsidiaries in line with PTTEP's business direction and strategy. We designate PTTEP executives and staff to second into key positions of PTTEP's subsidiaries. The strategic direction and financial investment of PTTEP's subsidiaries is overseen by the Company. The boards of directors of the subsidiaries, especially the E&P related and new business, have the business management decision authority to the paths to achieve the set targets and strategy. As for the associated companies, we nominate PTTEP representatives to serve as shareholders and/or members of the Board of Directors in accordance with the terms of investment, in order to take part in the decision making of the overall business strategy and policy of these companies. To manage both the subsidiaries and associated companies, we adhere to the Good Corporate Governance and Business Ethics of the PTTEP Group, in order to ensure effectiveness, transparency, fairness, and the attainment of our business goals.

With respect to the selection of directors of the Company's subsidiaries and associated companies, we designate PTTEP executives responsible for projects under each relevant subsidiary and associated company as directors of these entities to ensure that they are managed in line with the Company's business direction and strategy. We may also appoint a local director, if required by the domestic laws and regulations or investment conditions. The subsidiaries and associated companies meanwhile are obligated to report their performance to the Company on a quarterly basis in order to ensure their performance and effectiveness.

1.4.3 Shareholding Structure of PTTEP

As of December 31, 2018, PTTEP held shares in 76 legal entities, comprising 63 subsidiaries and 13 associated companies as shown below:



The definitions of the term 'Subsidiary' and 'Associated Company' are as defined in the Notification of the Securities and Exchange Commission No. Kor Chor. 17/2551, Re: Determination of Definitions in Notifications relating to Issuance and Offer for Sale of Securities.

1.5 Relationship with the Major Shareholder

The Company's petroleum exploration and production business is part of the business group of PTT Public Company Limited (PTT), our major shareholder, the national energy company which engages in a fully integrated petroleum and petrochemical business by strategically investing directly and indirectly through its group of companies, both in the upstream and downstream businesses.

Currently, PTT holds 65.29% of PTTEP's registered and paid-up capital, effectively making the PTT Group the only full-scale natural gas business operator in Thailand. As the major buyer of the Company's petroleum products, PTT, in turn, refines and processes the products and supplies them as energy and raw materials for the power, petrochemical, transportation sectors as well as other industries and households.

In 2018, PTTEP supplied crude oil, natural gas, LPG, and condensate to PTT. Conditions and price settings of all transactions between PTTEP and PTT follow the normal business practices at the arm's length basis conditions for non-related persons or operations. Details of connected transactions between PTTEP and PTT are disclosed in the "Connected Transactions" section.

2. Nature of Business Operation

2.1 Revenue Structure

PTTEP and our subsidiaries' revenues are mainly from sales of petroleum products of which its price is marked to the world fuel price in US Dollar. Thus, PTTEP and our subsidiaries' revenue structure of 2016 - 2018 are presented here in US Dollar in order to reflect the Company's revenue structure for the petroleum exploration and production projects in the production phase of PTTEP and our subsidiaries as at December 31, 2018 comprised 22 projects: the Bongkot, Contract 4, Arthit, S1, MTJDA, B8/32 & 9A, Contract 3, Sinphuhorm, L53/43 & L54/43, G4/43, E5, PTTEP1, G4/48, L22/43, Zawtika, Yadana, Vietnam 16-1, Natuna Sea A, Yetagun, Algeria 433a&416b, Vietnam 9-2 and B6/27 projects.

In addition, PTTEP and our subsidiaries recorded revenues proportionately from gas pipeline transportation which are Moattama Gas Transportation Company (MGTC), Taninthayi Pipeline Company LLC (TPC) and Andaman Transportation Limited (ATL).

Revenue structure of PTTEP and our subsidiaries during 2016 - 2018

Product	Operated by	% of shares held by the Company	2016		2017		2018	
			Revenue (Million USD)	%	Revenue (Million USD)	%	Revenue (Million USD)	%
<u>Sales</u>								
Crude oil	PTTEP	-	115.46	2.66	137.42	3.03	186.21	3.41
	PTTEPI	100	36.30	0.83	45.38	1.00	53.74	0.98
	PTTEPS	100	290.41	6.68	346.92	7.65	469.42	8.59
	Orange	53.9496	75.49	1.74	87.08	1.92	81.38	1.49
	B8/32 Partners	25.0009	28.75	0.66	36.84	0.81	36.49	0.67
	PTTEP HV	100	17.34	0.40	20.49	0.45	26.07	0.48
	PTTEP AP	100	235.79	5.42	220.59	4.87	143.80	2.63
	PTTEP HL	100	114.77	2.64	113.58	2.51	123.07	2.25
	Natuna 2	50	1.54	0.04	2.80	0.06	2.32	0.04
	PTTEP AG	100	34.10	0.78	53.58	1.18	55.93	1.02
Natural gas	PTTEP	-	1,560.28	35.89	1,492.21	32.92	1,869.72	34.20
	PTTEPI	100	856.73	19.71	789.76	17.42	907.14	16.59
	PTTEPS	100	36.34	0.84	42.44	0.94	42.79	0.78
	Orange	53.9496	31.84	0.73	23.95	0.53	20.70	0.38
	B8/32 Partners	25.0009	9.90	0.23	10.09	0.22	9.59	0.18
	PTTEP HV	100	1.36	0.03	1.51	0.03	1.61	0.03
	PTTEP HL	100	1.70	0.04	0.32	0.01	0.91	0.02
	Natuna 2	50	43.97	1.01	61.35	1.35	75.60	1.38
	PTTEP SP	100	177.99	4.09	139.11	3.07	161.07	2.95
LPG	PTTEP	-	9.48	0.22	9.04	0.20	7.94	0.14
	PTTEPS	100	28.44	0.65	27.14	0.60	23.82	0.44

Product	Operated by	% of shares held by the Company	2016		2017		2018	
			Revenue (Million USD)	%	Revenue (Million USD)	%	Revenue (Million USD)	%
Condensate	PTTEP	-	401.05	9.22	522.10	11.52	768.63	14.06
	PTTEPI	100	43.02	0.99	49.70	1.10	66.70	1.22
	PTTEPS	100	1.07	0.02	0.76	0.02	0.94	0.02
	PTTEP SP	100	36.44	0.84	47.04	1.04	67.22	1.23
Total sales			4,189.56	96.36	4,281.20	94.44	5,202.81	95.17
<u>Revenue from pipeline transportation</u>								
Pipeline transportation	MGTC	25.5	28.20	0.65	36.20	0.80	61.93	1.14
	TPC	19.3178	9.30	0.21	9.35	0.21	7.23	0.13
	ATL	80	28.99	0.67	32.26	0.71	38.40	0.70
Total revenue from pipeline transportation			66.49	1.53	77.81	1.72	107.56	1.97
<u>Other income</u>								
Gain on foreign exchange			11.59	0.27	51.40	1.13	-	-
Interest income			30.06	0.69	59.58	1.31	83.35	1.52
Gain on financial derivatives			-	-	-	-	13.97	0.26
Other income			41.48	0.95	53.27	1.18	50.79	0.93
Total other income			83.13	1.91	164.25	3.62	148.11	2.71
Total revenues			4,339.18	99.80	4,523.26	99.78	5,458.48	99.85
Share of gain of associates and joint ventures			8.55	0.20	9.75	0.22	7.93	0.15
Grand total after inclusion of share of gain of associates and joint ventures			4,347.73	100.00	4,533.01	100.00	5,466.41	100.00

For 2018, total revenues for PTTEP and our subsidiaries was 5,466 MMUSD (equivalent to 176,943 MMTHB), an increase of 933 MMUSD or 21% when compared with the revenues in 2017 which was 4,533 MMUSD (equivalent to 153,526 MMTHB). The increase was primarily due to an increase in sales revenue of 922 MMUSD from an increase in natural gas and condensate sales revenue. The increase was primarily due to an increase in the average selling price of operating projects under PTTEP and PTTEP International Limited (PTTEPI).

2.2 Products and Services

2.2.1 Petroleum

Petroleum is defined as a naturally occurring hydrocarbon mixture, which includes crude oil, natural gas, condensate, related products, and other hydrocarbon products which are free in nature.

Crude oil is the portion of petroleum which is liquid in nature and obtained from oil wells and gas separation process, yet to be refined or purified.

Natural gas is hydrocarbon in gas or vapor phase at atmospheric temperature and pressure, commonly having methane as its major constituent.

Condensate is a low-density liquid hydrocarbon. It is condensed from hydrocarbon gas. Condensation occurs when gas is produced at the surface where temperature and pressure are lower than those in the reservoir.

Liquefied Petroleum Gas (LPG) is obtained from a crude oil refinery or the natural gas separation process, primarily consisting of butane and propane.

Crude oil, condensate, and LPG are measured in barrels, while natural gas is measured in cubic feet at standard conditions (One atmosphere or atm at 60 degrees Fahrenheit). All petroleum products can be converted to barrels of oil equivalent (BOE) based on their heat contents. One cubic foot of natural gas has a heating value of approximately 1,000 British thermal units (BTU), whereas one barrel of crude oil has a heating value of approximately 6,000,000 BTU.

2.2.2 Gas Transportation Pipeline

PTTEP Offshore Investment Company Limited (PTTEPO), a wholly-owned subsidiary of PTTEP, has major investments in other companies, such as an 80% holding in Andaman Transportation Limited (ATL), 25.5% in Moattama Gas Transportation Company (MGTC), and 19.31784% in Taninthayi Pipeline Company (TPC). The objective of the company is to invest in gas pipeline transportation connecting at the border between the Republic of the Union of Myanmar and Thailand.

2.2.3 Jetty and Warehouse

Petroleum Development Support Base was established to provide jetty and warehouse services to support PTTEP Group's offshore exploration and production activities both in Thailand and abroad. The Support Base mainly accommodates the Company's own offshore operating projects in Thailand, such as Bongkot Project, Arthit Project, B6/27 Project, as well as those projects of other offshore oil and gas operating companies, such as PTT, Chevron Thailand Exploration and Production Limited, Carigali-PTTEPI Operating Company Sdn Bhd (CPOC), MP G11 (Thailand) Limited, KrisEnergy G10 (Thailand) Ltd., and Mubadala Petroleum (Thailand) Limited. Moreover, the Support Base can also support affiliated offshore operating projects, such as Myanmar M3 Project, Myanmar M11 Project, and Zawtika Project which are located in the Republic of the Union of Myanmar. Currently, our Support Base operates at two branches in the provinces of Songkhla and Ranong.

1. *Petroleum Development Support Base (Songkhla Branch)* solely provides marine jetty berthing and warehousing services. It is owned and operated by PTTEP International Limited (PTTEPI), a subsidiary of PTTEP. The jetty is equipped with 380 meters of wharf which is capable of simultaneously berthing six supply vessels with a size of more than 500 gross tons. The jetty is also equipped with storage facilities and operated with a high standard of material-handling equipment. The Support Base also operates under an international management system which focuses on safety and security while taking into account the issues of occupational health and the environment. It strictly follows the International Ship and Port Facilities Security Code (ISPS Code) which has been approved by the Marine Safety and Environment Bureau of the Royal Thai Marine Department. The jetty is therefore recognized as one of the country's leading shore-based facilities for petroleum exploration and production activities. The 58-rai warehousing service facility is divided into four sections, namely; storage warehouse; open yard; free zone storage warehouse; and free zone yard for the best storage and maintenance purposes of materials and equipment. This facility is also used for certain goods that have been granted tax and duty benefits in its duty-free areas.

2. *Petroleum Development Support Base (Ranong Branch)* provides marine jetty berthing and warehousing services. It is also owned and operated by PTTEPI; though the jetty service, which is operated through Ranong's multi-purpose port, is owned by the Port Authority of Thailand. The jetty has a 150-meter wharf that is capable of simultaneously berthing two supply vessels with a size of more than 500 gross tons. The Support Base is also fully equipped with storage facilities and standard material-handling equipment. The 25-rai warehousing service facility is divided into four sections, namely; storage warehouse; open yard; free zone storage warehouse; and free zone yard for the best storage and maintenance purposes of materials and equipment. As well, this facility is for certain goods that have been granted tax and duty benefits in its duty-free areas.

To ensure that the services of both Support Base branches meet international standards and top safety levels, performance audits are continually conducted at both sites, emphasizing safety, security, occupational health and the environment. Both are also operated by and equipped with high security systems, such as parameter and high mast lights, barbed-wire fencing, a CCTV system, and 24-hour security guards.

PTTEP is also aware of its responsibilities to society and the environment, especially the local communities surrounding the Support Bases. The Company's efforts in this regard have resulted in several international accreditations including the International Environment Control Program (ISO 14001 certification), and the Occupational Health Control Program (OHSAS 18001 certification). The Company has also prepared an Emergency Response Plan under the ISO 22301 standard to handle unexpected and emergency cases as well as to rehearse and exercise our response plans. This ensures that our Support Bases are capable of responding to emergency situations with the latest technologies and methods for continuity of the operation.

2.2.4 PTT Digital Solutions Company Limited (PTT Digital)

PTT ICT Solutions Company Limited (PTT ICT), an affiliate of which 20% is owned by PTTEP, signed an agreement with PTTEP to provide the Company with all information technology and communication services in accordance with the resolution of PTTEP's Board of Directors Meeting No. 10/2549/254 on September 29, 2006. This agreement includes infrastructure design and implementation services, consultancy services, procurement services, and outsourcing services to support the Company's needs in information technology and communications, based on the PTT Group's ICT Policy Strategy to drive and increase synergy within the group.

PTT ICT has re-registered its name with the Department of Business Development of the Ministry of Commerce as PTT Digital Solutions Company Limited, effective since June 22, 2017. The current service contract is valid for 5 years starting from January 1, 2016.

2.2.5 Energy Complex Company Limited (Energy Complex)

PTT and PTTEP have jointly established, constructed, and managed the Energy Complex Investment Project. The complex is considered to be the energy business center of the country, also comprising the Ministry of Energy, subsidiaries and associated companies of the PTT Group, as well as some private energy companies.

2.2.6 PTTEP Services Limited (PTTEP Services)

PTTEP Services was established in accordance with the resolution of PTTEP Board Meeting No. 12/2546/216. With its primary business objective of supplying the manpower to support PTTEP Group's operational activities, the company ensures that PTTEP is sufficiently staffed for both domestic and international expansion.

To fulfill its objective, PTTEP Services has recruited and hired various types of staff, both Thai and non-Thai, such as specialists, engineers, operators, technicians, etc., to serve PTTEP since July 1, 2004. The company has continuously developed and improved its compensation, welfare and benefits to ensure its staff are provided with fair compensation and good welfare and benefit programs that make its staff feel motivated. This has also helped to improve the company's competitiveness in the market.

To enhance personnel capabilities that will effectively support PTTEP operations, PTTEP Services has provided several training and development programs that focus on compulsory Safety, Security, Health and Environment (SSHE) training in addition to functional training based on PTTEP's business requirements. Furthermore, the company has provided any basic training required for personnel to perform their duties effectively. This includes computer training, English training and other soft skills training.

PTTEP Services' business has continuously grown and expanded. Apart from supplying manpower for PTTEP, the company has also provided manpower for Carigali-PTTEPI Operating Company Sdn. Bhd. (CPOC), a PTTEP joint venture company in Malaysia. On March 23, 2018, the company increased its paid-up capital from 1 million Baht to 10 million Baht; the Company was also registered as an International Headquarters (IHQ) in order to optimize benefits from providing services to overseas clients.

2.2.7 PTT Global LNG Company Limited (PTTGL)

PTTEP and PTT have jointly established PTTGL on June 23, 2017 pursuant to the resolution of PTTEP's Board of Directors No. 1/2560/419 on January 26, 2017 and No. 7/2560/425 on May 25, 2017 to carry out business related to Liquefied Natural Gas (LNG) value chain with equal shareholding at 50%. PTTEP is seeking investment opportunities in LNG as natural gas has seen the highest consumption growth, being the cleanest form of energy among fossil fuels, with an abundance of reserves globally.

As of December 31, 2018, PTTGL had one investment project, a 10% share in PETRONAS LNG 9 Sdn Bhd (a subsidiary of PETRONAS). The company operates an LNG liquefaction plant in Malaysia with 3.6 million tons per annum (31.2 million barrels of oil equivalent) capacity.

2.2.8 AI and Robotics Ventures Company Limited (ARV)

PTTEP incorporated the establishment of AI and Robotics Ventures (ARV) on September 21, 2018. ARV is wholly-owned by EP-Tech Ventures Holding Company Limited, which is a subsidiary of PTTEP. The business strategy of ARV targets becoming an innovation platform to leverage cutting-edge AI and robotics technologies to create simplified solutions that respond to business challenges in E&P and non-E&P industries, such as agriculture and environment sectors, all of which are the key driving forces to fuel domestic and Southeast Asian economies. Based on the abovementioned strategy, ARV has also set out its strategic objectives, which are to accelerate the AI and robotics research and development in Thailand, strengthen the manufacturing and competitiveness in both national and regional levels, and become a new channel of income for PTTEP in the near future.

In addition, ARV has set its main goal for the initial stage (2019 - 2021) to become a successfully recognized AI & Robotics organization in Southeast Asia under the investment budget of approximately THB 1.6 billion, covering three main activities, which are (1) research and development of innovative technology, (2) marketing and services, and (3) platform development in order to create a solid basis of innovation development for long-term sustainable growth.

2.3 Permission to Operate, Concession or Business Promotion

PTTEP operates petroleum exploration and production business in the Kingdom of Thailand and abroad. The Company's investments in foreign countries must comply with all applicable laws and regulations of those invested countries, such as Production Sharing Contract, Concession, or Services Agreement. Within the Kingdom of Thailand, the Company must comply with the Petroleum Act B.E. 2514 and its amendments which set out the rights to explore, exploit and produce petroleum under concession regime, production sharing contract regime and services agreement regime. Key points in the petroleum business are as follows:

2.3.1 Demarcation of Petroleum Exploration and Production Areas

The Department of Mineral Fuels, the Ministry of Energy, as the government authority under petroleum law, is responsible for demarcating each petroleum exploration and production areas (Block) and inviting oil companies to submit their applications requesting for awarding concession, production sharing contract or services agreement. In considering any awards, the Petroleum Committee has duty to render consultation to the Minister. The Minister with the approval of the Cabinet has the authority to sign the concession, production sharing contract or services agreement to award the right to explore, exploit and produce petroleum. Qualification of each applicant will be considered by the State to award the right to explore, exploit and produce petroleum which includes without limitation to adequacy of the investment funds to be brought in and used in the exploration activities, transfer of knowledge and technology, employment of Thai nationals, and the utmost benefits of the State.

2.3.2 Characteristic of Joint Venturer

A petroleum concession, a production sharing contract or a services contract may be awarded to a single concessionaire/contractor or multiple concessionaires/contractors. Since the risk of the petroleum exploration and production business is relatively high in its nature, it is common for concessionaires or contractors to form a joint venture in order to diversify such business risk. In a joint venture, a company will be designated as the "operator" to conduct the exploration and production operations on behalf of its partner(s) and commonly under the supervision of a management committee or an operating committee which is composed of representatives of all parties. Other non-operator companies will participate in making of operational decisions including technical, work program and budget. The operator will cash call all parties to finance the project. Generally, whether an oil company will become a project operator depends largely on its investment conditions, readiness, and business strategy in that particular project.

2.3.3 Nature of Operations and Investment Decisions

Before an oil company decides to invest in a petroleum exploration in the Kingdom of Thailand or abroad, it has to consider the chance of having a successful exploration as well as other investment risk factors. A thorough study on the information available is conducted to determine whether the area has high petroleum potential and whether the project is commercially feasible. The success ratio of exploration wells in neighboring areas as well as other risk factors in the invested countries must also be taken into account. Assuming that the project is commercially feasible, the company will apply for a right to explore, exploit and produce petroleum or, if such right is already awarded, "farm-in" to the existing petroleum concession.

After the oil company is awarded a right to explore, exploit and produce petroleum, an exploration program will be conducted, normally taking 2-3 years. If the petroleum reserves are found, the oil company will compare the amount of investment funds required for the development phase and the expected sales value of the petroleum based on the commercialized petroleum reserves. If the study indicates that the reserves are worth investing in as generally, this means that the petroleum field is considered to have commercial viability; a further investment onto development phase is therefore justified. The operator shall then apply for an approval of petroleum production and simultaneously may start its production activity. The operator is still able to explore the rest of the existing areas if it is within the time frame of the exploration period as mentioned in the concession, the production sharing contract or the services contract. At this stage, the operator must have a certain degree of confidence about the investment. However, as the investment expenditure required for such development phase is very high; the operator must normally be able to identify buyers of the petroleum in advance, whereas a long-term sales agreement for the petroleum to be produced shall be signed. Currently, PTT Public Company Limited ("PTT") is the biggest petroleum buyer in Thailand. The principal elements of the sales agreement for petroleum generally include determination method of the sales price and quantity of the petroleum to be delivered. Sales of natural gas from domestic areas is made at the wellhead, while sales of natural gas from foreign areas is made at the Thai borders. PTT is currently responsible for installation of most of the gas pipelines for the production amount as specified in the gas sales agreement. Sales of crude oil is made at the buyer's refinery, while sales of condensate is made at the Floating Storage Unit (FSU) near the wellhead.

2.3.4 Description of Laws Relating to the Business

Operation of petroleum business in Thailand is governed by two major enactments, namely, the Petroleum Act B.E. 2514, and the Petroleum Income Tax Act B.E. 2514 and its amendments. The concessionaire and contractor must be a limited company or a juristic person which has the same status as a limited company, established under the laws of Thailand or foreign laws. Several major features of these laws are as follows:

(1) Concession

(1.1) The concessionaire(s) and the co-venturer(s) shall pay the royalty which is normally in cash. The Minister may authorize such royalty payment in kind of petroleum with the prior notice of not less than 6 months. The royalty can be used as credit against income tax (Thailand I) or deducted as expenses (Thailand III).

(1.2) Petroleum income tax is prescribed at a rate not lower than 50% and not higher than 60% of the net profit from the petroleum operation.

(1.3) Interest paid cannot be deducted as expenses for income tax purposes.

(1.4) Each concessionaire could be awarded concessions with no limitation in terms of number of blocks.

Thailand I for the petroleum concessions awarded by the Ministry of Industry¹ from B.E. 2514 to B.E. 2532 and those onshore petroleum concessions issued before B.E. 2525

Thailand II² for the onshore petroleum concessions awarded by the Ministry of Industry from B.E. 2525 to B.E. 2532

Thailand III for the petroleum concessions awarded by the Ministry of Industry from B.E. 2533

¹ Currently, the Ministry of Energy

² Under Section 36 of the Petroleum Act (No. 4) B.E. 2532, all petroleum concessionaires under Thailand II have applied to be subject to the criteria under Thailand III.

Details of the Terms: Thailand I, II, and III

Term	Thailand I	Thailand II	Thailand III
Royalty Rates	12.5% of income from sales or disposal of petroleum which may be treated as tax credit	12.5% of income from sales or disposal of petroleum which may be treated as tax credit	progressive rate at sliding scale of 5-15%, deemed to be expenses which could be deducted in tax calculation
Petroleum Income Tax	50% of net profit from petroleum business operation	50% of net profit from petroleum business operation	50% of net profit from petroleum business operation
Special Benefits	-	annual benefits and annual production bonus	special remunerator benefit which may be taken as deduction
Exploration Period	8 years with 4 year extension	8 years with 4 year extension	6 years with 3 year extension
Production Period	not exceeding 30 years from exploration's expiration date, with extension not exceeding 10 years	not exceeding 30 years from exploration's expiration date, with extension not exceeding 10 years	not exceeding 20 years from exploration's expiration date, with extension not exceeding 10 years
Concession Areas	not exceeding 10,000 sq. km. per exploration block, up to 5 exploration blocks	not exceeding 10,000 sq. km. per exploration block, up to 5 exploration blocks	not exceeding 4,000 sq. km. per exploration block, up to 5 exploration blocks ³

(2) Production Sharing Contract

(2.1) All petroleum operation expenditure shall be responsible by the contractor whereas the contractor shall be recovered such expenditure by deducting from the production. The expenditure that can be deducted shall be the actual expenditure according to the work program and budget approved by the Director General of the Department of Mineral Fuels, the Ministry of Energy, but shall not exceed 50% of the overall production.

(2.2) The contractor shall pay the royalty to the State at the rate of 10% of the overall production.

(2.3) The remaining production after deducting the royalty and the recoverable expenditure shall be shared to the contractor, but not exceeding 50%.

(2.4) Petroleum income tax is prescribed at a rate not lower than 20% of the net profit from petroleum operation.

(3) Services Contract

(3.1) Services contract can be either the hiring for exploration and production contract, the hiring for exploration contract or the hiring for production contract.

(3.2) The contractor shall be paid by the State according to the terms and conditions of each services contract.

(3.3) All petroleum operation expenditure shall be responsible by the contractor.

(3.4) Payment shall be made to the contractor after deducting the royalty.

³ Under Section 28 of the Petroleum Act (No. 6) B.E. 2550, effective on October 18, 2007, there is currently no limitation in terms of number of blocks.

2.4 Market and Competition

PTTEP has invested in both domestic and overseas projects, including the Republic of Indonesia, the Republic of the Union of Myanmar, the Socialist Republic of Vietnam, Malaysia, the Commonwealth of Australia, Canada, the United Mexican States, the People's Democratic Republic of Algeria, the Republic of Mozambique and the Federative Republic of Brazil. The target markets are both domestic and overseas where we have invested in. The Company's petroleum products include natural gas, crude oil, condensate, and LPG.

In 2018, total sales by the Company and our subsidiaries averaged 305,522 barrels of oil equivalent per day (BOED). The total sales ratio of natural gas to liquid was 72%:28% by volume and 59%:41% by revenue, as shown below.

Product	Volume	Value (million USD)
Natural Gas	497,477 MMSCF or 80.16 MMBOE	3,089.14
Condensate	13.23 MMBBL	903.49
Crude Oil	17.52 MMBBL	1,178.43
LPG	74,292 metric tons or 0.62 MMBOE	31.76

2.4.1 Marketing Characteristics

PTTEP sells our outputs from domestic and regional projects primarily to the Thai market through PTT Plc. (PTT), the major buyer and processor of all the products. PTT then turns the processed products to the country's power sector, petrochemical industry sector, transportation sector, industry sector, and household sector.

Marketing of petroleum products varies with their characteristics and field location which in turn differentiate the market and sales price structures.

(1) Natural Gas

Due to capital-intensive investment in developing oil and gas exploration business, gas sales agreements (GSAs) must be agreed or signed between the buyer and seller before any major investment is made. GSAs are typically a long-term contract, ranging from 15 to 30 years. Prices, volumes, and points of sale are stipulated for each of the contracts. Currently, the designated transfer points for all domestically sold gas are at the Central Processing Platform (CPP), from which the buyer will invest in the transmission system to the CPP. The delivery point of the gas sold from the Republic of the Union of Myanmar to Thailand is however at the Myanmar-Thai border. In this case, the seller is responsible for investment in the transmission pipelines from the CPP to the border.

Gas prices are usually linked to fuel prices and several key economic indices as well as to reflect the investment costs and be competitive comparing with fuel oil for the GSA period.

Sales volumes are based on the assessed reserves on the negotiation date. GSAs stipulate obligations between buyer and seller for a committed volume. If the buyer does not take the volume of gas as committed to in the GSA, it must pay for the committed volume whether the gas is taken or not (Take-or-Pay). As a consequence, the buyer is entitled to take delivery of free of charge in subsequent years (Make-up Gas).

On the other hand, should the seller fail to deliver as nominated by the buyer, the buyer is entitled to an agreed discount price of the undelivered volumes as stipulated in the agreement (Shortfall).

(2) Condensate and Crude Oil

Condensate and crude oil prices are determined by their properties and benchmarked with crude oil prices of those predominantly sold in the region. Contracts are either short-term or long-term, and some are sold in spot the markets.

(3) LPG

LPG produced from S1 Project is sold to PTT under a long-term contract with the price in line with the government's policy and announcements by the Joint Committee on Energy Policy Administration.

Sales of petroleum products from PTTEP's international fields vary from country to country as follows:

- Zawtika, Yadana and Yetagun projects in the Republic of the Union of Myanmar: Approximately 80% of the produced natural gas from Zawtika and Yadana projects is primarily sold to Thailand through PTT, while the remaining 20% is sold to the Republic of the Union of Myanmar for its domestic power generation. Nearly all of the condensate from Yetagun Project in 2018 is sold in the regional spot markets due to the revamping of domestic refinery. All the gas output from Yetagun Project is currently sold to PTT for the consumption in Thailand.

- Vietnam 9-2 and Vietnam 16-1 projects in the Socialist Republic of Vietnam: All of the oil output produced from Vietnam 9-2 Project is sold to Binh Son Refining and Petrochemical Company Limited (BSR), a refinery in the Socialist Republic of Vietnam, for the consumption in the Socialist Republic of Vietnam. The produced crude from Vietnam 16-1 Project is sold in the regional spot markets through auction, while the produced gas from both projects is sold to Vietnam Oil and Gas Group, a state enterprise, for the consumption in the Socialist Republic of Vietnam.

- Algeria 433a & 416b Project in the People's Democratic Republic of Algeria: The Bir Seba Field has been commenced the production with its first commercial sales of crude oil since December 2015. The crude oil is sold and marketed by PTT as the marketing agent in the spot markets.

For MTJDA Project in Malaysia-Thailand Joint Development Area, the produced natural gas is sold to PTT for the consumption in Thailand. Starting from April 2015, the gas has been sold to Malaysia according to the Gas Balancing Agreement between PTT and Petroliaam Nasional Berhad (PETRONAS). The condensate output meanwhile has been marketed and sold by a co-marketing agent of PTT and PETRONAS Trading Corporation Sdn Bhd (PETCO) through auction in the spot markets.

2.4.2 Competition

Thailand's E&P industry is an oligopolistic due to the business' relatively high investment and advanced technology required. The growing demand especially for natural gas and the GSAs which are predominantly long-term contract coupled with take-or-pay clauses however have continued to attract new investments to the market.

Regarding the approximate domestic production in 2018, PTTEP's petroleum production accounts for 32% of the total domestic production in 2018, making the Company the leader among the domestic producers.

Producers	% Domestic Production Volume
PTTEP	32
Chevron	30
Total	10
MOECO	8
Petronas	7
Others	13

Source: Department of Mineral Fuels, Ministry of Energy

Currently, the shale gas revolution is driving a dramatic restructuring of the global natural gas markets. It creates new opportunities and incentives to move lower-cost natural gas to higher-value global markets via LNG exports. The global LNG demand growth is therefore expected to be stronger, resulting in an increase of its market share in the future.

2.5 Production

2.5.1 Exploration and Production Stages and Technology

Petroleum exploration and production can generally be divided into four major stages as follows:

(1) Acquisition stage: This is the first step to identify the areas with petroleum potential. The main activities conducted in this stage include:

- Basin Assessment
- Prospect and Lead Assessment

(2) Exploration & Appraisal stage: This stage mainly involves with additional study and well operation to increase the certainty of estimating size and properties of the petroleum systems. Also it is expected to prove the existence of petroleum in the area. The main activities conducted in this stage include:

- Detailed study of petroleum geology and additional seismic survey
- Reservoir formation evaluation and conceptual development design
- Exploration & Appraisal well drilling and testing
- Post-well evaluation

(3) Development stage: This is the last stage prior to the production. The main activities conducted in this stage include:

- Prospect Inventory & Ranking
- Field development plan design and optimization
- Production facilities design, construction, and installation
- Development well drilling

(4) Production stage: This is the stage where petroleum and associated products are flowed through the pressure controlled equipment (wellhead) and processing facilities including measuring equipment to obtain the production rates of all of the productions. The main activities conducted during this stage include:

- Monitoring of production rate, proportion between produced gas, crude oil or condensate, and water, as well as pressure decline rate

- Forecasting of the future reservoir performance
- Well work-over and facilities maintenance

PTTEP has been well equipped in terms of manpower, technology and equipment to operate the business efficiently according to the Company's target.

2.5.2 Petroleum Reserves

Petroleum reserves can be divided into two categories, namely, Proved Reserves and Unproved Reserves according to the level of certainty.

(1) Proved Reserves are those quantities of petroleum which, by analysis of geological and engineering data, can be estimated with reasonable certainty to be commercially recoverable, from a given date forward, from known reservoirs and under current economic conditions, operating methods, and government regulations.

Practically, Proved Reserves mean the petroleum in reservoirs which can be commercially produced based on supporting data gathered during the well testing process. In some cases, reserves may be classified as Proved Reserves essentially when the results from well logging and/or analyzing of the core samples can prove that the reservoirs and petroleum in the reservoirs are similar or comparable to those of the neighboring areas which have already been commercially produced or with the potential to be produced according to their well testing results. In addition, Proved Reserves must be able to be produced by using the existing production equipment or with the production equipment that have a firm plan to install in the future.

(2) Unproved Reserves are defined based on geoscience and/or engineering data similar to that used in the estimation of Proved Reserves but with technical or other uncertainties which preclude such reserves from being categorized as Proved. Unproved Reserves can be further categorized into Probable Reserves and Possible Reserves as follows:

- Probable Reserves are those additional quantities of petroleum obtained from an analysis of geoscience and/or engineering data similar to that used in the estimation of Proved Reserves but with less production possibility.
- Possible Reserves are those additional quantities of petroleum obtained from an analysis of geoscience and/or engineering data similar to that used in the estimation of Probable Reserves but with less production possibility than both Proved Reserves and Probable Reserves.

The Company's Proved Reserves are composed and reviewed annually by our earth scientists and reservoir engineers to ensure the industry's rigorous professional standards.

The Proved Reserves are reported on a gross basis which includes the Company's net working interest and related host country's interest. As of December 31, 2018, the total amount of Proved Reserves of PTTEP Group's projects was 164 million stock-tank barrels (MMSTB) of crude oil and condensate^{*}, and 3,286 billion standard cubic feet (BSCF) of natural gas or 513 million barrels of oil equivalent (MMBOE). The total amount of Proved Reserves in terms of oil equivalent in consolidation was therefore 677 MMBOE. Details of the Company's Proved Reserves are shown in the following table.

^{*} LPG included

PTT Exploration and Production Public Company Limited

Crude Oil and Condensate and Natural Gas Proved Reserves ⁽¹⁾

As of December 31, 2018

	Crude Oil and Condensate ⁽²⁾			Natural Gas			Barrel of Oil Equivalent		
	(MMSTB)			(BSCF)			(MMBOE)		
	Domestic	Foreign	Total	Domestic	Foreign	Total	Domestic	Foreign	Total
Proved Reserves as of Dec 31, 2017	99	57	156	1,824	1,225	3,049	398	233	631
1) Revision of previous estimates	19	5	24	108	51	159	36	14	50
2) Improved recovery	5	0	5	57	13	70	14	2	16
3) Extensions and discoveries	14	1	15	368	3	371	72	1	73
4) Purchases/Sales of petroleum in place	6	(8)	(2)	249	-	249	47	(9)	38
5) Production	(27)	(7)	(34)	(425)	(187)	(612)	(97)	(34)	(131)
Proved Reserves as of Dec 31, 2018	116	48	164	2,181	1,105	3,286	470	207	677

(1) The Proved Reserves are reported on a gross basis which includes the Company's net working interest and the related host country's interest.

(2) LPG included

Furthermore, in order to improve efficiency, check and balance of the reserves estimation, reporting and disclosure, the company maintains a Reserves Committee which has the following roles and responsibilities:

- Review and endorse the Company's Annual Reserves
- Review and approve Major Changes of Reserves, and Reserves for Newly-Acquired Project
- Ensure that all activities that related to reserves estimation and disclosure of reserves information conform to regulatory and legal requirements as well as to corporate and international standards.
- Approve Annual Reserves Audit Plan, appoint Reserves Auditor, as well as approve Reserves Audit Report to ensure compliance with Company's framework and continual process improvement.

2.5.3 PTTEP Petroleum Production

In 2018, the total production of PTTEP Group was 131 MMBOE, consisting of 34 MMSTB of crude oil and condensate* and 612 BSCF or 97 MMBOE of natural gas. This was equivalent to a production rate of approximately 359,386 barrels of oil equivalent per day (BOED) which was approximately 11,878 BOED or 3.4% increase from the previous year. The increase was mainly due to the acquisition of the additional 22.2222% participating interests in the Bongkot Project and high nomination from buyer in MTJDA and Contract 4 projects.

2.5.4 Environmental Impact Management

To achieve PTTEP's new vision of becoming the "Energy Partner of Choice" by creating shared social values for all stakeholders, and engaging society become part of our business operations, we have consistently pursued the work on environmental impact mitigation and minimization. In 2018, we updated the environmental risk factors to be in line with the global trend. The environmental risks of the Company's business operations comprise 3 aspects:

- (1) Environmental Impact Assessment and Compliance
- (2) Greenhouse Gas Emission
- (3) Accidental spills of hydrocarbons (crude oil and condensate) and chemical substances

To ensure that our operations will have a minimal environmental impact, we have introduced and implemented the following environmental risk-related measures, which can be summarized as follows:

- (1) Environmental Impact Assessment and Compliance
 - Conducting environmental impact assessments, implementing prevention, correction and mitigation measures, for both domestic and international projects.
 - Using the technique of re-injecting produced water to subsurface reservoirs. Since 2008, the efficiency rate of produced water re-injection is 100 % for the Bongkot Project, Arthit Project, S1 Project, PTTEP 1 Project, and L53/43 & L54/43 Project.
 - Maintaining Synthetic Drilling Fluid (SDF) on discharged cuttings within the standard as stated in the Environmental Impact Assessment Report

- Monitoring the quality and condition of discharged wastewater from the production process, seawater, sediment, benthos, and fish around the production platform, as prescribed in the project's Environmental Impact Assessment Report. In addition, environmental compliance monitoring reports must be submitted to the Department of Mineral Fuels of the Ministry of Energy, and the Office of Natural Resources and Environmental Policy and Planning (ONEP) of the Ministry of Natural Resources and Environment.

In addition, PTTEP produced the environmental impact assessment report, as per the Announcement of the Ministry of Natural Resources and Environment, requiring an environmental impact assessment report for all exploration and production projects, to identify the environmental issues, and to determine prevention and mitigation measures as well as environmental monitoring programs. They are then submitted to the regulatory and approval agencies prior to commencement of the project. Our operations are regulated by government agencies of the respective countries in which we operate. In Thailand, there are two main agencies responsible for petroleum exploration and production activities, namely, the Department of Mineral Fuels (DMF) of the Ministry of Energy, which is the regulatory agency, and the Office of Natural Resources and Environmental Policy and Planning (ONEP) of the Ministry of Natural Resources and Environment, which is the approval agency.

(2) Greenhouse Gas Emissions

- Developing short-term and medium-term targets for the reduction of greenhouse gas emissions intensity of 20% by 2020 and 25% by 2030 from the 2012 base year. Details of the Company's greenhouse gas emissions are disclosed in the 2018 Sustainability Report.

- Conducting organizational risk assessment regarding climate change adaptation activities.
- Adopting the ISO14064-1:2006 Standard: Guidance at the Organization Level for Quantification and Reporting of Greenhouse Gas Emissions and GHG Protocol, as well as the United Nations Framework Convention on Climate Change (UNFCCC) for the purpose of monitoring and reporting the Company's greenhouse gas emissions, including improving the greenhouse gas emissions report by direct measurement of hydrocarbon leak at sources.

(3) Accidental spills of hydrocarbons (oil and condensate) and chemical substances

- Updating spill response and management plans, and providing equipment, trainings and exercises to ensure immediate and effective Tier 1 spill response, including being a member of the Oil Industrial Environmental Safety Group Association (IESG) and a member of the Oil Spill Response Limited (OSRL), and working with PTT Group on Tier 2 and Tier 3 spill response respectively.

2.5.5 Performance over Past Three Years

PTTEP promotes operational and production process safety management, which is fundamental to our SSHE core value and practice, by managing and controlling the related risks to as low as reasonably practicable (ALARP). We adopt various safety performance indicators such as Lost Time Injury Frequency (LTIF) and Total Recordable Injury Rate (TRIR). In 2017, LTIF, TRIR and spill rates were better than the International Association of Oil and Gas Producers (IOGP) average.

To support the expansion of our operations, we emphasize the need for robust and comprehensive SSHE measures in both domestic and international projects. In the past year, documents on SSHE management were revised and standardized, including updating documents to be used as additional standard to cover activities with risks, conducting SSHE awareness training for all staff, and minimizing the rate of incidents to the lowest possible level. While sufficient SSHE measures have been in place, we are determined to continuously improve our performance in this regard to support the Company's future sustainable growth.

PTTEP has strictly complied with the relevant legal requirements and was recognized with numerous domestic and international awards, for instance:

(1) PTTEP was selected as a member of the 2018 Dow Jones Sustainability Indices (DJSI) in the DJSI World Oil and Gas Upstream & Integrated Industry for the fifth consecutive year since 2014.

(2) PTTEP received the SET Sustainability Award 2018 – Outstanding Category from the Stock Exchange of Thailand (SET). The Company also received Thailand Sustainability Investment Award 2018 for the third year. The awards recognized PTTEP as a listed company with outstanding sustainable practices and ongoing commitment to sustainability with good governance, environment and social responsibility, and transparency.

(3) PTTEP was assessed for the SSHE performance and was certified by an external organization. As a result of the determination of all PTTEP staff, our sustainability report was certified by the Global Report Initiative (GRI) for the seventh consecutive year.

(4) PTTEP implemented the environmental management system in alignment with the International Organization for Standardization (ISO). In 2018, we were certified with the ISO 14001:2015 by the AJA Registrars, accredited by the United Kingdom Accreditation Service (UKAS), for all operational units that we act as the operator in Thailand. The ISO 14001 "One Common System" is used for all sites including the international projects, to improve the efficiency of our environmental management system, continuously revise our process, as well as effectively maintaining, controlling, monitoring and mitigating the environmental impact, consistent with our SSHE management system, in the following areas:

- Headquarters
- Bongkot Project
- Arthit Project
- S1 Project
- PTTEP 1 Project and L53/43 & L54/43 Project
- Sinphuhorm Project
- PTTEP Petroleum Development Support Base (Songkhla and Ranong)
- PTTEP Core Research Center (Ayutthaya)
- Montara Field, Darwin base, and Perth office of PTTEP Australasia (Ashmore Cartier) Pty Ltd in Australia
- Block M9, Zawtika Operation Center at Dawei, Office at Yangon in the Republic of the Union of Myanmar

We are the first company in the petroleum exploration and production business in Thailand to be certified with this standard.

(5) PTTEP was certified with the OHSAS 18001:2007 Occupational Health and Safety Standard, by AJA Registrars, accredited by the ANSI-ASQ National Accreditation Board (ANAB), for the operational areas of our domestic projects, namely Arthit, and Bongkot (for both North & South fields), S1, PTTEP 1, L53/43 & L54/43, Sinphuhorm – petroleum production; and PTTEP Petroleum Development Support Base (Ranong) – offshore petroleum exploration and production support. We also plan to expand the coverage of the OHSAS to our international projects.

(6) Prior to the commencement of any new project, environmental impact assessment report is submitted to the approval agency for its consideration. In addition, a compliance report on the implementation of measures identified in the approved EIA is submitted periodically as required.

(7) A monthly and annual summary report on SSHE performance is submitted to the Department of Mineral Fuels. The operating sites are audited for SSHE performance by the Department of Mineral Fuels.

(8) PTTEP was selected as one of the 100 outstanding companies for Environmental, Social and Governance (ESG) by the Thaipat Institute, which is a pioneer for developing business sustainability data.

(9) Our certificates for Green Meetings and Green Meetings Plus of the PTTEP Headquarters and for Green Meetings of the PTTEP Petroleum Development Support Base (PSB) were renewed by Thailand Business Council for Sustainable Development (TBCSD), in recognition of our effort to organize meetings that reduce energy consumption and environmental impact.

(10) PTTEP received the Green Office Award for 2017– Excellence Level (G-Gold) for head office building. PTTEP is the first company in petroleum exploration and production business to receive the highest level award of the Thailand Green Office Award campaign organized by the Department of Environmental Quality Promotion. The award is given to an office with sound on environmental management in various aspects, e.g., energy utilization, water utilization, resource utilization and pollution prevention including low level emission of greenhouse gases.

(11) PTTEP received the Green Procurement Certificate from Thailand Environmental Institute (TEI), as PTTEP and TEI have jointly developed green procurement criteria. Green procurement is a part of PTTEP Green Practice Roadmap which aims at environmental impact mitigation from operations, lowering of carbon and ecological footprints, as well as creating value-added processes to business.

(12) PTTEP received the Low Emissions Support Scheme (LESS) Letter of Recognition from the Minister of Natural Resources and Environment, which was the second time that we received this recognition of The Thailand Greenhouse Gas Management Organization (TGO), for the commitment and cooperation of all staff the Head Office and Songkhla Petroleum Development Base in reducing the total amount of greenhouse gas emissions by 413,723 kilograms of carbon dioxide equivalent.

(13) PTTEP received the Best Practice Award in ISO 14001 & OHSAS 18001 presented by the AJA Registrars. PTTEP is one of the 21 companies out of more than 900 AJA certified companies in Thailand to receive such award.

(14) PTTEP received the Best Initiatives in Environmental Stewardship Award from the Asset Magazine, a leading financial magazine in Hong Kong.

(15) PTTEP organized the oil spill response (IMO level 1) training for 32 frontline staff (certified by IMO) to ensure staff's competency and readiness.

Regarding chemical and hydrocarbon spills, which is one of the key performance indicators for environment management, the figures for the years 2016 - 2018 were 0.74, 4.65 and 9.98 tonnes, respectively. Details are disclosed in the 2018 Sustainability Report.

2.5.6 Environmental Disputes or Lawsuits and Approach to Resolution

Details are disclosed in the "Legal Dispute" section.

2.5.7 Safety, Security, Health and Environment Management

PTTEP develops, implements, and continuously improves our Safety, Security, Health and Environment (SSHE) Culture based on the long-term roadmap to achieve our ultimate goal, which is to prevent any accident that may result in injury, occupational illness, and any other work-related harm. In 2018, PTTEP's SSHE strategy was mainly focused on improving the Company's SSHE Management System (SSHE MS) in both operational and process safety, and the strengthening of our SSHE culture. We aim to reach the highest level within our SSHE Culture Maturity Model, which is derived from the International Association of Oil & Gas Producers (IOGP), primarily by enhancing the awareness of our line management with regard to their roles and responsibilities. Furthermore, we will be promoting SSHE leadership awareness among our employees and contractors at all levels. Importantly, PTTEP is still dedicated to carry through with strong efforts to improve and sustain the environment in all areas of our operations. Successful implementation of these SSHE requires full commitment from all of PTTEP Group's personnel, from the highest executive officer to the operational staff and contractors.

In 2018, PTTEP's Safety Key Performance Indicators of Lost Time Injury Frequency Rate (LTIF) and Total Recordable Injury (TRIR) were better than those of the previous year and in the top quartile of IOGP's performance. This is a direct result of our ongoing incident prevention campaigns in operations.

PTTEP operates in accordance with SSHE standards and legislation in all areas and, furthermore, follows up incidents. In 2018, the Company received the Best Practice Award in ISO 14001 & OHSAS 18001 from AJA Registrars Limited, a leading company for SSHE management verification. We also received the PTT Group SSHE Awards 2018 in the "PTT Group Zero Accident - Most Valuable Zero PSE TIER 1" category from the PTT Group. Those achievements reflect PTTEP's emphasis and commitment to continuously improve SSHE implementation, so as to achieve our ultimate goal of being a "Target Zero" organization where employees and contractors can come to work and return home safely every day.

3. Risk Factors

Due to technical and operational complexities in the petroleum exploration and production business, together with the need for high volume of investment for new investment opportunities, exploration activities, project development activities, as well as production activities, PTTEP, therefore, places great importance on risk management by setting up a carefully considered Risk Governance Framework. This Framework defines roles and responsibilities for personnel working in each level of authority, ranging from the Board of Directors, management to the business units/functions to ensure that all the risks are addressed, monitored and reported with management that is systematic and efficient.

In 2018, despite improvement of the crude oil price from the previous year, a number of uncertainties led to the persistence of oil price volatility. Hence, PTTEP has continued our strategies in maintaining unit costs and increasing operational efficiency, while striving for long-term sustainable growth. PTTEP is also reshaping the organization to enhance our competitiveness in the E&P business, which is our core business, while searching for opportunities in related businesses to invest in the near future. Key risk factors associated with our core business can be summarized as follows.

3.1 Strategic & Portfolio Risks

3.1.1 New Investment Risks

PTTEP continues to focus on E&P opportunities in Southeast Asia, particularly Malaysia, Myanmar and Thailand that includes the bidding of the expiring Bongkot and Erawan concessions, which is the area that the Company is familiar with. Moreover, PTTEP also seeks out business opportunities in prolific petroleum areas with acceptable geopolitical risks and low costs of development and production. Certain risks and uncertainties must also be considered. These include political stability, energy policy changes, and clarity with regard to the decommissioning of construction and production equipment, benefit sharing and new fiscal regimes in Thailand (Production Sharing Contract or PSC).

The Company has drawn up plans to mitigate those risks which may potentially affect our operations and investment growth, such as adopting strict due diligence, recruiting proficient consultants, promoting understanding among stakeholders, proactively pursuing effective public relations, monitoring and providing opinions for appropriate decommissioning of equipment in areas related to the technical aspect, regulatory requirements, economic feasibility as well as environmental and social impacts. In addition, we also regularly assess and analyze risks associated with climate change in relation to the business, as well as attempt to identify our “Low Carbon Footprint Reduction” roadmap, targets and action plans to manage the risks and their impacts. The Company works to manage effects from related risks such as the collection of carbon taxes in various countries that we operate in, and physical damage to our assets and construction structures caused by the rise in global temperatures.

Investment in new countries or unfamiliar territories contains a number of inherent risks. The Company has therefore established risk mitigation guidelines for the assessment of each investment. The guidelines provide advice in various aspects, ranging from petroleum potential, size and project characteristics, acquisition procedures, additional reserves volume, operator’s capability and performance, attractiveness of the fiscal regime, geographical conditions, related laws and regulations, political stability, issues concerning international relations, economic conditions and financial stability. The risks are then taken into account when prevention measures and options are formulated and integrated into a return-on-investment analysis or a joint venture agreement.

Investment in new projects, including farm-in and farm-out joint ventures, mergers and acquisitions, as well as withdrawal or divestment from any given project must be intensively screened by the Investment Committee and Management Committee. Their responsibility is to assess and ensure that each project adheres to the Company's investment direction and policy and that each project is economically and technologically feasible, and whether conventional or unconventional resources are involved before proposing it to the Risk Management Committee prior to the final approval of the Board of Directors.

3.1.2 Organizational Capability Risks

Organizational capability is a key factor towards the achievement of the Company's targets. Thus, business processes and human resources are, inevitably, of great importance. Potential risks that may occur include the risk from a lack of expertise and knowledge, and risk of business process inefficiency. In this regard, PTTEP has taken the following actions to enhance our business processes and organizational capability.

(1) Knowledge management, including new technologies and capability of the Company's research and development program, is developed, in line with our growth strategy to expand into new business opportunities. Our Capability and Technology Development Roadmap has been developed along with continuous research on technology to support business growth.

(2) Systems, procedures, and organizational structure are improved and developed, in line with PTTEP's growth strategy and business plan. These include work process improvement towards matrix organization to maximize work efficiency, development of the Delegation of Authority and Signatures (DAS), as well as enhancement of the IT Global Platform, system stability and confidentiality control, e.g., adoption of cloud storage. Meanwhile, development of our financial and accounting management capability aims to take the Company to the level of world-class finance. Some improvement measures that are being implemented include; enhancement of efficiency of our managerial accounting data analysis for M&A decision-making; establishment of the Shared Service Center; use of blockchain technology for international payment; and provision of finance and accounting in-house training offerings for staff, called FNA Academy training.

(3) To prepare for our investments in our core business and new business opportunities, the Company has devised Human Resources Development plans to recruit required and qualified staff members in operating and targeted countries. The plans focus on developing their capabilities and leadership, recruiting of external personnel in key positions that do not yet have in-house personnel, together with enhancing our employees' engagement by targeting the Company to be ranked in Thailand's Top Quartile level in 2020. In addition, human resource improvement and our values and culture embedded also ensure that development and growth of the Company are in line with PTT Group's goals.

3.2 Financial & Marketing Risks

3.2.1 Financial Risks

PTTEP determines cash management policy with an emphasis on sources of funds, debt financing, and liquidity management, while it also properly and promptly manages financial risks that might affect the Company's financial status. The financial policy as defined by the Board of Directors is to ensure the robustness of the financial status to support the Company's investment plans and execution in both the short term and long term.

Financial risks mainly consist of counterparty risk, and cash and liquidity risks. To manage counterparty risk, it is PTTEP Group's policy that we conduct business only with reputable and creditworthy counterparties. The financial stability and credibility of each counterparty must be analyzed and reviewed regularly. Currently, the majority of PTTEP Group's products are sold to PTT which is our parent company.

For cash and liquidity risks which may arise from our inability to maintain adequate working capital necessary for the operations, PTTEP Group has a policy to minimize such risks by adopting appropriate cash flow management and maintaining both committed and uncommitted credit facilities with banks and financial institutions.

3.2.2 Marketing and Distributing Risks

PTTEP has entered long-term gas sales agreements (GSAs) with PTT, which is the Company's major domestic buyer. The terms of the GSAs generally last 15 - 30 years. To mitigate market risks which can result in refusals from buyers to purchase contracted volumes of natural gas, GSAs stipulate obligations for buyer and seller to commit to the annual minimum volumes. Buyers must pay for the committed volume of gas, whether or not the full amount is taken (Take-or-Pay).

To effectively cope with the dynamics of Thailand's energy demand, the Company closely monitors petroleum demand in coordination with PTT and related government agencies to collectively outline an optimized supply plan. The Company reviews and adjusts our production as well as project development plans regularly to ensure that the development master plan is able to optimize reserves and resources of existing assets to match the country's energy demand. We also have a project in Mozambique which possesses large natural gas reserves that can be developed as a Liquefied Natural Gas (LNG) project. This project is a good example of the projects which fit in well with PTT's plan to import LNG as well as to contribute effectively to the enhancement of the energy security of Thailand.

3.2.3 Petroleum and Oil Price Risks

PTTEP Group's product prices depend on the world's crude oil prices, which are subject to multiple factors beyond our control; for example, the economic, political, and geopolitical stability of various countries (e.g., countries affected by sanctions from the United States of America), OPEC's production policy, capability and production plans of major oil producing countries (e.g., the United States of America, Russia), oil reserves in each country, and changes of the global climate.

Fluctuations in the world's oil prices immediately affect the prices of PTTEP Group's crude oil and condensate. Yet, while natural gas prices tend to follow oil prices, most of PTTEP Group's contractual natural gas prices are adjusted every 3, 6, or 12 months, depending on the gas price formula of each project. As a result, natural gas prices are more stable when compared to those of crude oil and condensate.

For the year 2018, PTTEP Group implemented an oil price hedging program with the objective of minimizing the negative impact on the Company's cash flow and operating performance.

3.2.4 Exchange Rate Risks

PTTEP Group adopts the U.S. Dollar (USD) as its functional currency in accordance with the International Financial Reporting Standards (IFRS) since the USD is the main currency used for trading petroleum products, such as crude oil

and natural gas, which are the Company's major products. PTTEP Group's cash flows, however, still experience an exchange rate risk from the Thai Baht (THB) movement against USD as most of the Company's revenue is in THB which is linked to USD. For example, revenue from USD-linked crude oil sold to a Thai company must be paid in THB equivalent to USD only, while the Company's main cash outflows, such as investments and operating expenditures, are mostly in USD. The currency mismatch and discrepancies between payables and receivables' settlement periods as well as the USD/THB volatility therefore inevitably impose foreign exchange risks to our cash flows. Under this circumstance, PTTEP Group has minimized the foreign exchange risks by using available financial derivative instruments in the market, such as forward and option contracts, to hedge the exposure relating to the foreign exchange rate as determined in the sales agreements by, for example, matching the Company's USD revenue with USD investments and operating expenditures.

With USD as the functional currency, coupled with the foreign exchange rate volatility, PTTEP Group is also exposed to the foreign exchange translation risk arising from the translation of non-USD assets and liabilities at the end of every accounting period. To minimize such translation risk, we have consistently put in great efforts to maintain a proper balance between our non-USD assets and liabilities, mainly in THB, as well as entering cross-currency swaps on our non-USD denominated obligations to reduce the impact from the exchange rate volatility by converting both interest and principal payments to USD.

3.2.5 Interest Rate Risks

PTTEP Group is exposed to interest rate risk as the risk affects future cash flows and fair value of the financial instruments employed. PTTEP Group eliminates and minimizes the risk by maintaining an appropriate debt portfolio optimization (ratio of fixed rate liabilities and floating rate liabilities) and using financial derivatives, such as interest rate swaps. Interest rate risk management is conducted dynamically, appropriately, and correspondingly to the nature of the business, the market conditions, relevant costs and the Company's acceptable risk limits.

3.3 Political and Legal/Regulatory Risks

3.3.1 Political Risks in Investment Countries

Based on PTTEP's foreign investment policy, we aim to invest in target areas of strategic significance in order to accommodate long-term growth. It is possible that such areas may be prone to geopolitical risks. Given this circumstance, PTTEP not only sets a certain level of acceptable risks in terms of politics, the economy, investment, law and regulations but we also appoint a geopolitical risk team to closely follow the situations in countries and territories where PTTEP operates. The team periodically produces analytic reports on the developments regarding political stability, macro-economic conditions, legal and regulatory aspects, and security, across a range of investment countries. So far, we have found that the high-risk areas remain in Africa and the Middle East, mainly as a result of political and economic instability. PTTEP believes that comprehensive assessments of these risks are key to preparedness especially during an urgent incident. Evaluating risks in different scenarios assists our management and relevant departments to efficiently mitigate the risks related to the countries where PTTEP invests.

Results from the above analysis are used to formulate geopolitical risk rating scores which will be considered as part of the assessment process before making decisions about whether to invest in new projects. In addition, PTTEP liaises closely with the Ministry of Foreign Affairs and Royal Thai Embassies in countries we invest to ensure that the Company's business operations are well-supported by relevant government agencies and that the projects are aligned with the respective national energy policies.

3.3.2 Compliance Risks

Generally, these risks can result from a variety of factors, such as complexity of specific laws, changes made to existing laws and regulations, misinterpretation of laws, or even nuances of the language in which the laws are written. The risks can potentially lead to certain actions or conduct that may be deemed incorrect, ultimately causing a violation of or non-compliance with applicable laws which may then lead to pecuniary forms of punishment, such as fines and operational difficulties, potential revocation, suspension of licenses, and possible damage to PTTEP Group's reputation. To minimize these risks, the Compliance Department¹ is responsible for assuring that all of the business units strictly comply with their relevant laws, thereby building confidence among the Company's shareholders, Board of Directors, management, and employees that we are in full compliance with laws relating to our business operations. In addition, PTTEP regularly monitors the legislation process to ensure that PTTEP's businesses comply with emerging laws.

In 2018, the Company continued to focus on anti-corruption risks and their monitoring programs. Details are disclosed in the "Corporate Governance" section, "Anti-Corruption" part.

3.4 Operational Risks

3.4.1 Exploration Risks

Exploration activities are essential for the E&P business as they are to ensure that additional new petroleum reserves are found to replace those which have been turned to production to generate the revenues, as well as to add new reserves to support future production targets and growth.

The objective of an exploration is to search for sizable petroleum resources for commercial development. The risks associated with exploration activities are geological risks and the uncertainty of finding a petroleum field of commercial size (Resources Volume Uncertainty).

Managing key exploration risks thus depends on the selection of exploration sites with good chances of finding sizable petroleum reserves that allow for commercial operations within an appropriate time and cost. The key factors that are used to consider whether to invest in petroleum exploration include chance of success, resource estimation, exploration period and planned expenditures, thoroughness of geological studies, seismic acquisition and interpretation, exploration economic evaluation, and the terms of contracts.

PTTEP establishes clear processes and criteria in evaluating each step of the project, starting from potential petroleum basin evaluation and selection, in-depth subsurface studies of targeted blocks, and above-ground investment risks. The Geosciences and Exploration Group of PTTEP is tasked with formulating the exploration strategy and strategic plan based on the exploration portfolio management, while allocating exploration budgets to high potential blocks for further exploration activities. This process is reviewed and revised annually to ensure that the exploration strategies reflect and remain in line with the outcomes of the overall exploration activities, and the agreement with the corporative targets.

¹ Since January 1, 2019, the Compliance Department has been renamed to the Governance, Compliance, and Internal Control Department, as part of the organizational restructuring of PTTEP to centralize all compliance works into the same function.

In addition, the Company also stipulates that exploration studies need to pass the evaluation by the petroleum potential assessment review team to ensure that processes and results of various exploration project studies have covered the key issues. The assessment must also remain in line with certain criteria and standards as well as PTTEP's practices to ensure investment confidence and that the results of the exploration are in accordance with PTTEP's goals.

3.4.2 Project Development Risks

Following oil price fluctuations, PTTEP has continued to adjust the Company's development plans as well as cost-cutting plans. Development projects are part of the preparation towards increasing reserves and production in the near future, such as those in the Mozambique Rovuma Offshore Area 1 Project, Algeria Hassi Bir Rekaiz Project, and the Cash-Maple Field in PTTEP Australasia Project. Meanwhile, for new projects with the potential of delays and cost overruns, the Company has implemented the following risk mitigation measures to ensure that they all remain on schedule.

(1) Project management: To safeguard against project delays and cost overruns, the Company focuses on related policy formulation, project management organization, project planning and engineering system designs, contract management, procurement, and construction monitoring.

(2) Personnel and process: To meet the targets set for safety, quality, budget, and timeline for project completion, the Company focuses on development of the team's skills which help us to better prepare for and protect ourselves when there is increased competition in employment market for those with extensive skills and experience in the field. Information and experience-sharing from previous projects are also encouraged as part of all our project team skills development, while the Company's Project Realization Process (PREP) continues to actively seek out new approaches to fine-tune the operations so that targets are realized.

(3) Commercial contracts: To ensure maximum efficiency in minimizing the risks associated with non-contractual compliance and disputes while working with our contractors, the Company focuses on contract drafting, definitions of terms and conditions and contract administration. These risks can, however, be controlled by negotiations based on comprehensive competency, knowledge, and concerted effort from various departments, such as those pertaining to construction, engineering, procurement, finance, accounting, and legal aspect. Prudent contract management also lessens the risks and helps mitigate possible damage which can potentially result from delays, potentially causing adverse effects on a given project and the Company's performance at large.

3.4.3 Production Risks

In every production process, PTTEP has to face various potential risks, starting from the production process at the bottom of the well until the point of sale. These risks involve, for instance, risk of well potential, production design flaws, damaged equipment, aging facilities, operation errors, and poor product quality, all of which can directly impact the corporate goals, production and sales targets.

Mitigation of production risks focuses on the areas of process planning and platform design, production control systems, and preventive maintenance. Operational Excellence Management System - Reliability & Asset Integrity, which is a part of the Operational Excellence Project, has been adopted and continuously improved to ensure the highest standards of

production in terms of integrity and safety. The Asset Reliability & Integrity Management System (ARIMS) has been designed specifically to minimize production losses due to worn-out equipment and also to improve equipment efficiency through preventive maintenance and inspection, with the goal of achieving zero unplanned shutdowns. Meanwhile, work procedures, operation manuals, and extensive training programs have been improved, developed and adopted to instill greater understanding and efficiency among the Company's operating personnel.

The Company has also set up the Operational Risk Committee (ORC) to analyze and assess the production risks in respect to technical issues, contracts, and operational support for projects to increase the overall efficiency and effectiveness.

3.4.4 Safety, Security, Health and Environmental Risks

PTTEP has continued to analyze Safety, Security, Health and Environment (SSHE) risks to reduce the likelihood and impact of unexpected events. The analysis comprises identification of internal and external factors. This helps to prevent major accidents as well as to reduce the risks that would affect PTTEP Group's employees and assets.

PTTEP has managed SSHE Risks through the Company's SSHE Management System to set the SSHE policies, standards, guidelines and procedures for employees and contractors, so that they understand the implementation process and its objectives. This is in addition to fostering SSHE awareness in the corporate culture by providing training relating to safety and risk management to improve knowledge and performance as well as to keep the risks to the level as low as reasonably practicable (ALARP).

PTTEP has monitored SSHE Risk Management through the Company's Risk Management Committee in many levels and with a variety of key risk indicators and trackers; for example, Total Recordable Injury Rate, audit findings, close-out status, natural disasters, security status, and health infection in high risk countries to ensure that all situations are being monitored to determine the suitable mitigation plans for improvement, corrections, and preventions towards achieving even higher social and business sustainability.

3.4.5 Digital Security Threat Risks

Cybercrime frequently occurs and spreads across multiple business sectors through various channels, such as software vulnerability attacks, ransomware, and malware which can potentially lead to business disruption. PTTEP recognizes the importance of safeguarding against digital security threats and includes the risk of digital security threats in the Company's Corporate Risk Profile to closely monitor the development as well as to implement necessary measures.

Measures include upgrading the IT systems and antiviruses to ensure that it is able to detect security threats, conducting penetration tests to find network weaknesses and those networks in need of improvement, raising IT security awareness and understanding among the Company's staff through IT security e-learning programs, establishing the Security Operation Center (SOC) to be responsible for IT network surveillance, conducting Cyber Security Response Drills, regularly performing data backup and reviewing disaster recovery plan, which the results are subsequently reported to the Risk Management Committee and the Board of Directors, respectively to ensure prompt response to disruptive and emergency situations.

3.5 Emerging Risks

3.5.1 Climate Change Risks

As an exploration and production company, PTTEP is well aware of risks from climate change and its possible impacts on our business operations in various aspects, namely (1) Physical: a cyclone, a flood, or a phenomenon caused by higher global temperatures, which can lead to serious damage to the Company's production platforms or make exploration areas / production sites inaccessible, (2) Regulatory: such as emission pricing, carbon tax, or more stringent enforcement of climate change legislation depending on the countries in which we operate, and (3) The trend towards more environmentally-friendly forms of energy usage. At the 2015 United Nations Climate Change Conference (COP21) held in Paris, France, in December 2015, heads of state and governments around the world signed an agreement with the aim of reducing greenhouse gas emissions and substituting typical fossil fuel for low carbon fuel. Thailand has also adopted a plan to reduce greenhouse gas emissions by 20 - 25% by 2030 (compared to the base year 2015).

PTTEP has established risk management framework on climate change focusing on improving work processes to maximize energy efficiency aiming for 5% reduction of energy intensity within 2020 and 25% reduction of greenhouse gas emissions within 2030 (compared to base year 2012). The Company has conducted reforestation activities to help increase the absorption of greenhouse gases as well as carbon offset through various mechanisms. Correspondingly, PTTEP has also engaged with Thailand Greenhouse Gas Management Organization (TGO) to develop a set of activities, measures, and policies to reduce greenhouse gases under the Thailand Voluntary Emission Reduction (T-VER) project.

PTTEP's strategy on the new business opportunities emphasizes the gas value chain businesses including the "Gas to Power" project and Liquefied Natural Gas (LNG), as well as renewable energy opportunities will also support the transition to low carbon society.

3.5.2 Risks arising from Disruptive Technology that Adversely Impacts Oil and Gas Industry

Technological advancement and renewable energy are playing an increasingly more crucial role in the energy industry. They come in all forms, such as more reliable and efficient energy storage, battery-powered cars (Electric Vehicle), as well as other renewables and EV businesses whose production costs have decreased exponentially over the years. Such disruptive technologies coupled with the government's policy regarding environmental issues with the intention of reducing greenhouse gas (GHG) emissions following the recent Paris Agreement on climate change as well as promotion of alternative energy usage, such as the Alternative Energy Development Plan (AEDP) 2015 - 2036 that aims to increase the proportion of alternative energy consumption in forms of electricity, heat, or biofuel to 30% of the final stage of energy consumption in 2036, can cause tremendous damage to the energy industry. Oil demand has consequently been affected to the degree in which some believe that days of the oil era can start to be numbered. For PTTEP Group, our revenues from crude oil and condensate make up approximately 30 - 40% of total revenue.

In this regard, for the year 2018, PTTEP modified business operations by establishing the Business and Organization Transformation Group and setting up a Business and Organization Transformation project under the name "ENTERPRISE" to help push the Company's transformation, which involves using digital technologies and innovation as well as

“Organizational Transformation” to remodel processes, allowing for more efficient and effective systems in order to become a lean organization with agile ways of working, resulting in reduced costs with lower uses of environmental resources. The “ENTERPRISE” project is expected to create value 4.8 times compared to investment by the year 2022.

In addition, PTTEP has explored new business opportunities in order to enhance operational flexibility and competitiveness for sustainable growth by placing a great emphasis on 3 principal areas: (1) diversifying into other businesses in the oil and gas value chain, e.g., “Gas to Power” project in Myanmar and Liquefied Natural Gas (LNG) (2) establishing a new subsidiary in order to support future investments, such as being a service provider for activities using robotics and AI, predictive maintenance, and (3) renewable energies. PTTEP targets the profit contribution from new businesses around 10% of PTTEP’s profit within 2030.

4. PTTEP and Our Subsidiaries' Assets

4.1 Property, Plant and Equipment

4.1.1 Oil and Gas Properties

PTTEP and our subsidiaries' properties are mainly jointly controlled oil and gas properties in each project. These properties comprise land, buildings, construction, machine and equipment, transportation pipeline, capitalized exploratory and production drilling costs, decommissioning costs, which are estimated by PTTEP Group's engineers and management's judgment, and acquisition costs of concession right, which shall incur when PTTEP and our subsidiaries acquire the concession right.

As at December 31, 2018, PTTEP and our subsidiaries' oil and gas properties are represented as share of the joint ventures' individual assets for each project as follows:

<u>PTTEP's joint ventures</u>	<u>Company's interest (%)</u>
Bongkot ¹	66.6667
Arthit	80
Contract 4 (B12/27)	45
Sinphuhorm (E5 North)	20
S1	25
Contract 3 (B10, B11, B12 and B13)	5
E5	20
Algeria Hassi Bir Rekaiz	24.5
<u>PTTEPI's joint ventures</u>	<u>Company's interest (%)</u>
Yadana	25.5
Yetagun	19.31784
PTTEP1	100
G4/43	21.375
G9/43	100
L22/43	100
L53/43 & L54/43	100
G4/48	5
Bongkot (G12/48) ¹	66.6667
Contract 4 (G7/50)	45
Arthit (G8/50)	80
Zawtika	80

¹ On January 31, 2018, the Company signed an Agreement for the Assignment and Transfer of the 22.2222% participating interests in the Bongkot Project, consisting of Blocks B15, B16, B17 and G12/48, as disclosed in Note 5 - Business Acquisition.

Myanmar M3	80
Myanmar M11	100
MTJDA	50
<u>PTTEPO's joint venture</u>	<u>Company's interest (%)</u>
B8/32 & 9A ²	25.001
<u>PTTEP SV's joint venture</u>	<u>Company's interest (%)</u>
Vietnam 52/97	7
<u>PTTEP KV's joint venture</u>	<u>Company's interest (%)</u>
Vietnam B & 48/95	8.5
<u>PTTEP HL's joint venture</u>	<u>Company's interest (%)</u>
Vietnam 16-1	28.5
<u>PTTEP HV's joint venture</u>	<u>Company's interest (%)</u>
Vietnam 9-2	25
<u>PTTEP AG's joint venture</u>	<u>Company's interest (%)</u>
Algeria 433a & 416b	35
<u>PTTEPS's joint venture</u>	<u>Company's interest (%)</u>
Sinphuhorm (EU-1)	20
B6/27	100
S1	75
<u>PTTEP SM's joint venture</u>	<u>Company's interest (%)</u>
Indonesia Semai II ³	-
<u>PTTEP SA's joint venture</u>	<u>Company's interest (%)</u>
Myanmar MD-7	50
Myanmar MOGE 3	75
<u>PTTEP ML's joint venture</u>	<u>Company's interest (%)</u>
Indonesia Malunda ⁴	-
<u>PTTEP CA's joint venture</u>	<u>Company's interest (%)</u>
Mariana Oil Sands	100

² PTTEP Offshore Investment Company Limited (PTTEPO) has shareholding in Orange Energy Limited and B8/32 Partners Limited, which hold the project's concession.

³ On May 9, 2018, PTTEP Semai II Limited (PTTEP SM) received the official approval from the Government of the Republic of Indonesia to terminate and return the exploration block of Indonesia Semai II Project.

⁴ On June 4, 2018, PTTEP Malunda Limited (PTTEP ML) received the official approval from the Government of the Republic of Indonesia to terminate and return the exploration block of Indonesia Malunda Project.

<u>PTTEP AP's joint venture</u>	<u>Company's interest (%)</u>
PTTEP Australasia	
• AC/L7, AC/L8 ⁵	-
• AC/RL7, AC/RL12 and AC/P54	100
• AC/L1, AC/L2 ⁶	-
• AC/L3	100
• AC/RL10	90
• AC/RL4 (Tenacious)	100
• AC/RL6 (Audacious), AC/RL6 (exclusive of Audacious)	100
• AC/RL4 (exclusive of Tenacious), AC/RL5	100
<u>Cove Group</u>	<u>Company's interest (%)</u>
Mozambique Rovuma Offshore Area 1	8.5
<u>Natuna 2's joint venture</u>	<u>Company's interest (%)</u>
Natuna Sea A	11.5
<u>PTTEP BL's joint venture</u>	<u>Company's interest (%)</u>
Barreirinhas AP 1	25
Brazil BM-ES-23	20
<u>PTTEP SP's joint venture</u>	<u>Company's interest (%)</u>
Contract 4 (B12/27)	15
Sinphuhorm (E5 North and EU-1)	35
<u>PTTEP G7's joint venture</u>	<u>Company's interest (%)</u>
Contract 4 (G7/50)	15
<u>PTTEP HKO's joint venture</u>	<u>Company's interest (%)</u>
Sarawak SK410B	42.5
Sarawak SK417 ⁷	80
Sarawak SK438 ⁷	80

⁵ On July 15, 2018, PTTEP Australasia (Ashmore Cartier) Pty Ltd (PTTEP AAA) signed the Agreement for the Sale of Montara Assets to divest a 100% stake in the Montara field (block AC/L7 and AC/L8), as disclosed in Note 6 - Montara Divestment.

⁶ On May 7, 2018, PTTEP Australasia (Ashmore Cartier) Pty Ltd (PTTEP AAA) received the official approval from the Government of Commonwealth of Australia to terminate and return the exploration blocks of AC/L1 and AC/L2.

⁷ On March 30, 2018, PTTEP HK Offshore Limited (PTTEP HKO), a subsidiary of the Group, had entered into the Production Sharing Contract to obtain the exploration and production rights of 2 offshore exploration blocks, Sarawak SK417 and Sarawak SK438 located in Malaysia. PTTEP HKO is the operator of the projects.

PTTEP MEP's joint venture
Company's interest (%)

Mexico Block 12 (2.4)⁸

20

Mexico Block 29 (2.4)⁸

16.67

As at December 31, 2018, details of properties' net book value are as follows:

Unit: Million USD

Details of properties	Historical cost	Accumulated depreciation	Allowance for impairment of assets	Net book value
Oil and Gas Properties	25,839.55	(17,990.69)	(329.88)	7,518.98
Exploration and Evaluation Assets	4,955.80	-	(1,643.45)	3,312.35
Goodwill	1,203.43	-	(112.39)	1,091.04
Pipeline and Others	1,200.57	(429.06)	(5.25)	766.26
Total	33,199.35	(18,419.75)	(2,090.97)	12,688.63

⁸ On January 31, 2018, PTTEP Mexico E&P Limited, S. de R.L. de C.V. (PTTEP MEP), a subsidiary of the Group, and its partners had been selected as the successful bidders of 2 exploration blocks located in the Gulf of Mexico, Mexico, which are block 12 in the Mexican Ridges located on the Western Gulf of Mexico and block 29 in the Campeche on the Southern Gulf of Mexico. PTTEP MEP and the consortium signed the concession agreement on May 7, 2018.

4.2 Investments

PTTEP has details of subsidiaries, associates, joint operations and joint ventures presented as follows:

Company name	Registered country	Type of business	Participating interest (%) (including indirect holding)	
			Dec 31, 2018	Dec 31, 2017
<u>Subsidiaries</u>				
1. PTTEP International Limited (PTTEPI)	Thailand	Petroleum	100	100
2. PTTEP Offshore Investment Company Limited (PTTEPO)	Cayman Islands	Petroleum	100	100
3. PTTEP Services Limited (PTTEP Services)	Thailand	Human resource support	100	100
4. PTTEP Siam Limited (PTTEPS)	Thailand	Petroleum	100	100
5. PTTEP HK Holding Limited (PTTEP HK)	Hong Kong	Petroleum	100	100
6. PTTEP Treasury Center Company Limited (PTTEP TC)	Thailand	Treasury center for the Group's business	100	100
7. PTTEP Energy Holding (Thailand) Company Limited (PTTEP EH) ¹	Thailand	Petroleum	100	-
8. PTTEP Business Center Company Limited (PTTEP BC)	Thailand	Petroleum	100	100
9. PTTEP Energy Development Company Limited (PTTEP ED) ²	Thailand	Petroleum	100	-
10. EP-Tech Ventures Holding Company Limited (EP-Tech) ³	Thailand	Petroleum-related Technology	100	-
11. AI and Robotics Ventures Company Limited (ARV) ⁴	Thailand	Technology	100	-
12. PTTEP Southwest Vietnam Company Limited (PTTEP SV)	Cayman Islands	Petroleum	100	100
13. PTTEP Kim Long Vietnam Company Limited (PTTEP KV)	Cayman Islands	Petroleum	100	100
14. PTTEP Hoang-Long Company Limited (PTTEP HL)	Cayman Islands	Petroleum	100	100
15. PTTEP Hoan-Vu Company Limited (PTTEP HV)	Cayman Islands	Petroleum	100	100
16. PTTEP Algeria Company Limited (PTTEP AG)	Cayman Islands	Petroleum	100	100
17. PTTEP Holding Company Limited (PTTEPH)	Cayman Islands	Petroleum	100	100

¹ On May 8, 2018, the Company established PTTEP Energy Holding (Thailand) Company Limited (PTTEP EH), as disclosed in Note 18.6 - Significant Transactions during the Year.

² On May 9, 2018, the Group established PTTEP Energy Development Company Limited (PTTEP ED), as disclosed in Note 18.6 – Significant Transactions during the Year.

³ On June 4, 2018, the Group established EP-Tech Ventures Holding Company Limited (EP-Tech), as disclosed in Note 18.6 – Significant Transactions during the Year.

⁴ On September 21, 2018, the Group established AI and Robotics Ventures Company Limited (ARV), as disclosed in Note 18.6 – Significant Transactions during the Year.

Company name	Registered country	Type of business	Participating interest (%) (including indirect holding)	
			Dec 31, 2018	Dec 31, 2017
<u>Subsidiaries</u> (continued)				
18. PTTEP Indonesia Company Limited (PTTEP ID)	Cayman Islands	Petroleum	100	100
19. PTTEP Africa Investment Limited (PTTEP AI)	Cayman Islands	Petroleum	100	100
20. PTTEP Rommana Company Limited (PTTEPR) ⁵	Cayman Islands	Petroleum	-	100
21. PTTEP Australia Pty Ltd (PTTEP AU)	Commonwealth of Australia	Petroleum	100	100
22. PTTEP Australia Offshore Pty Ltd (PTTEP AO)	Commonwealth of Australia	Petroleum	100	100
23. PTTEP South Asia Limited (PTTEP SA)	Cayman Islands	Petroleum	100	100
24. PTTEP Semai II Limited (PTTEP SM)	Cayman Islands	Petroleum	100	100
25. PTTEP Australia Perth Pty Ltd (PTTEP AP)	Commonwealth of Australia	Petroleum	100	100
26. PTTEP Australia Browse Basin Pty Ltd (PTTEP AB)	Commonwealth of Australia	Petroleum	100	100
27. PTTEP Australia Timor Sea Pty Ltd (PTTEP AT)	Commonwealth of Australia	Petroleum	100	100
28. PTTEP Australasia (Operations) Pty Ltd (PTTEP AAO)	Commonwealth of Australia	Petroleum	100	100
29. PTTEP Australasia (Ashmore Cartier) Pty Ltd (PTTEP AAA)	Commonwealth of Australia	Petroleum	100	100
30. PTTEP Australasia (Staff) Pty Ltd (PTTEP AAS)	Commonwealth of Australia	Petroleum	100	100
31. PTTEP International Holding Company Limited (PTTEP IH)	Cayman Islands	Petroleum	100	100
32. PTTEP Southwest Vietnam Pipeline Company Limited (PTTEP SVPC)	Cayman Islands	Gas pipeline transportation	100	100
33. PTTEP FLNG Holding Company Limited (PTTEP FH) ⁶	Hong Kong	Petroleum	100	100
34. PTTEP Netherland Holding Limited (PTTEP NL)	Cayman Islands	Petroleum	100	100
35. JV Marine Limited (JV Marine)	Cayman Islands	Petroleum	100	100
36. PTTEP South Mandar Limited (PTTEP SMD)	Cayman Islands	Petroleum	100	100
37. PTTEP South Sageri Limited (PTTEP SS)	Cayman Islands	Petroleum	100	100
38. PTTEP Sadang Limited (PTTEP SD)	Cayman Islands	Petroleum	100	100

⁵ On June 29, 2018, PTTEP Rommana Company Limited (PTTEPR) received the approval of dissolution of the company from the registrar, as disclosed in Note 18.6 – Significant Transactions during the Year.

⁶ On August 24, 2017, the Company approved for the registration for the dissolution of PTTEP FLNG Holding Company Limited (PTTEP FH). It is currently in the process of the dissolution.

Company name	Registered country	Type of business	Participating interest (%) (including indirect holding)	
			Dec 31, 2018	Dec 31, 2017
<u>Subsidiaries</u> (continued)				
39. PTTEP Malunda Limited (PTTEP ML)	Cayman Islands	Petroleum	100	100
40. PTTEP Netherlands Coöperatie U.A. (PTTEP NC)	Netherlands	Petroleum	100	100
41. PTTEP Canada Limited (PTTEP CA)	Canada	Petroleum	100	100
42. PTTEP Canada International Finance Limited (PTTEP CIF)	Canada	Investment funding for the Group's business	100	100
43. Cove Energy Limited (Cove)	United Kingdom of Great Britain and Northern Ireland	Petroleum	100	100
44. Cove Energy Mozambique Rovuma Onshore Limited (CEMROL) ⁷	Republic of Cyprus	Petroleum	100	100
45. Cove Energy East Africa Limited (CEEAL)	Republic of Cyprus	Petroleum	100	100
46. PTTEP Mozambique Area 1 Limited (PTTEP MZA1)	Republic of Cyprus	Petroleum	100	100
47. Cove Energy Kenya Limited (CEKL) ⁸	Republic of Kenya	Petroleum	100	100
48. PTTEP Netherlands Holding Coöperatie U.A. (PTTEP NH)	Netherlands	Petroleum	100	100
49. PTTEP Brazil Investment B.V. (PTTEP BI)	Netherlands	Petroleum	100	100
50. PTTEP Brazil Investments in Oil and Gas Exploration and Production Limitada (PTTEP BL)	Federative Republic of Brazil	Petroleum	100	100
51. Sinphuhorm Holdings Limited (SHL)	Cayman Islands	Petroleum	100	100
52. PTTEP SP Limited (PTTEP SP)	United Kingdom of Great Britain and Northern Ireland	Petroleum	100	100
53. PTTEP G7 Limited (PTTEP G7)	Thailand	Petroleum	100	100
54. PTTEP HK Offshore Limited (PTTEP HKO)	Hong Kong	Petroleum	100	100
55. PTTEP MENA Limited (PTTEP MENA) ⁹	Hong Kong	Petroleum	100	-
56. PTTEP Mexico E&P Limited, S.de R.L. de C.V. (PTTEP MEP)	Mexico	Petroleum	100	100

⁷ On May 22, 2017, the Company approved for the registration for the dissolution of Cove Energy Mozambique Rovuma Onshore Limited (CEMROL). It is currently in the process of the dissolution.

⁸ On May 22, 2017, the Company approved for the registration for the dissolution of Cove Energy Kenya Limited (CEKL). It is currently in the process of the dissolution.

⁹ On September 19, 2018, the Group established and registered as a shareholder of PTTEP MENA Limited (PTTEP MENA), as disclosed in Note 18.6 – Significant Transactions during the Year.

Company name	Registered country	Type of business	Participating interest (%) (including indirect holding)	
			Dec 31, 2018	Dec 31, 2017
<u>Associates</u> ¹⁰				
1. Energy Complex Company Limited (Energy Complex)	Thailand	Property rental services	50	50
2. PTT Digital Solutions Company Limited (PTT Digital)	Thailand	Information technology and communication services	20	20
3. PTTEP AP Group’s Associates ¹¹	Commonwealth of Australia	Air base services	50	50
4. PTT Global LNG Company Limited (PTTGL)	Thailand	Petroleum	50	50
5. Leismer Aerodrome Limited (LAL)	Canada	Air transportation	32	-
<u>Joint Ventures</u> ¹²				
Erawan 2 FSO Bahamas Limited (Erawan 2) ¹³	Bahamas	FSO rental services	13.11	13.11
<u>Joint Operations</u>				
1. Carigali – PTTEPI Operating Company Sdn Bhd. (CPOC)	Malaysia	Petroleum	50	50
2. Moattama Gas Transportation Company (MGTC)	Bermuda	Gas pipeline transportation	25.5	25.5
3. Taninthayi Pipeline Company LLC (TPC)	Cayman Islands	Gas pipeline transportation	19.3178	19.3178
4. Orange Energy Limited (Orange)	Thailand	Petroleum	53.9496	53.9496
5. B8/32 Partners Limited (B8/32 Partners)	Thailand	Petroleum	25.0009	25.0009
6. Hoang-Long Joint Operating Company	Socialist Republic of Vietnam	Petroleum	28.5	28.5
7. Hoan-Vu Joint Operating Company	Socialist Republic of Vietnam	Petroleum	25	25
8. Leismer Aerodrome Limited (LAL) ¹⁴	Canada	Air transportation	-	32

¹⁰ All investments in associates have been assessed as immaterial to the Group.

¹¹ PTTEP AP's group associates are Mungalalu Truscott Airbase Pty Ltd and Troughton Island Pty Ltd.

¹² All investments in joint ventures have been assessed as immaterial to the Group

¹³ Erawan 2 has a 100% shareholding in Asia Pacific Marine Services (EF) B.V.

¹⁴ During 2018, the Group revisited the classification of the investment according to current situations. As a result, the investment is classified as investment in associate, accounted for using the equity method.

Company name	Registered country	Type of business	Participating interest (%) (including indirect holding)	
			Dec 31, 2018	Dec 31, 2017
<u>Joint Operations</u> (continued)				
9. Groupement Bir Seba (GBRS)	People's Democratic Republic of Algeria	Petroleum	35	35
10. Andaman Transportation Limited (ATL)	Cayman Islands	Gas pipeline transportation	80	80
11. Natuna 2 B.V. (Natuna 2)	Netherlands	Petroleum	50	50
12. Mozambique LNG1 Company Pte. Ltd. (MZ LNG1) ¹⁵	Singapore	Petroleum	-	8.5

4.3 Net Book Value

As at December 31, 2018, PTTEP's net book value amounted to 12,020 MMUSD (equivalent to 390,063 MMTHB) or USD 3.03 per share (equivalent to THB 98.25 per share).

¹⁵ During 2018, the Group revisited the classification of the investment according to current situations. As a result, the investment is classified as other long-term investment, accounted for using the cost method.

5. Legal Dispute

As of December 31, 2018, the outstanding legal dispute which PTTEP or one of the Company's subsidiaries is a party involved as well as which can significantly affect our operation or the subsidiary's, excluding dispute from the normal operation and circumstance, is as follows:

5.1 PTTEP Australasia (Ashmore Cartier) Pty Ltd ("PTTEP AAA") was sued for damages at the Federal Court of Australia by a group of Indonesian seaweed farmers.

On August 3, 2016, a group of Indonesian seaweed farmers filed a lawsuit against PTTEP AAA at the Federal Court of Australia, claiming for the damages caused by 2009 Montara incident in Australia. The lawsuit was filed after the lapsing of the period of prescription for claims. However, the Federal Court of Australia has granted an extension of the limitation period due to certain legal exceptions on November 15, 2017. As of December 31, 2018, the case was still under the court proceeding. This lawsuit did not state the amount of claim.

Regarding the lawsuit filed by the Ministry of Environment and Forestry of Indonesia against PTTEP and PTTEP AAA at the Central Jakarta District Court of Indonesia on May 3, 2017, the court has dismissed the case as per the plaintiff's request to revoke the lawsuit.

PTTEP and PTTEP AAA continue to maintain the position, based on independent scientific researches overseen by the Australian Government, that no oil from Montara reached the shores of Australia or Indonesia, that there is no lasting impact on the ecosystems and biodiversity in Australian waters in the areas immediate to Indonesian waters, and that there is no long-term damage to the environment in the Timor Sea.

6. General Information and Other Significant Information**6.1 Information of PTTEP**

Company Name	PTT Exploration and Production Public Company Limited or PTTEP
Headquarters Address	555/1 Energy Complex Building A, 6 th and 19 th - 36 th floor, Vibhavadi Rangsit Road, Chatuchak, Bangkok 10900, Thailand
Type of Business	Exploration and production of petroleum and investments in related businesses
Registration Number	0107535000206
Telephone	+66-2537-4000
Facsimile	+66-2537-4444
Website	www.pttep.com
E-mail	Independent Directors: independentdirector@pttep.com Investor Relations: ir@pttep.com Corporate Secretary: corporatesecretary@pttep.com
Registered Capital	3,969,985,400 ordinary shares with THB 1 per share (THB 3,969,985,400)
Paid-Up Capital	3,969,985,400 ordinary shares with THB 1 per share (THB 3,969,985,400) as of December 31, 2018

6.2 Subsidiaries' Information¹

As of December 31, 2018, there were 63 subsidiaries as follows:

- Subsidiaries with the same contact address, telephone and facsimile numbers as PTTEP as in 6.1. Details of the directors designated by the PTTEP Group for each subsidiary are disclosed in Attachment 2.

No.	Company Name	Abbreviation	Number of Shares Sold		Shareholders	
E&P and Related Businesses						
1.	PTTEP International Limited	PTTEPI	2,000,000,000	Ordinary Share	PTTEP	100%
2.	PTTEP Siam Limited	PTTEPS	1,000,000	Ordinary Share	PTTEP PTTEPO	51% 49%
3.	Orange Energy Limited	Orange	1,000,000	Ordinary Share	PTTEPO MOECO B.V. KrisEnergy	53.95% 36.05% 10%
4.	PTTEP G7 Limited	PTTEP G7	7,238,741	Ordinary Share	PTTEPI	100%
5.	PTTEP Energy Holding (Thailand) Company Limited	PTTEP EH	53,282,230	Ordinary Share	PTTEP	100%
6.	PTTEP Energy Development Company Limited	PTTEP ED	805,000	Ordinary Share	PTTEP EH	100%
7.	EP-Tech Ventures Holding Company Limited	EP-Tech	310,000	Ordinary Share	PTTEP EH	100%
8.	JV Marine Limited	JV Marine	50,000	Ordinary Share	PTTEP IH	100%
9.	PTTEP Algeria Company Limited	PTTEP AG	50,000	Ordinary Share	PTTEPO	100%
10.	PTTEP Africa Investment Limited	PTTEP AI	50,000	Ordinary Share	PTTEPH	100%
11.	PTTEP Holding Company Limited	PTTEPH	50,000	Ordinary Share	PTTEPO	100%
12.	PTTEP Hoang-Long Company Limited	PTTEP HL	50,000	Ordinary Share	PTTEPO	100%
13.	PTTEP Hoan-Vu Company Limited	PTTEP HV	50,000	Ordinary Share	PTTEPO	100%
14.	PTTEP Indonesia Company Limited	PTTEP ID	50,000	Ordinary Share	PTTEPH	100%
15.	PTTEP International Holding Company Limited	PTTEP IH	50,000	Ordinary Share	PTTEPH	100%
16.	PTTEP Kim Long Vietnam Company Limited	PTTEP KV	50,000	Ordinary Share	PTTEPO	100%
17.	PTTEP Malunda Limited	PTTEP ML	50,000	Ordinary Share	PTTEP ID	100%

¹ Notification of the Securities and Exchange Commission No. Kor Chor. 17/2551, Re: Determination of Definitions in Notifications relating to Issuance and Offer for Sale of Securities

No.	Company Name	Abbreviation	Number of Shares Sold		Shareholders	
18.	PTTEP South Asia Limited	PTTEP SA	50,000	Ordinary Share	PTTEPH	100%
19.	PTTEP Netherland Holding Limited	PTTEP NL	50,000	Ordinary Share	PTTEP IH	100%
20.	PTTEP Offshore Investment Company Limited	PTTEPO	6,667	Ordinary Share	PTTEP PTTEPI	75% 25%
21.	PTTEP Sadang Limited	PTTEP SD	50,000	Ordinary Share	PTTEP ID	100%
22.	PTTEP Semai II Limited	PTTEP SM	50,000	Ordinary Share	PTTEP ID	100%
23.	PTTEP South Mandar Limited	PTTEP SMD	50,000	Ordinary Share	PTTEP ID	100%
24.	PTTEP South Sageri Limited	PTTEP SS	50,000	Ordinary Share	PTTEP ID	100%
25.	PTTEP Southwest Vietnam Company Limited	PTTEP SV	50,000	Ordinary Share	PTTEPO	100%
26.	Sinphuhorm Holdings Limited	SHL	100	Ordinary Share	PTTEPO	100%
27.	PTTEP Australia Pty Ltd	PTTEP AU	50,000	Ordinary Share	PTTEPH	100%
28.	PTTEP Australia Offshore Pty Ltd	PTTEP AO	50,000	Ordinary Share	PTTEP AU	100%
29.	PTTEP Australia Perth Pty Ltd	PTTEP AP	50,000	Ordinary Share	PTTEPH	100%
30.	PTTEP Australia Browse Basin Pty Ltd	PTTEP AB	50,000	Ordinary Share	PTTEP AP	100%
31.	PTTEP Australasia (Staff) Pty Ltd	PTTEP AAS	10	Ordinary Share	PTTEP AB	100%
32.	PTTEP Australasia (Ashmore Cartier) Pty Ltd	PTTEP AAA	1,700,000	Ordinary Share	PTTEP AB	100%
33.	PTTEP Australasia (Operations) Pty Ltd	PTTEP AAO	106,686,517	Ordinary Share	PTTEP AB	100%
34.	PTTEP Australia Timor Sea Pty Ltd	PTTEP AT	50	Ordinary Share	PTTEP AB	100%
35.	PTTEP Netherlands Coöperatie U.A.	PTTEP NC	-	-	PTTEP IH PTTEP NL	0.00005% 99.99995%
36.	PTTEP Netherlands Holding Coöperatie U.A.	PTTEP NH	-	-	PTTEP HK PTTEPI	75% 25%
37.	PTTEP Brazil Investment B.V.	PTTEP BI	50,000	Ordinary Share	PTTEP NH	100%
38.	PTTEP Canada Limited	PTTEP CA	2,968,254,040	Ordinary Share	PTTEP NC	100%
39.	PTTEP FLNG Holding Company Limited	PTTEP FH	10,000	Ordinary Share	PTTEP IH	100%
40.	PTTEP HK Holding Limited	PTTEP HK	10,000	Ordinary Share	PTTEP PTTEPI	25% 75%

No.	Company Name	Abbreviation	Number of Shares Sold		Shareholders	
41.	Cove Energy Limited	COVE	63,840,000	Ordinary Share	PTTEP AI	100%
42.	Cove Energy East Africa Limited	CEEAL	1,000	Ordinary Share	COVE	100%
43.	Cove Energy Mozambique Rovuma Onshore Limited	CEMROL	1,000	Ordinary Share	CEEAL	100%
44.	PTTEP Mozambique Area 1 Limited	PTTEP MZA1	1,000	Ordinary Share	CEEAL	100%
45.	Cove Energy Kenya Limited	CEKL	1,000	Ordinary Share	CEEAL COVE	99.9% 0.1%
46.	PTTEP Brasil Investimentos Em Exploração e Produção de Petróleo e Gás Ltda.	PTTEP BL	790,293,700	Ordinary Share	PTTEP BI PTTEP NH	99.9999999% 0.0000001%
47.	PTTEP SP Limited	PTTEP SP	2	Ordinary Share	SHL	100%
			61,279,585	Ordinary Share		
48.	PTTEP HK Offshore Limited	PTTEP HKO	10,000	Ordinary Share	PTTEP HK	100%
49.	PTTEP Mexico E&P Limited, S. de R.L. de C.V.	PTTEP MEP	3,000	Ordinary Share	PTTEP HK PTTEP HKO	99% 1%
50.	PTTEP MENA Limited	PTTEP MENA	500	Ordinary Share	PTTEP BC	100%
Service Business						
51.	PTTEP Services Limited (Personnel services support)	PTTEP Services	1,000,000	Ordinary Share	PTTEP PTTEPI	25% 75%
52.	Andaman Transportation Limited (Investments in gas pipeline projects in Myanmar)	ATL	62,500	Ordinary Share	PTTEPO MOGE	80% 20%
53.	PTTEP Southwest Vietnam Pipeline Company Limited (Investments in gas pipeline projects in Vietnam)	PTTEP SVPC	50,000	Ordinary Share	PTTEPH	100%
54.	PTTEP Canada International Finance Limited (Raise fund for PTTEP business)	PTTEP CIF	50,000	Ordinary Share	PTTEP NC	100%
55.	PTTEP Treasury Center Company Limited (Treasury center for PTTEP and subsidiaries)	PTTEP TC	10,000,000	Ordinary Share	PTTEP PTTEPI	25% 75%
56.	PTTEP Business Center Company Limited (Business center for PTTEP and subsidiaries)	PTTEP BC	521,572,300	Ordinary Share	PTTEP EH	100%

No.	Company Name	Abbreviation	Number of Shares Sold		Shareholders	
Other Business						
57.	AI and Robotics Ventures Company Limited	ARV	300,000	Ordinary Share	EP-Tech	100%

- Subsidiaries with different contact address, telephone and facsimile numbers from PTTEP².

No.	Company Name	Type of Business	Abbreviation	Number of Shares Sold		Shareholders
58.	Carigali-PTTEPI Operating Company SDN BHD	Petroleum Exploration and Production	CPOC	350,000	Ordinary Share	<ul style="list-style-type: none"> PTTEPI 50% PC JDA 50%
	Head Office: Level 8, Tower 2, PETRONAS Twin Towers Kuala Lumpur City Center, 50088 Kuala Lumpur, Malaysia					
	Telephone: +603-2782-2555					
	Facsimile: +603-2713-9877					
59.	PTT Global LNG Company Limited	Investment in LNG Business	PTTGL	10,421,446,000	Ordinary Share	<ul style="list-style-type: none"> PTT 50% PTTEP BC 50%
	Head Office: 555/1 Energy Complex Building A, 6 th Floor, Vibhavadi Rangsit Road, Chatuchak, Chatuchak, Bangkok 10900, Thailand					
	Telephone: +66-2140-4599					
	Facsimile: +66-2140-4559					
60.	Energy Complex Company Limited	Property Leasing	EnCo	180,000,000	Ordinary Share	<ul style="list-style-type: none"> PTTEP 50% PTT 50%
	Head Office: 555/1 Energy Complex Building A, Vibhavadi Rangsit Road, Chatuchak, Chatuchak, Bangkok 10900, Thailand					
	Telephone: +66-2140-1000					
	Facsimile: +66-2140-1122					

² Details of directors designated by the PTTEP Group of each subsidiary are disclosed in Attachment 2.

No.	Company Name	Type of Business	Abbreviation	Number of Shares Sold		Shareholders
61.	Mungalalu Truscott Airbase Pty Ltd	Air Base Operations	-	600	Ordinary Share	<ul style="list-style-type: none"> ● PTTEP AAO 50% ● Mr. Arthur Hamilton 41.667% ● Mr. Alex Wood 8.333%
	Head Office: Unit 8, 9 Swan Crescent, Winnellie, Northern Territory, 0820, Australia					
	Telephone: +61-8-8981-6981					
	Facsimile: +61-8-8918-8017					
62.	Troughton Island Pty Ltd	Air Base Operations (Secondary)	-	100	Ordinary Share	<ul style="list-style-type: none"> ● PTTEP AAO 50% ● Mr. Arthur Hamilton 44% ● Mr. Alex Wood 6%
	Head Office: Unit 8, 9 Swan Crescent, Winnellie, Northern Territory, 0820, Australia					
	Telephone: +61-8-8981-6981					
	Facsimile: +61-8-8918-8017					
63.	Natuna 2 B.V.	Petroleum Exploration and Production	Natuna	90,000	Ordinary Share	<ul style="list-style-type: none"> ● PTTEP NH 50% ● PHE OG 50%
	Head Office: Atrium Building, 8 th Floor, Strawinskylaan 3127, 1077 ZX, Amsterdam, The Netherlands					
	Telephone: -					
	Facsimile: -					

Remarks: Names of other shareholders in the subsidiaries

Abbreviation	Name
PTT	PTT Public Company Limited
PC JDA	PC JDA Ltd.
PHE OG	Pertamina Hulu Energi Oil and Gas Company
KrisEnergy	KrisEnergy (Gulf of Thailand) Ltd.
MOGE	Myanmar Oil and Gas Enterprise
MOECO B.V.	MOECO International B.V.

6.3 Associated Companies' Information³

As of December 31, 2018, PTTEP had 13 associated companies. Details of the directors designated by the PTTEP Group for each associated company are disclosed in Attachment 2.

No.	Company Name	Type of Business	Abbreviation	Number of Shares Sold		Shareholders
1.	PTT Digital Solutions Company Limited	Information Technology and Communication Services	PTT Digital	15,000,000	Ordinary Share	<ul style="list-style-type: none"> ● PTTEP 20% ● PTT 20% ● GC 40% ● ThaiOil 20%
	Head Office: 555/1 Energy Complex Building A, 4 th -5 th Floor, Vibhavadi Rangsit Road, Chatuchak, Chatuchak, Bangkok 10900, Thailand					
	Telephone: +66-2537-3456					
	Facsimile: +66-2537-2935					
2.	Moattama Gas Transportation Company	Gas Pipeline in Myanmar	MGTC	1,000,000	Ordinary Share	<ul style="list-style-type: none"> ● PTTEPO 25.5% ● Unocal Myanmar 28.2625% ● Total E&P Myanmar 31.2375% ● MOGE 15%
	Head Office: No. 5 Sacred Tooth Relic Lake Avenue, Punn Pin Gone Quarter No. 5, Mayangon Township, Yangon, Myanmar					
	Telephone: +95-1-650-977, 660-466					
	Facsimile: +95-1-650-478, 650-479					
3.	Taninthayi Pipeline Company LLC	Gas Pipeline in Myanmar	TPC	100,000	Ordinary Share	<ul style="list-style-type: none"> ● PTTEPO 19.31784% ● PCM III 30.00140% ● PCML 10.90878% ● MOGE 20.45414% ● Nippon 19.31784%
	Head Office: 16 Shwe Taung Kyar Bahan, Yangon, Myanmar					
	Telephone: +95-1-526-411-4					
	Facsimile: +95-1-525-698					
4.	B8/32 Partners Limited	Petroleum Exploration and Production	B 8/32 Partners	110,000	Ordinary Share	<ul style="list-style-type: none"> ● PTTEPO 25% ● MOECO B.V. 16.71% ● KrisEnergy 4.63% ● Chevron Global 46.34% ● Chevron 7.32%
	Head Office: 19 Siam Commercial Bank Park Plaza, East 3 rd Building, 5 th Floor, Ratchadaphisek Road, Chatuchak, Bangkok 10900, Thailand					
	Telephone: +66-2545-5555					
	Facsimile: -					

³ Notification of the Securities and Exchange Commission No. Kor Chor. 17/2551, Re: Determination of Definitions in Notifications relating to Issuance and Offer for Sale of Securities

No.	Company Name	Type of Business	Abbreviation	Number of Shares Sold		Shareholders
5.	Hoang Long Joint Operating Company	Petroleum Exploration and Production	HL JOC	- ⁴	-	<ul style="list-style-type: none"> ● PTTEP HL 28.5% ● PVEP 41% ● SOCO 28.50% ● OPECO 2.0%
	Head Office: Suite 2001, Me Linh Point Tower, 2 Ngo Duc Ke Street, District 1, Ho Chi Mihn City, S.R. Vietnam					
	Telephone: +84-8-3829-9359					
	Facsimile: +84-8-3822-6106					
6.	Hoan-Vu Joint Operating Company	Petroleum Exploration and Production	HV JOC	- ⁵	-	<ul style="list-style-type: none"> ● PTTEP HV 25% ● SOCO 25% ● PVEP 50%
	Head Office: Suite 2006, Me Linh Point Tower, 2 Ngo Duc Ke Street, District 1, Ho Chi Mihn City, S.R. Vietnam					
	Telephone: +84-8-3823-9525					
	Facsimile: +84-8-3823-9526					
7.	Groupement Bir Seba	Petroleum Exploration and Production	GBRS	- ⁶	-	<ul style="list-style-type: none"> ● PTTEP AG 35% ● PVEP 40% ● Sonatrach 25%
	Head Office: Zone d'activité Route Nationale N°3 BP 256 EURO JAPAN Hassi Messaoud, Ouargla, Algeria					
	Telephone: +213-29-79-71-66					
	Facsimile: +213-29-79-09-15					
8.	Erawan 2 FSO Bahamas Ltd.	Lease of FSO (vessel)	Erawan 2 FSO Bahamas	100	Ordinary Share	<ul style="list-style-type: none"> ● JV Marine 13.11% ● Chevron Global 65.91% ● MOECO 20.98%
	Head Office: Ocean Center, Montagu Foreshore, East Bay Street, Nassau, New Providence, Bahamas P.O. Box SS-19084					
	Telephone: -					
	Facsimile: -					

⁴ No share was issued. Percentage of shareholding is subject to participation interest in the concession.

⁵ No share was issued. Percentage of shareholding is subject to participation interest in the concession.

⁶ No share was issued. Percentage of shareholding is subject to participation interest in the concession.

No.	Company Name	Type of Business	Abbreviation	Number of Shares Sold		Shareholders
9.	Leismer Aerodrome Limited	Air Base Operations	LAL	200	-	<ul style="list-style-type: none"> ● PTTEP CA 32% ● AOC Leismer Corner Partnership 48% ● FCCL 20%
	Head Office: 1200, 215 – 9 th Avenue SW					
	Calgary, AB T2P 1K3, Canada					
	Telephone: +1-403-237-8227					
10.	Facsimile: +1-403-264-4640	Petroleum Exploration and Production	MZ LNG 1	250,000	Ordinary Share	<ul style="list-style-type: none"> ● PTTEP MZA1 8.5% ● ANADARKO 26.5% ● MITSUI 20% ● BPRL 10% ● BREML 10% ● ONGC Videsh 10% ● ENH 15%
	Mozambique LNG 1 Company Pte. Ltd.					
	Head Office: 50 Raffles Place #60-00 Singapore					
	Land Tower Singapore 048623					
11.	Telephone: -	Social Enterprise	SPSE	1,000,000	Ordinary Share	<ul style="list-style-type: none"> ● PTTEP 15% ● PTT 20% ● GC 15% ● ThaiOil 15% ● IRPC 15% ● GPSC 10% ● PTTOR 10%
	Facsimile: -					
	Sarn Palung Social Enterprise Company Limited					
	Head Office: 555/1 Energy Complex					
12.	Building A, 10 th Floor, Vibhavadi Rangsit Road,	Lease of FSO (vessel)	Asia Pacific Marine Services	18,000	Ordinary Share	<ul style="list-style-type: none"> ● Erawan 2 FSO 100%
	Chatuchak, Chatuchak, Bangkok 10900, Thailand					
	Telephone: +66-2537-2971					
	Facsimile: -					
	Asia Pacific Marine Services (EF) B.V.					
	Head Office: Naritaweg 165, Telestone 8,					
	1043 BW Amsterdam, The Netherlands					
	Telephone: -					
	Facsimile: -					

No.	Company Name	Type of Business	Abbreviation	Number of Shares Sold		Shareholders
13.	PTTGL Investment Limited	Investment in LNG Business	PTTGLI	309,825,000	Ordinary Share	● PTTGL 100%
	Head Office: 1401 Hutchison House 10					
	Harcourt Road, Hong Kong					
	Telephone: -					
	Facsimile: -					

Remarks: Names of other shareholders in the associated companies

Abbreviation	Name
PTT	PTT Public Company Limited
GC	PTT Global Chemical Public Company Limited
ThaiOil	Thai Oil Public Company Limited
Chevron	Chevron Block B8/32 (Thailand) Ltd.
ANADARKO	Anadarko Mozambique Area 1 Limited
BPRL	BPRL Venture Mozambique B.V.
BREML	BEAS Rovuma Energy Mozambique Limited
Chevron Global	Chevron Global Energy Inc.
Erawan 2 FSO	Erawan 2 FSO Bahamas Ltd.
ENH	Empresa Nacional De Hidrocarbonetos
FCCL	FCCL Partnership
GPSC	Global Power Synergy Public Company Limited
KrisEnergy	KrisEnergy (Gulf of Thailand) Ltd.
mitsui	Mitsui E&P Mozambique Area 1 Ltd.
MOGE	Myanmar Oil and Gas Enterprise
MOECO B.V.	MOECO International B.V.
MOECO	Mitsui Oil Exploration Co., Ltd.
Nippon	Nippon Oil Exploration (Myanmar) Ltd.

Abbreviation	Name
ONGC Videsh	ONGC Videsh Ltd.
OPECO	OPECO Vietnam Ltd.
PCML	Petronas Carigali Myanmar (Hong Kong) Ltd.
PCM III	Petronas Carigali Myanmar III Inc.
PTTOR	PTT Oil and Retail Business Public Company Limited
PTTGL	PTT Global LNG Company Limited
PVEP	PetroVietnam Exploration Production Corporation
SOCO	SOCO Vietnam Ltd.
Sonatrach	Société Nationale pour la Recherche, la Production, le Transport, la Transformation et la Commercialisation des Hydrocarbures
AOC Leismer Corner Partnership	Athabasca Oil Corporation
Total E&P Myanmar	Total E&P Myanmar SAS
Unocal Myanmar	Unocal Myanmar Offshore Co., Ltd.

6.4 References

1) Share Registrar

- 1.1) **Name** Thailand Securities Depository Company Limited
 Address 93, 14th Floor, Ratchadaphisek Road, Dindaeng, Bangkok 10400, Thailand
 Telephone SET Contact Center: +66-2009-9999
 Website <http://www.set.or.th/tsd>

2) Registrar and Paying Agent

- 2.1) Registrar and paying agent for THB 5,000 million debentures issued in May 2009, and THB 5,000 million subordinated capital debentures issued in June 2012

Name TMB Bank Public Company Limited
Address Floor 5A, 3000 Phahon Yothin Road, Chatuchak, Bangkok 10900, Thailand
Telephone +66-2299-1824, +66-2299-1825
Facsimile +66-2242-3270

- 2.2) Registrar and paying agent for THB 11,400 million debentures issued in June 2014, and THB 8,200 million debentures issued in June 2014

Name Siam Commercial Bank Public Company Limited
Address 17th Floor, North Wing, G Tower Grand Rama 9,
 9 Rama 9 Road, Huai Khwang, Huai Khwang, Bangkok 10310, Thailand
Telephone +66-2128-2316
Facsimile +66-2128-4621, +66-2128-4622

3) Debenture Holders' Representative

- 3.1) Debenture holders' representative for THB 5,000 million debentures issued in May 2009, and THB 5,000 million subordinated perpetual capital debentures issued in June 2012

Name Siam Commercial Bank Public Company Limited
Address 17th Floor, North Wing, G Tower Grand Rama 9,
 9 Rama 9 Road, Huai Khwang, Huai Khwang, Bangkok 10310, Thailand
Telephone +66-2128-2316
Facsimile +66-2128-4621, +66-2128-4622

4) Trustee

- 4.1) Trustee for outstanding USD 700 million debentures issued in April 2011, outstanding USD 145 million subordinated perpetual capital debentures issued in June 2014, and outstanding USD 855 million subordinated perpetual capital debentures issued in July 2017

Name BNY Mellon Corporate Trust
Address #04-01 Millenia Tower, 1 Temasek Avenue, Singapore 039192
Telephone +65-6632-0473, +65-6432-0351, +65-6654-1037
Facsimile +65-6883-0338

- 4.2) Trustee for outstanding USD 490 million debentures issued in June 2012

Name Citicorp International Limited
Address 39th Floor, Champion Tower, Three Garden Road, Central, Hong Kong
Telephone +852-2868-7964
Facsimile +852-2323-0279

5) Registrar and Paying Agent

- 5.1) Registrar and paying agent for short-term bills of exchange with a total revolving credit of up to THB 50,000 million

Name TMB Bank Public Company Limited
Address Floor 5A, 3000 Phahon Yothin Road, Chom Phon,
Chatuchak, Bangkok 10900, Thailand
Telephone +66-2299-1824, +66-2299-1825
Facsimile +66-2242-3270

6) Process Agent for Common Shares

- 6.1) Name CT Corporation System
Address 13th Floor, 111 Eighth Avenue, New York County (Manhattan),
New York, New York, 10011
Telephone +1-212-894-8800, +1-212-894-8940
Facsimile -

7) Cross Currency Swap Counterparties

- 7.1) Name Deutsche Bank AG, Bangkok Branch
Division Corporate Treasury Sales
Address 63 Athenee Tower, 27th - 29th Floor, Wireless Road, Lumpini,
Pathumwan, Bangkok 10330, Thailand
Telephone +66-2646-5139
Facsimile +66-2651-5892

7.2) **Name** Siam Commercial Bank Public Company Limited
 Division Financial Market Division
 Address 12th Floor, Zone B, 9 Ratchadaphisek Road,
 Chatuchak, Bangkok 10900, Thailand
 Telephone +66-2544-5741-9
 Facsimile +66-2937-7968

8) **FX Contracts Counterparties**

8.1) **Name** Kasikornbank Public Company Limited
 Division Capital Markets Business Division
 Address 400/22 Phahon Yothin Avenue, Samsen-Nai, Phayathai,
 Bangkok 10400, Thailand
 Telephone +66-2470-3006
 Facsimile +66-2271-4486

8.2) **Name** Krung Thai Bank Public Company Limited
 Division Corporate Sales, Global Markets Group
 Address Building 1 (Nana Nua), 8th Floor, 35 Sukhumvit Road,
 Klongtoey Nua, Wattana, Bangkok 10110, Thailand
 Telephone +66-2208-4644
 Facsimile +66-2256-8398

8.3) **Name** Siam Commercial Bank Public Company Limited
 Division Financial Market Division
 Address 12th Floor, Zone B, 9 Ratchadaphisek Road,
 Chatuchak, Bangkok 10900, Thailand
 Telephone +66-2544-5741-9
 Facsimile +66-2937-7969

8.4) **Name** Bank of America, National Association, Bangkok Branch
 Division Fixed Income Currencies and Commodities (FICC) Sales
 Address 87/2 All Seasons Place, CRC Tower, 20th Floor,
 Wireless Road, Lumpini, Pathumwan, Bangkok 10330, Thailand
 Telephone +66-2305-2988, +66-2305-2986
 Facsimile +66-2685-3224

- | | | |
|-------|------------------|--|
| 8.5) | Name | Citibank, N.A. |
| | Division | Corporate Sales & Structuring Thailand |
| | Address | Interchange 21 Building, 399 Sukhumvit Road,
Klongtoey Nua, Wattana, Bangkok 10110, Thailand |
| | Telephone | +66-2788-2785 |
| | Facsimile | +66-2788-4825-8 |
| 8.6) | Name | CIMB Thai Bank Public Company Limited |
| | Division | Global Sales, Treasury Sales Division |
| | Address | 44 Langsuan Road, Lumpini, Pathumwan, Bangkok 10330, Thailand |
| | Telephone | +66-2670-4623, +66-2670-4658 |
| | Facsimile | +66-2657-3282-3 |
| 8.7) | Name | Bank of Ayudhya Public Company Limited |
| | Division | Sales & Trading Division Global Markets Group |
| | Address | 550 Phloen Chit Road, Lumpini, Pathumwan, Bangkok 10330, Thailand |
| | Telephone | +66-2021-6380-1, +66-2021-6385, +66-2021-6207 |
| | Facsimile | +66-2296-6908 |
| 8.8) | Name | Bangkok Bank Public Company Limited |
| | Division | Treasury Division |
| | Address | 333 Silom Road, Silom, Bangrak, Bangkok 10500, Thailand |
| | Telephone | +66-2021-1111 |
| | Facsimile | +66-2636-4633 |
| 8.9) | Name | Oversea-Chinese Banking Corporation Limited |
| | Division | Global Markets |
| | Address | 1 Q.House Lumpini Building, 15 th Floor,
South Sathon Road, Tungmahamek, Sathon, Bangkok 10120, Thailand |
| | Telephone | +66-2287-9852 |
| | Facsimile | +66-2287-9898 |
| 8.10) | Name | TMB Bank Public Company Limited |
| | Division | Capital Markets |
| | Address | 3000 Phahon Yothin Road, Chatuchak, Bangkok 10900, Thailand |
| | Telephone | +66-2676-8008 |
| | Facsimile | +66-2292-4690-2 |

8.11) **Name** Deutsche Bank AG, Bangkok Branch
Division Corporate Treasury Sales
Address 63 Athenee Tower, 27th-29th Floor, Wireless Road, Lumpini,
Pathumwan, Bangkok 10330, Thailand
Telephone +66-2646-5139
Facsimile +66-2651-5892

9) **Auditor**

9.1) **Name** State Audit Office of the Kingdom of Thailand
Address Soi Areesampan, Rama VI Road, Phayathai,
Bangkok 10400, Thailand
Telephone +66-2271-8025
Facsimile +66-2618-5800

10) **Legal Advisors**

10.1) **Name** Linklaters (Thailand) Ltd.
Address 20th Floor, Capital Tower, All Seasons Place,
87/1, Wireless Road, Bangkok 10330, Thailand
Telephone +66-2305-8000
Facsimile +66-2305-8010

10.2) **Name** Weerawong, Chinnavat & Partners Ltd.
Address 540 Mercury Tower 22nd Floor, Phloen Chit Road,
Lumpini, Pathumwan, Bangkok 10330, Thailand
Telephone +66-2264-8000
Facsimile +66-2657-2222

10.3) **Name** Siam Premier International Law Office Limited
Address 26th Floor, The Offices of Central World,
999/9 Rama I Road, Pathumwan, Bangkok 10330, Thailand
Telephone +66-2646-1888
Facsimile +66-2646-1919

10.4) **Name** Herbert Smith Freehills (Thailand) Limited
Address 1403 Abdulrahim Place, 990 Rama IV Road,
Silom, Bangrak, Bangkok 10500, Thailand
Telephone +66-2657-3888
Facsimile +66-2636-0657

- 10.5) Name Allen & Overy LLP
Address Level 12, Exchange Tower,
2 The Esplanade, Perth WA 6000, Australia
Telephone +61-8-6315-5900
Facsimile -
- 10.6) Name Baker & McKenzie Abogados, S.C.
Address Edificio Virreyes, Pedregal 24, Piso 12,
Lomas Virreyes / Col. Molino del Rey
11040 México City, D.F.
Telephone +52-55-5279-2900
Facsimile +52-55-5279-2999
- 10.7) Name Fredrik J. Pinakunary Law Offices
Address Office 8 Building, 17th Floor,
Jl. Jenderal Sudirman Kav. 52-53
SCBD Lot. 28, Jakarta, Indonesia 12190
Telephone +62-21-2933-2990
Facsimile +62-21-2933-2992
- 10.8) Name Herbert Smith Freehills LLP
Address 50 Raffles Place, Singapore Land Tower #24-01, Singapore 048622
Telephone +65-6868-8000
Facsimile +65-6868-8001
- 10.9) Name Shearman & Sterling LLP
Address 6 Battery Road #25-03, Singapore 049909
Telephone +65-6230-3800
Facsimile +65-6230-3899

11) Advisor to the Board of Directors

- 11.1) Name Mr. Tongchat Hongladarom
Address 8 Room 8/48 Prasanmit Condominium, Sukhumvit 23,
Klongtoey-Nua, Wattana, Bangkok 10110, Thailand
Telephone +66-2258-4363
Facsimile +66-2258-4363

6.5 Other Significant Information

- None -