



Upstream



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The unprecedented events that unfolded in 2020 served as the perfect catalyst for Upstream to reinvent itself. We continued to deliver results operationally through a combination of strategic and decisive measures. This was no doubt made possible by the herculean efforts of our frontliners despite the challenges they faced. As we implemented rigorous measures to reduce costs and maintain liquidity, we also strengthened our portfolio by encouraging more value-driven exploration and development of discovered resources to promote a vibrant oil and gas landscape. This was especially true in Malaysia. In parallel, bold efforts were undertaken within Upstream to support PETRONAS' Sustainability Agenda, including making ground-breaking progress in Carbon, Capture and Storage (CCS) as well as emissions reduction initiatives.

We are well on our way towards becoming a safe, resilient, low cost and low carbon exploration and production (E&P) business through value-focused, purposeful strategies combined with world class execution, anchored on PETRONAS' integrated business model. We are resolutely adopting digitalisation and technology in the way we work and deliver business excellence. Last but not least, we remain uncompromising in our safety endeavours to ensure everyone goes home safely.

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Adif Zulkifli
Executive Vice President and Chief Executive Officer,
Upstream

The Upstream business continued to create value and achieve business excellence whilst remaining resilient despite the disruptions brought about by the COVID-19 pandemic and energy demand volatility. Upstream activities in Malaysia and internationally were inevitably affected due to the prolonged lockdowns implemented all over the world.

The impact of the challenges was largely hedged by the deliberate steps we undertook to enhance our operational performance while keeping costs down. Upstream implemented prudent measures to ensure continued business resilience, including reviewing all its activities as well as prioritising and rephasing projects. We also continued to focus our efforts on maintaining asset integrity and reliability, whilst ensuring that our customers were optimally served.

In addition, we also enhanced our strategies to address future uncertainties which included the implementation of innovative technology and digital infrastructure. These continued to fuel the way forward in Upstream, empowering our people and redefining the way we work. All this enabled us to capitalise on opportunities, ensure sustainable production and carry on operating safely.

We continued to uphold disciplined capital and operational spending as well as preserved liquidity to ensure business sustainability for the long term.

The upstream industry is expected to face an increasingly uncertain outlook given the low oil price environment, lower spending across the industry, higher costs, finite resources and production gaps as the shift to a low-carbon economy picks up pace. Moving forward, the strategies in place to reinvent Upstream will hold us in good stead in our aspiration to be a safe, resilient, low cost and low carbon E&P business.

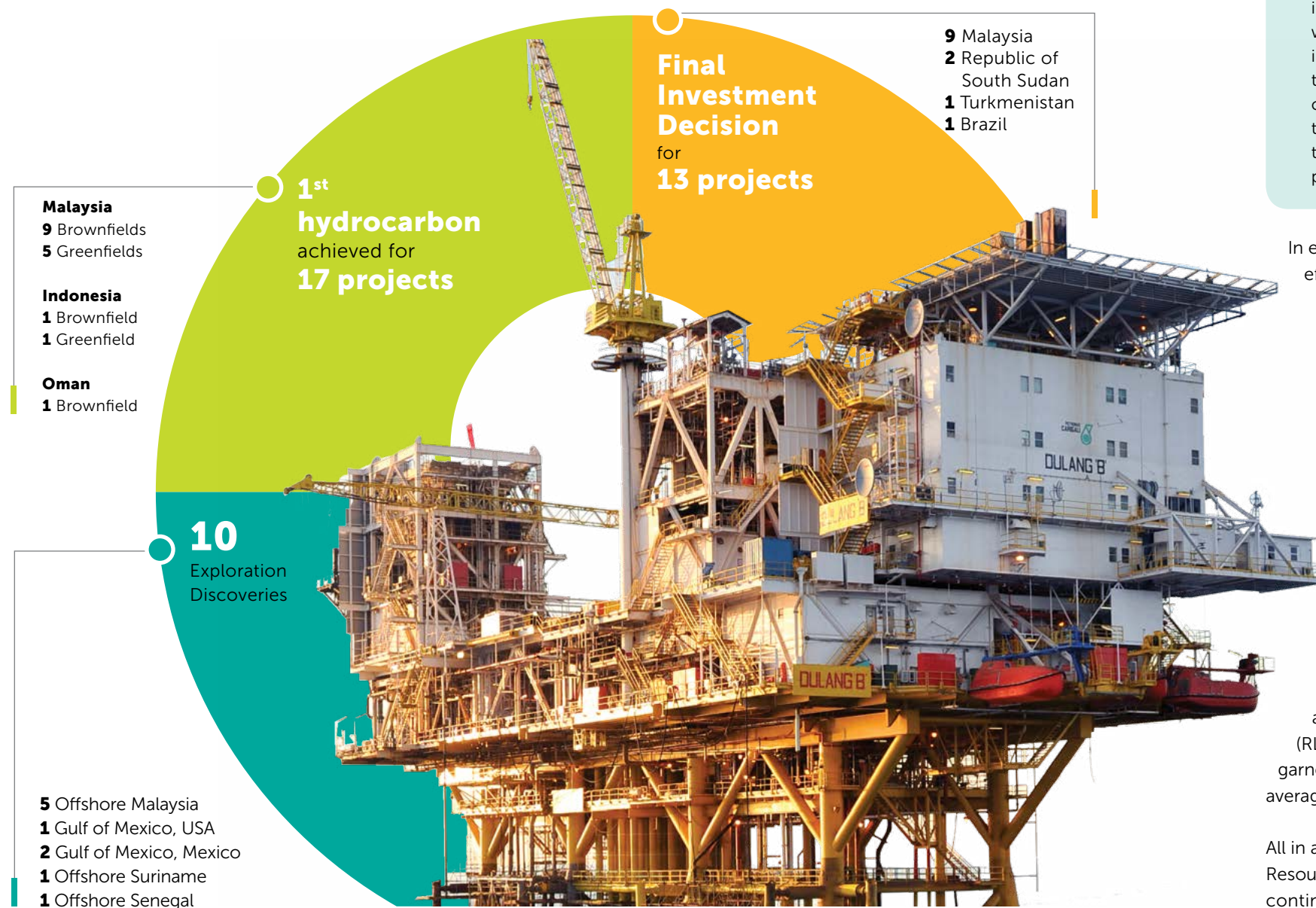


How We Created Value

1 Ensuring Sustainable Supply

We remain focused on two strategic prongs, namely **Maximising Cash Generators** and **Expanding Core Business**, by taking prudent steps to ensure sustainable production despite the challenges faced during the pandemic. We ensured continued energy supply to our stakeholders, attesting to our resilience and agile operations.

During a tough 2020, Upstream recorded a total daily production average of 2,209 thousand barrels of oil equivalent (boe) per day, an 8.2 per cent decrease in comparison to 2019. This was attributed to the low oil price environment and reduced demand brought on by the prolonged impact of the COVID-19 pandemic. Despite an unpredictable year, a total of 17 Upstream projects achieved first hydrocarbon. These comprised nine Brownfields and five Greenfields in Malaysia, one Brownfield in both Indonesia and Oman respectively, as well as one Greenfield in Indonesia.



Expanding Core Business



Monument Discovery

The Monument discovery in the Gulf of Mexico, USA marked a significant milestone for PETRONAS in our efforts to expand our oil and gas business portfolio by growing our international resource base. This was our first entry and discovery into oil and gas operations in the Gulf of Mexico, USA. We will continue to explore opportunities in the Americas region to strengthen the sustainability of our global portfolio.



Polok-1 and Chinwol-1 Deepwater Discoveries

In line with our expansion into the Americas, PETRONAS made two deepwater oil discoveries in Mexico from the Polok-1 and Chinwol-1 exploration wells in Block 29, located in the Salina Basin, Gulf of Mexico, Mexico. PETRONAS currently holds interest in 10 exploration blocks across three of Mexico's prolific main basins encompassing a total area of approximately 22,000 sq. km.



Drilling Success of Sloanea-1

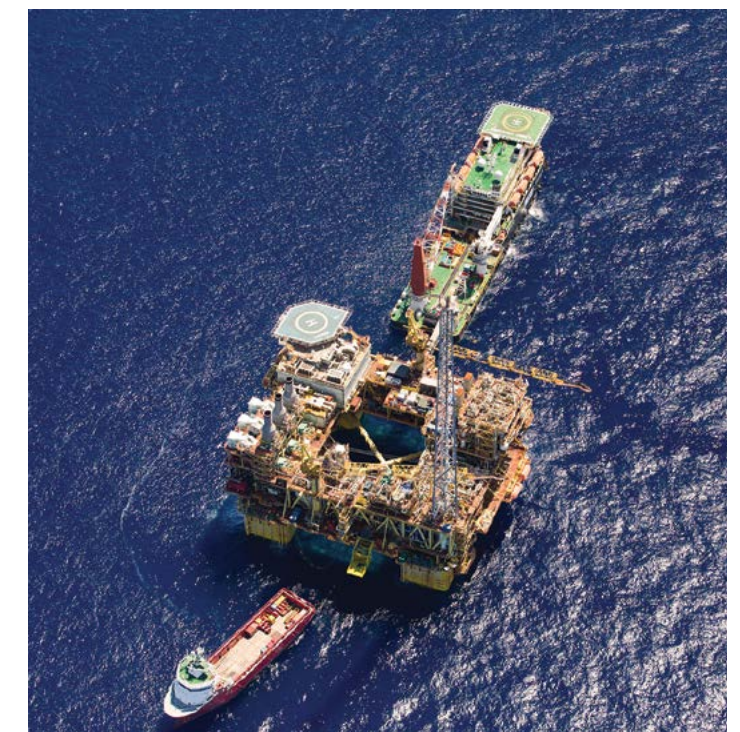
The successful discovery of the Sloanea-1 exploration well in Block 52, located in the Suriname-Guyana basin, offshore Suriname paves the way for PETRONAS to continue exploring in Suriname, which is one of our focus basins in the Americas.

In ensuring sustainability of production, we continued our efforts to replenish our resources and reserves, focusing on prudent growth. Upstream recorded a total of 13 projects which achieved Final Investment Decision (FID). These FID projects encompassed nine projects in Malaysia, two in the Republic of South Sudan, one in Turkmenistan and one in Brazil. As at 1 January 2021, PETRONAS' total Petroleum Reserves (2P) stood at 8.6 bboe, a decrease of 7 per cent from 2019.

PETRONAS' total Contingent Resources (2C) stood at 15.3 bboe, an increase of 1 per cent from 2019. A total of ten discoveries were made in 2020 comprising seven discoveries which contributed to our resource addition namely in Malaysia, Suriname as well as Gulf of Mexico, USA and Gulf of Mexico, Mexico.

Our strong performance track record saw Upstream achieve a three-year average 1P Reserves Life Index (RLI) of 8.9 years, an increase over the 1P RLI of 8.0 years garnered in 2019. This also led to a commendable three-year average 1P Reserves Replacement Ratio (RRR) of +1.6.

All in all, we recorded a three-year average Overall (2P+2C) Resource Life Index (ORLI) of 38.7 years. PETRONAS will continue to focus on high value and material prospects



moving forward, by leveraging technology and our world class capabilities. We will continue to set our sights on ensuring a balanced, value-driven and healthy funnel of resources and reserves in sustaining a robust portfolio.

2 Banking on Operational Excellence

We continued to enhance operational excellence through technology, digitalisation and intelligent facilities to reduce costs as well as increase productivity and efficiency across Upstream's operations.

The introduction of Upstream's Operational Excellence Management System (OEMS) incorporates a value-driven approach that delivers bespoke solutions in each field to ensure safe, reliable, and sustainable operations. This was seen in the Asset Reference Plan (ARP), where a holistic long-term asset strategy was established and applied in the Samarang Production Sharing Contract (PSC) off the coast of Sabah, offshore Malaysia. This has led to the identification of potential value creation of RM519 million over the next five years. Of this, RM16.5 million has been earmarked to be realised by the end of 2021.

Another example is the implementation of the Run-To-End (RTE) operating model in late life fields. As of the first quarter of 2021, OEMS successfully implemented the RTE model in three fields. This is expected to deliver a potential value creation of over RM40 million in the next five years. OEMS continues to set the standard for Upstream's value-driven approach by continuously improving asset management and efficiency.

In line with Upstream's expansion into the area of intelligent facilities, the Resak platform located offshore Kertih in Terengganu is the first platform in Malaysia to pilot remote operations with a 30 per cent potential operational expenditure (OPEX) reduction. This comes on the back of swift technological advancements in automation, robotics and Artificial Intelligence (AI).

In Canada, we continue to gain capital and operational efficiencies through technological advancements and cost compression efforts. In 2020, PETRONAS Energy Canada Limited (PETRONAS Canada) further refined the updated well design that was implemented in 2018, which has over 60 per cent longer lateral sections, as a minimum, and up to 100 per cent longer lateral sections than the previous design. As a result, PETRONAS Canada's wells on certain pads were drilled up to 25 per cent faster and completion costs were 15 per cent lower than planned for the year.

PETRONAS Canada also completed the construction and commissioning of key infrastructure for gas processing plants and compressor stations to support its production ramp-up plan over the next five years. This includes the construction of its Town North gas plant which was completed in November 2020 with commissioning well underway. Serving as its flagship gas plant, this facility will have a processing capacity of 555 million standard cubic feet per day (MMscfd) when the third phase is completed (tentatively in 2025). This will help us deliver our long-term production commitment for our North Montney venture in Canada.

Further improving operational efficiencies in our La Amarga Chica (LAC) block in Argentina, we reduced cost per well by 20 per cent. The adoption of longer wells, robust well design and High-Density Completion improved our resources and reserves by 13 per cent. The accelerated learning experience also helped LAC achieve comparable cost efficiency in just one year compared to six to seven years in neighbouring blocks. LAC under PETRONAS E&P Argentina S.A. (PEPASA), is on track to be Best-in-Class in unconventional play by 2025. This coupled with the first crude export deals in collaboration with its partners in June–August 2020, cemented PETRONAS' ability to monetise its unconventional resources in the region.

In addition, PETRONAS' Unconventional Centre of Excellence located in Calgary, Canada, continues to enhance our unconventional expertise, refine technical innovations, strengthen collaborations and share best practices with our other operating regions that have unconventional resources including Argentina, Australia and Oman.

Other highlights for the year include:

50% reduction in operating rig time following the deployment of the **Enhanced Single-Trip Multizone (ESTMZ)** at Samarang, off the coast of Sabah, offshore Malaysia for well extension packing. This was achieved by simplifying complex operational processes which also led to a **50 per cent capital expenditure (CAPEX)** reduction in the gravel pack operation.

0.34 million tCO₂e/year of Greenhouse Gas (GHG) emissions reduction at Samarang field off the coast of Sabah, offshore Malaysia by recovery of associated gas through separator pressure tuning and recommissioning of additional lines to deliver all gas from satellite platforms to a central platform.

75% cumulative OPEX reduction since 2016 for mature field operations at the Tembungo field, off the coast of Sabah, offshore Malaysia through successful process simplification, maintenance optimisation and Run-to-End approach (RTE).

33% reduction in OPEX from the pilot **Corrosion Under Insulation (CUI) system** at Erb West, off the coast of Sabah, offshore Malaysia. The CUI system, which incorporates a portable lightweight x-ray device designed to monitor and detect corrosion without removing any insulation, has proven to be **10 times swifter** than conventional methods.

3 Focused on Progress

Anchoring on PETRONAS' Three-Pronged Growth Strategy, Upstream has clear targets underpinned by a robust strategy to safely deliver superior performance.

We continuously look at innovative solutions to mitigate any potential risks or challenges that may impact the industry. With this purpose in mind, we are leveraging technology, digitalisation, and data as our differentiator, accelerator and asset respectively, to deliver our strategy with pace, while being cost effective and low carbon-oriented. As a result, our digitalisation efforts, namely the Facilities of the Future programme, is helping us reduce our carbon footprint and enhancing safety at offshore platforms, allowing us to reduce future OPEX by up to 50 per cent.

Similarly, among Upstream's new initiatives include incorporating virtual inspection and performance testing which have enhanced our Process Cycle Efficiency (PCE). This includes Factory Acceptance Testing (FAT) which was done online. This has helped us to move away from conventional on-site testing at vendor and offshore facilities, saving time and costs. Furthermore, our focus on intelligent facilities, which includes remote operations such as the Resak platform offshore Terengganu, is set to be more pervasive across our operations.

Meanwhile, our GHG emissions reduction efforts are focused on achieving zero continuous flaring and venting of hydrocarbons

which aim to reduce GHG emissions by approximately 2 million tCO₂e per year, and potentially recover about 33 million standard cubic feet per day towards the sale of gas.

We are also applying Carbon Capture and Storage (CCS) in our high CO₂ fields; and considering Renewable Energy as our preferred source of power at platforms. Our focus on CCS innovation aims to target further carbon emissions reduction, while seeking to expand our portfolio of technologies to create value.

The Kasawari CCS project off the coast of Sarawak, offshore Malaysia is a strategic project that supports the PETRONAS Carbon Commitment (PCC) and GHG emissions reduction efforts. We plan to commence the first injection of CO₂ by the end of 2025. Once onstream, the project is expected to reduce CO₂ volume emitted via flaring by 76 million metric tonnes with an annual average of 3.7 million metric tonnes per annum (mtpa).

As the energy landscape continues to change, particularly in the upstream space, our continuous efforts are focused on making our business safe, resilient, low cost and low carbon.



Digitalisation at Upstream

Innovative technologies and digital solutions will continue to be deployed at scale to improve the bottom line across our assets and increase the efficiency of our growth engines.

Delivering New Value

Recorded RM180.6 million incremental value with Alpha LNG which integrates Upstream’s production optimisation with G+NE’s cargo delivery needs.

Delivered 2.1 kboed incremental production from six fields in Malaysia via data driven production optimisation. This was enabled on a scaled-up Digital Fields techno-digital solution which has generated more than RM756 million in value since its implementation in 2017.

Realised RM41 million in cost savings by implementing a combination of off-the-shelf wells and sand management technologies in drilling operations and **gained approximately 230,000 boe in incremental production** in 2020. Among the technologies piloted were Single Trip Multizone (STMZ), SMART Digital Artificial Lift (DIAL), and Enhanced Single Trip Multizone (ESTMZ) at four fields which were then replicated in other fields in Malaysia.

Improving Safety, Productivity and Efficiency

Achieved 90% reduction in human exposure to onsite data collection activities and removed the need for facility modification by digitising assets through Internet of Things (IoT) and Edge Analytics (Edge) Technologies.

Accelerated up to 36 times faster seismic data transfer (from 12 days to eight hours) by leveraging on global cloud and networking infrastructure.

PETRONAS progressed from being a participant to an implementor with the **Software as a Service (SaaS) Open Subsurface Data Universe (OSDU) exploration and production (E&P) data platform**. This aims to free up 1,000x more E&P data for users, integrating 12 corporate data stores to a single data platform and lowering data management and infrastructure costs by 10 per cent over a two-year period.

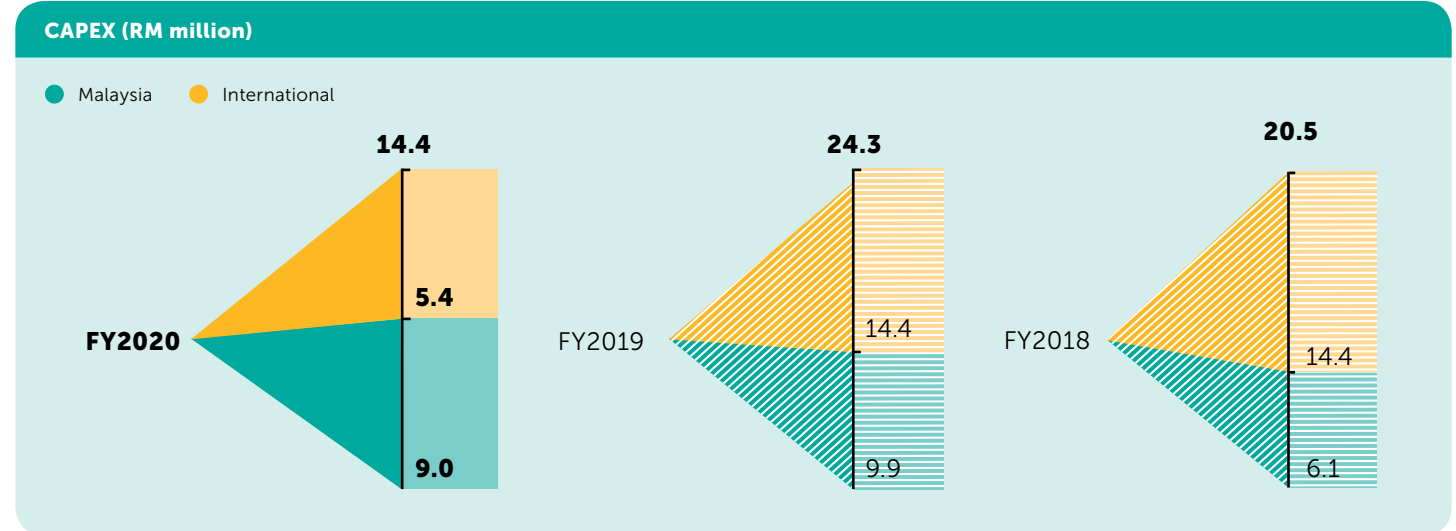
Attained 30% efficiency improvement in Field Development Planning with step changes in subsurface big data processing and analysis workflows.

Partnerships and Collaboration in Data Liberalisation

As a progressive and innovative regulator, PETRONAS through its regulatory arm, Malaysia Petroleum Management (MPM), introduced new guidelines for its Petroleum Arrangement Contractors (PACs) to utilise cloud computing to accelerate their businesses. Combined with the establishment of advanced data centres in Malaysia by public cloud service providers in 2022, cloud will establish an open and cyber-secure data ecosystem to revitalise the Malaysian E&P landscape.

Doing More with Less

Upstream CAPEX was lower in 2020 against 2019, mainly due to volatile demand and fluctuating oil prices that affected our cashflow. In 2020, we embarked on an extensive cost optimisation exercise on both CAPEX and OPEX to maintain PETRONAS’ resilience and competitiveness. We streamlined projects and activities, focused on prudent and efficient operations, and implemented technology and digital solutions to bring down costs. On the domestic front, we continued to commit to maintain spend to sustain the local oil and gas industry and to spur economic growth in Malaysia amidst the prolonged crisis.



Note: Graphs are not to scale.



The year 2020 was undoubtedly a year that prompted a great reset across all industries, no less in the oil and gas industry. For the medium to long term, the upstream industry is expected to face an increasingly challenging outlook given the low oil price environment, lacklustre spending, higher costs, finite resources and production gaps as the shift to a low-carbon economy picks up pace. These factors are expected to be compounded by the ongoing COVID-19 pandemic.

Upstream’s game plan to address future challenges at pace is to be a safe, resilient, low cost and low carbon E&P business.

Our overall focus will be on being leaner, more efficient and more competitive than before as guided by the Group’s Three-Pronged Growth Strategy which is changing the way we do business and the way we work.

**Governance and Disclosure
(Reserves and Resources)**

PETRONAS' Discovered Reserves and Resources framework, governance and procedures, known as the PETRONAS Reserves and Resources Management System (PRRMS), is closely aligned with globally recognised industry standards that are guided by the Society of Petroleum Engineers' Petroleum Resources Management System (SPE PRMS). The PRRMS governance framework stipulates that PETRONAS' Management can call for a fully independent third-party audit at least once every four years or more often, in the event of any special requirements. Annually, PETRONAS' Reserves and Resources department is also required to perform independent audits on PETRONAS' hydrocarbon portfolio to assess the integrity and robustness of PETRONAS' Reserves and Resources as reported in its Annual Review of Petroleum Resources (ARPR) to be approved by the PETRONAS Executive Leadership Team (ELT).

In 2018 and 2019, PETRONAS appointed Sproule International Ltd (Sproule), a global energy consulting firm, as its independent oil and gas Reserves auditor, based on a competitive bidding process. The last independent third-party audit was conducted in April 2019, and the scope of audit covered by this fully independent third-party audit included PETRONAS' Reserves and Contingent Resources base and the ranges associated with the subsurface uncertainties as per the ARPR of 1 January 2019, as well as the Net Present Value of PETRONAS' total Entitlement of Reserves and Contingent Resources as of the same date. The following is Sproule's audit opinion in respect of PETRONAS' Reserves and Contingent Resources as per the ARPR of 1 January 2019:

Based on the results of our audit, it is our opinion that PETRONAS' internally generated 1P, 2P and 3P* crude oil, natural gas and natural gas products Reserves and the related Net Present Value at 8% discount factor (NPV8) (based on Key Planning and Budget Input basis), as well as the 1C, 2C and 3C** crude oil, natural gas and natural gas products Contingent Resources and the related NPV8 value (KPBI basis) are, in aggregate, reasonable, and have been prepared in accordance with generally accepted oil and gas engineering and evaluation practices as set out in the PRRMS.

* The term 1P is used to denote Proved Reserves; 2P is the sum of Proved and Probable Reserves; and 3P is the sum of Proved, Probable and Possible Reserves.
** The term 1C denotes low estimate of Contingent Resources; 2C is the best estimate of Contingent Resources; and 3C denotes a high estimate of Contingent Resources.



PETRONAS' estimated volumes came within +/- 0 per cent of Sproule's estimates for 2P and +/- 3 per cent for 2C for the data as at 1 January 2019. These results demonstrate the integrity and robustness of PETRONAS' internally generated Reserves and Contingent Resources estimates.

Although no fully independent third-party Reserves audit was conducted in 2020, PETRONAS believes the same independence, rigour and standards as applied by third-party auditors were upheld by PETRONAS' Reserves and Resources Department in assuring the integrity and robustness of PETRONAS' Reserves and Resources estimates as at 1 January 2020 and 1 January 2021. For example, for the finalisation of the ARPR as at 1 January 2021, a total of 81 fields were audited between March and August 2020 by PETRONAS' Reserves and Resources department, covering approximately 70 per cent of the top NPV fields, and approximately 65 per cent of the 2P and 2C fields. These fields span PETRONAS' operations in 11 countries (including Malaysia) and 44 contracts.

