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Oil and Gas Practice

# Ten ways to boost Indonesia's energy sector in a postpandemic world

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# Contents

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# Introduction

**Even before the COVID-19 pandemic,** Indonesia's energy industry had fallen on hard times. Production was well below what it had been just a decade ago, modernization efforts hadn't kept pace with those of most other countries, and (until recently) fuel imports had been rising continually. Then the coronavirus crisis hit, causing economic slowdowns that further undermined the sector. With a determined push, sector leaders can revitalize the industry despite mounting challenges.

McKinsey's analysis of possible scenarios suggests that efforts to bolster the struggling sector can begin in earnest with the easing of large-scale social restrictions linked to the pandemic. Leaders can build on dynamic investment programs already in place and capitalize on Indonesia's rich resources, stable economic growth, and large, young population. Success in the post-COVID-19 environment will largely depend on how the sector reimagines and reforms itself as well as on how public and private leaders address the fundamental long-term challenges facing the sector.

## Impact of COVID-19 on energy demand

Indonesia confirmed its first case of COVID-19 in March 2020. By mid-October, the number of cases had grown to more than 350,000, the highest in Southeast Asia, and more than 12,000 Indonesians had died of the disease.[1] In response, the government implemented travel restrictions and a wide range of other mitigation policies. Both the pandemic and the mitigation measures have had a direct impact on the energy sector.

Travel restrictions and reduced road transport, for example, cut consumption of gasoline and diesel fuels by 15 to 20 percent and of jet fuel by 30 to 50 percent. In the power sector, an increase in domestic household electricity consumption was offset by a larger decline in consumption of industrial and commercial electricity. Liquefied petroleum gas (LPG) consumption increased with the rise in home cooking. Lower demand for power and fertilizer combined to slow growth in demand for gas from 5 to 6 percent to only 1.4 percent.[2] In total, energy demand could drop by about 7 percent in 2020 while GDP shrinks by as much as 1 to 4 percent.

Despite the short-term challenges, the long-term growth fundamentals of Indonesia's energy market remain robust, driven by a healthy long-term GDP growth projection, a young population, and a desire to reduce imports and the current account deficit. According to McKinsey estimates, the short-term decline in energy demand caused by the virus could recover by 2022.

[1] Richard C. Paddock and Dera Menra Sijabat, "Indonesia overtakes the Philippines as the hardest-hit country in Southeast Asia," *New York Times*, October 16, 2020, nytimes.com.
[2] *Global energy perspective 2019*, January 2019, McKinsey.com.

The pandemic has also affected corporate profits in the energy sector, dampening enthusiasm and reducing available resources for immediate new investments. Globally, ExxonMobil, BP, Chevron, and Total reported a collective 20 percent year-over-year drop in net profit for the first half of 2020, with profit margins falling to a distressing –14 percent.[3] In Indonesia, state-run power companies Pertamina and PLN reported a $768 million loss and almost no net profit in the first half of 2020, respectively.[4]

Global and domestic energy companies are facing one of their biggest challenges in decades. While the automatic response might be to hunker down and wait out the crisis, these uncertain times—coupled with anticipated long-term, global transitions in the industry—underscore the urgent need for transformative changes that address the immediate crisis and open a better path to the future.

## The value for Indonesia

A global leader in the late 20th century, Indonesia's energy sector has faced a variety of challenges in maintaining its status. In a 2020 assessment, the World Economic Forum ranked Indonesia 91st among 115 countries on energy-transition readiness and 58th on energy-system performance, defining the country's outlook as "potentially challenged."[5]

Several features of the country's energy sector illustrate these challenges:

— While Indonesia's oil and natural-gas recoverable resources are estimated at about 25 billion barrel-of-oil equivalents, production fell by 20 percent from 2010 to 2019. Already a net importer of oil, Indonesia may become a net importer of natural gas as well by around 2030. The COVID-19 crisis has caused a short-term drop in demand, but we expect demand to recover by 2022.

— The country lags behind in the development of renewable energy. Indonesia has only tapped into about 2 percent of the combined potential of geothermal, solar, wind, hydro, and biomass energy sources, and only 12 percent of its electricity comes from renewables. In comparison, more than 20 percent of electricity in the Philippines comes from renewables.[6]

— Air and water quality is increasingly important as urbanization picks up. A 2018 study by Greenpeace and IQAir concluded that Indonesia had the worst air pollution in Southeast Asia and the 11th worst in the world, with pollution levels four times worse than the World Health Organization threshold for clean air.[7] Another study published by *Nature Communications* in 2017 found that Indonesia ranked second globally for the amount of its plastic waste that ended up in the ocean, while four of the country's rivers were among the 20 most polluted in the world.[8]

[3] Figures based on company reports.
[4] Norman Harsono, "Pertamina logs $768 million net loss in first half of year," *Jakarta Post*, August 24, 2020, thejakartapost.com; Eko Wahyudi, "PLN profit down 96 percent to Rp273bn," *TEMPO.CO*, July 29, 2020, Tempo.co.
[5] "Energy Transition Index 2020 edition: Indonesia," World Economic Forum, May 2020, weforum.org.
[6] *2019 power situation report*, Philippines Department of Energy, 2019, doe.gov.ph.
[7] *2018 world air quality report*, IQAir AirVisual, March 2019, iqair.com.
[8] Laurent C. M. Lebreton et al., "River plastic emissions to the world's oceans," *Nature Communications*, June 7, 2017, Volume 8, nature.com.

Meanwhile, global trends are revolutionizing the energy sector. In most major markets, energy demand has been dropping as efficiency improvements are implemented. Indeed, global demand for fossil fuels could peak sometime in the early 2030s. The adoption of electric vehicles is one factor in this trend; sales reached more than two million a year in 2018.[9]

Renewable energy is also becoming a major source of electricity. From 2015 to 2017, more than half of the world's new generation capacity relied on wind and solar power. By 2035, more than half of the world's power supply is expected to be generated from renewable sources.[10]

In light of concerns about climate change, much of the world seems to have reached a consensus on the pressing need for decarbonization. Many countries have expanded carbon-pricing initiatives, and there is renewed interest in clean-energy solutions such as hydrogen for long-haul cargo transportation and industrial applications.

To date, Indonesia has been relatively untouched by these global trends and the benefits they can deliver. But the country will not be able to revitalize its energy sector unless it embraces some, if not all, of these trends. For example, electric two-wheeled vehicles could ease the pressure on Indonesia's oil imports. The McKinsey Global Energy Insights team, our premier energy intelligence and analytics wing, anticipates that there could be 3.7 million electric scooters on Indonesia's roads by 2030. Further, the cost of wind and solar power generation has fallen drastically. Wind and solar could be competitive with new-build traditional natural gas plants by the late 2020s and with coal plants by the late 2030s.

Revitalizing Indonesia's energy sector following the pandemic will require bold moves, difficult decisions, and significant investments. Players will need to reimagine and reform to address both short- and long-term challenges. But a successful effort could deliver substantial economic and social benefits. We estimate that the proposals presented in this report could add $60 billion to the country's GDP and create a more sustainable future.

In this report, we examine ten ideas for turning around Indonesia's energy sector and delivering great value to the country's economic growth and development. We also explore how these ideas could help the sector reimagine and reform itself and embrace challenges in the aftermath of the global pandemic.

[9] Roland Irle, "Global EV sales for 2018 – final results," EV-volumes.com, 2019, ev-volumes.com.
[10] *Global energy perspective 2019*, January 2019, McKinsey.com.

# 1 Reform energy subsidies to strengthen benefits

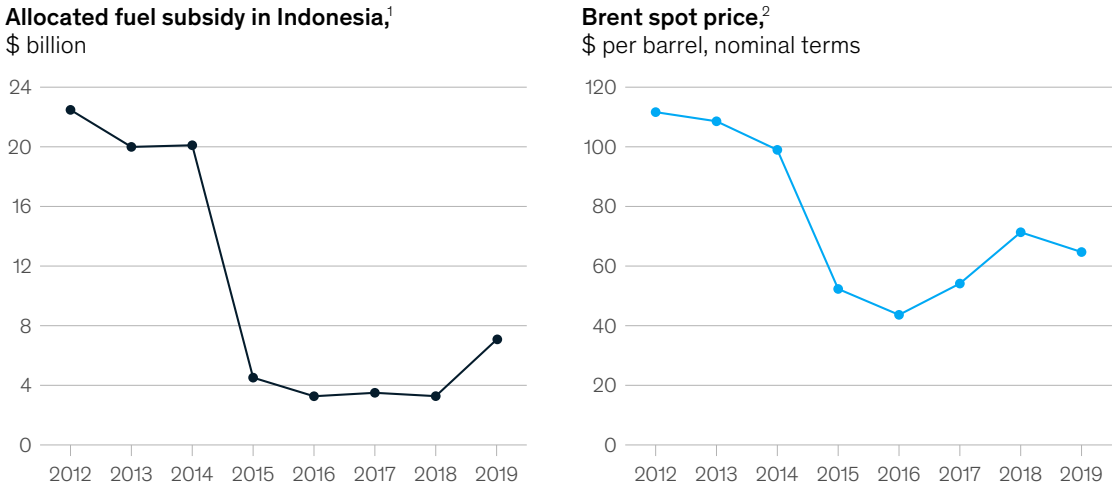
Fuel subsidies in Indonesia drain the public treasury and divert funds from potential projects that could deliver long-term economic impact. Fuel prices are lower now than in recent decades, providing an optimal opportunity for the government to restructure its subsidy program and provide benefits where they are most needed.

Reform is needed despite a sharp drop in subsidy expenditures. Before 2014, fuel subsidies in Indonesia totaled $20 billion a year or more, but following the drop in global oil prices, annual fuel subsidies fell to an average of about $4 billion a year from 2015 to 2019 (Exhibit 1).

Indonesia's subsidies have declined to one-fifth of past levels, but they remain massive. To illustrate, the current annual subsidy is the equivalent of investing in a major refinery upgrade every one to two years or a new refinery complex every four to five years. If ten years' worth of subsidies—about $40 billion—were redirected to existing and new refineries, the impact would be enough for Indonesia to become self-sufficient in creating oil products.

Exhibit 1

## Fuel subsidies fell sharply from 2015 to 2019 following a dramatic drop in oil prices.




[1]Numbers for 2018–19 reflect the current state budget allocation for fuel subsidy.
[2]The spot price for 2019 is the monthly average from January to September 2019.
Source: Indonesia's Ministry of Finance, National Public Procurement Agency, and APBN; US Energy Information Administration

The current climate provides a valuable opportunity to reform the country's energy policies. Low global oil prices have reduced the pressure to offer these subsidies, and a move toward market prices, rather than regulated prices, has shifted some of the burden and potential benefits of pricing decisions to Pertamina. Resurgent global oil prices, however, would make the current system unsustainable while at the same time making reform more difficult politically.

India, Malaysia, and other countries have found ways to achieve the twin goals of providing help to the poor while reducing subsidies overall. For example, they have adopted new technologies, such as unique personal identification numbers and direct cashless payments, to ensure that support reaches the lowest-income households. Indonesia would also need subsidy caps to keep control of the program, especially if global oil prices rise.

To achieve success, reform plans during recovery should be bold and comprehensive. In countries where reform has been deployed in phases, each successive phase has met renewed resistance from various interest groups, reigniting what can be an acrimonious debate and sometimes eroding the political will to move forward.

**If ten years' worth of subsidies—about $40 billion—were redirected to existing and new refineries, the impact would be enough for Indonesia to become self-sufficient in creating oil products.**

# 2 Revitalize investments in exploration and development

Indonesia was once a net exporter of oil and a member of OPEC, but inadequate investment, especially in exploration, and low global prices have weakened the country's oil industry. In 2018, Indonesia was a net importer of more than 550,000 barrels of crude oil and products per day, equivalent to about $20 billion a year, and within the next five years Indonesia could become a net importer of natural gas as well. Oil imports currently cover about 50 percent of the country's use. Boosting the domestic upstream industry using well-crafted incentives could help reverse this trend.

Over the past two decades, oil production in Indonesia has dropped more than 40 percent while natural gas production from existing basins has also declined. The effects are significant: imports of petroleum products have increased, terminals such as the one in Arun have switched from export to import facilities, and plants such as the liquefied natural gas (LNG) facility in Bontang are underutilized. While there have been some expansion projects in the past decade—such as those in Banyu Urip, Donggi-Senoro, Jangkrik, and Tangguh—they have not been enough to counter the decline in production.

Furthermore, recent annual investment in exploration has been about half as much as in 2010. Very few significant discoveries have been reported in Indonesia, and the final investment decisions on several marquee projects have been on hold for the past four to five years as developers evaluate the economic feasibility of these projects. From 2015 to 2019, annual capital expenditures for exploration in Indonesia averaged about $320 million, less than 5 percent of the annual capital expenditure for upstream projects.[11] Prolonged underinvestment has contributed to production declines in recent years.

Beyond the impact of COVID-19, global trends have kept oil and natural gas prices low. This may continue with several recent large discoveries and massive development projects, particularly in Central and South America, East Africa, the Middle East, and the United States. Continued low prices will not only strain investment decisions for Indonesia but also intensify competition for more economically attractive investments.

To revitalize investments in oil and natural gas exploration and development, Indonesia will need to take several crucial measures:

— Design targeted incentive schemes for exploration investment.

— Conduct comprehensive, time-based reviews of development projects already under way to find solutions that accelerate progress and meet investor and government needs.

— Simplify federal and provincial approval processes to accelerate implementation of beneficial projects.

— Attract basin operators experienced in enhanced oil recovery and other modern methods to invest in and develop mature asset operation capabilities.

[11] *Tahunan 2019: Meningkatkan investasi menuju produksi 1 juta BOPD*, SKK Migas, 2019, skkmigas.go.id.

# 3 Craft supportive regulations to smooth the handover of expiring PSCs

When production-sharing contracts (PSCs) expire, the transition to new operators can trigger drops in production and even damage to reservoirs. Indeed, several major Indonesian blocks that have changed operators in the past five years—including Mahakam, Sanga-Sanga, and southeast Sumatra—have experienced significant production drops following the transfer. Some of the decline can be attributed to aging infrastructure and depleted resources and was perhaps unavoidable, but a more supportive regulatory framework and better planning for the handovers could have mitigated the impact.

Over the next ten years, the PSCs for the Rokan fields and other important oil and natural gas blocks will expire. With combined production totaling 456,000 barrels per day, these blocks account for roughly 26 percent of the country's current production. Best-practice handover procedures can help minimize the disruption.

## Supportive regulatory framework

Regulators can begin to plan for investment in an aging basin four to five years before its PSC expires. Because of the lengthy payback periods for capital expenditures needed to sustain a mature field, such planning is essential well ahead of a handover or renewal. This need was evident in the Rokan PSC, where production fell by 20 percent after a 2018 decision on its PSC operatorship transition.

A supportive regulatory framework would include measures to ease cost recovery when operators change. When there is a change in operatorship, rather than a renewal with the same operator, regulations play an important role for cost recovery of investments made in the transition period. Without such measures, operators minimize investments as the expiration year nears, resulting in lower production and potential damage to the reservoir.

In addition, the government task force SKK Migas could make greater efforts to oversee smooth transitions. For example, it could enforce the creation of dedicated transition teams that bring together representatives of incumbent and future operators who are committed to transparent project timelines. Industry experience suggests that these teams should convene for 18 to 24 months during the transition period to allow adequate time to achieve handover milestones.

## Smooth handover processes

Handovers are inevitably disruptive, but regulators can put processes in place to lessen the impact. These processes should focus on ensuring safety, business continuity, and optimal production from the first day of the new operator's tenure.

Global industry experience demonstrates that a powerful component in ensuring a smooth handover is a transition management office set up by the new operator. This office would focus on implementing technical and functional measures to ease the transition, in part by establishing clear joint-governance structures that lay out roles, responsibilities, and decision rights.

Another vital aspect for smooth handovers is talent continuity. Critical positions and individuals who add value and would be difficult to replace could be identified and offered incentives, such as a transition bonus, to stay for an agreed-upon period of time. A process for applying for jobs under the new operator should be clearly articulated, and morale should be maintained using a comprehensive change-management plan led by senior managers. Any major staff changes could be identified before the handover is implemented.

A thorough assessment of assets is also important. Operational readiness following the handover can be supported early in the process through an audit of the integrity of facilities, wells and reservoirs, safety standards, environmental protections, ongoing contracts, and other essential assets. The transition agreement could reflect this assessment.

**A supportive regulatory framework would include measures to ease cost recovery when operators change.**

# 4 Capture value through digitization

Globally, the energy sector has been slower than others to draw value from modern technologies such as advanced analytics, the Internet of Things, automation, and mobile apps. To catch up, BHP, Chevron, Saudi Aramco, and other major players have invested heavily in digital technologies and are enjoying significant benefits.

The pandemic has accelerated digitization in energy as companies adjust to increases in online activity. For instance, remote working and learning became prevalent in a matter of weeks as companies adapted to lockdowns. Companies with superior digital infrastructure, agile organizations, and use cases that create value—such as remote inspection, automation, advanced analytics, and predictive maintenance—were well positioned to thrive as restrictions limited on-site work. In one example, Enel, Europe's largest utility, created a remote control room for its hydroelectric plants using digital infrastructure.

On a local level, Indonesian companies have also recognized the potential of digital technologies. Many have started pilot programs, in some cases capturing real value—for instance, increasing production by 30 to 40 percent and cutting costs by 15 to 20 percent. However, too many operators have fallen into the pilot trap, unable to move beyond initial forays and capture the full value of these measures.

Several obstacles make it difficult for Indonesian companies to move past pilot projects and implement digital measures throughout their organizations. Among the most common are low internet connectivity, limited awareness of digital ecosystems, few local reference cases to study, and a shortage of digital talent.

Companies can introduce the following measures to help overcome these hurdles:

— Develop a detailed plan that focuses on value creation and has the public support of senior managers.

— Establish a digital fund to finance the implementation of specific use cases—individual efforts to capture value—and make a commitment to scale up successful cases and abandon unsuccessful pilots.

— Create and implement a clear strategy to attract, retain, and develop digital talent.

— Prepare data platforms and technology architecture to support the rollout of digital use cases and agile approaches to innovation.

— Collaborate with the government's Digital Capability Center and share successful use cases.

# 5 Encourage performance while ensuring oversight for the power sector

By 2019, electricity had reached 99 percent of Indonesian households, industries, and businesses, a laudable improvement from about 67 percent in 2010.[12] But the 2019 blackout in Jakarta and West Java, which affected about 22 million customers,[13] illustrates the challenges that remain in creating an efficient, reliable, and sustainable power network in the country.

With growth in demand leveling off in recent years, Indonesia has an opportunity to prioritize the reliability, efficiency, and sustainability of the power sector. Supply security could be improved, for instance, through investments in flexible capacity such as batteries, grid upgrades, automation for real-time load management, and spinning reserves, a method for improving output from existing generators.

Digital technologies and smart-grid systems could also improve network efficiency by providing predictive maintenance, drone-based inspections of infrastructure, optimized power-plant operations, and many other scenarios. Other powerful tools include government incentives to promote decentralized power generation, smart homes and buildings, and microgrids, which can serve an area as small as a single building complex.

Tariff reform is also needed to create a more efficient and sustainable power network. Tariffs in Indonesia cover 86 percent of production costs, and government subsidies of $4 billion a year fill the gap. To make the power sector financially viable, the revenue scheme for state-owned power company PLN could move from a cost-plus system to a performance-based system that rewards cost efficiencies, offers a transparent and predictable plan, and remunerates PLN fairly for investments. To ensure affordability, Indonesia could offer subsidies targeting low-income households or strategic industries, allowing regional governments to supplement these subsidies if they wish.

As the country takes a fresh look at its energy market amid the pandemic, it has the opportunity to encourage performance in the power sector and ensure effective regulatory oversight, weaning PLN from its self-regulatory role. Many countries have successfully separated the role of regulator from that of operator, uncovering significant benefits for both industry and consumers. Drawing from this experience, Indonesia could establish three agencies:

— a single regulatory body for the power sector similar to Malaysia's Suruhanjaya Tenaga, Singapore's Energy Market Authority, or the United Kingdom's Ofgem; this agency would coordinate with multiple ministries to create an integrated regulatory framework on energy security, tariffs, subsidies, and renewables

— an independent single buyer to purchase electricity from power plants at competitive prices

— an independent system operator to oversee grid operations, maintenance, and investments

[12] "Electrification rate in Indonesia from 2010 to Q3 2019," Statista Research Department, April 27, 2020, statista.com.
[13] Devina Heriyanto, "Blackout in western Java: What we know so far," *Jakarta Post*, August 7, 2019, thejakartapost.com.

# 6 Unleash renewable energy

Accelerating development of renewable energy has become a hallmark of many countries' energy strategies. Most notably, in 2019 New Zealand and the United Kingdom pledged to become carbon neutral by 2050. Indonesia can also take aggressive steps toward developing energy security and sustainability using renewable technologies.

Indonesia's energy strategy has traditionally focused on building the lowest-cost production facilities. Today, coal-fired plants produce about 60 percent of the country's energy, and natural-gas plants contribute an additional 22 percent. As a result, Indonesia has barely tapped its potential for renewable energy (Exhibit 2).

Exhibit 2

## Indonesia has significant unexploited potential across a range of renewable energy technologies.

| **Type of renewable energy** | **Potential power generation,** gigawatts | **Current installed capacity,** 2018, gigawatts | **Comments** |
|---|---|---|---|
| Solar | 208 | ~0 | • High solar irradiation especially in East Java, Nusa Tenggara, Sulawesi; several projects under development<br>• Financing costs and supply chain restrictions drive up levelized cost of energy vs international standards |
| Wind | 61 | ~0 | • Recent surge in interest with improved economics (eg, 75-megawatt Sidrap wind farm) exceeded government's 2015–19 plan |
| Hydro | 75 | 5 | • Largest source of renewables today<br>• Large- and small-scale hydro plants possible, but subject to environmental and financing issues |
| Geothermal | 29 | 2 | • Limited concessions under development, few participants at several geothermal auctions<br>• High upfront capex and development risk |
| Biomass | 33 | <1 | • Cofiring applications in existing combined heat and power plants where capex is already in place<br>• Undeveloped supply chain despite agricultural industry, with extensive wastage of biomass |

Source: Indonesia's Electricity Procurement Plan (RUPTL) 2019-2028; Renstra EBTKE 2015-2019; McKinsey analysis

Indonesia's hydroelectric plants have installed capacity of about five gigawatts, but most other renewable energy sources barely exist in the country. If fully developed, renewable energy in Indonesia could have a total capacity of more than 400 gigawatts, or more than six times current needs.[14] This is more than enough to meet Indonesia's future demand, but the pace of energy transition will need to factor in cost trends. The large capital expenditures for transmission infrastructure—particularly in remote areas where renewable energy is typically abundant—discourage investment in big projects such as hydroelectric plants.

Indonesian regions that currently get power from diesel generators, such as the Eastern Islands, are particularly well suited for renewable energy. Diesel is the most expensive power source, and cost trends are making renewable energy increasingly attractive. Current trends could lead to cost reductions of more than 50 percent for batteries and about two-thirds for solar panels. Because batteries and solar panels are critical components of solar power systems, this would bring the cost of solar power well below that of diesel and even natural gas generation.

Before the coronavirus crisis hit, the Indonesian government announced a goal of increasing its use of renewable sources from 11 percent of the country's electricity in 2019 to 23 percent by 2025. Several measures can support progress toward that target:

— Promote fair and effective tariffs through competitive options.

— Streamline licensing and permitting processes.

— Allow large-scale solar projects.

— Reduce procurement costs for components such as solar panels, which remain significantly higher than in other countries.

— Reward renewable self-generation, such as rooftop solar-power systems.

[14] "Indonesia plans to replace fossil fuel plants with renewable energy plants to meet renewable target," GlobalData, February 7, 2020, globaldata.com.

# 7 Take full advantage of LNG markets and develop trading capabilities

Demand for natural gas in Indonesia reached a plateau even before the pandemic, as core sectors such as power and industrial faced economic headwinds. By reducing demand for fertilizer and power, the crisis has further weakened demand for natural gas, slowing it to an anticipated 1.4 percent in the short term.[15]

In the long term, however, natural gas will remain a core part of Indonesia's energy mix. Downstream oil and natural gas are expected to grow about 5.7 percent a year from 2023 onward. Natural gas is projected to command a 22 percent share of the total energy mix by 2025 and 24 percent by 2050.

At the same time, however, supply from existing natural gas fields in Indonesia is expected to decline by about 25 billion cubic meters, or about 3 percent, by 2035. Fewer new discoveries are being made, and new production is incurring much higher wellhead costs—more than $5 per million British thermal units.

Indonesia's natural-gas industry would benefit from efforts targeting both supply and demand. Foremost among these would be an effort to ensure the industry has a stable regulatory environment that attracts investors by supporting predictable, sustainable returns across the value chain. Upstream investments are burdened by policies such as price caps on supplies to industries viewed as priorities, while subsidies and high costs for residential natural gas limit new areas of growth such as city networks. Optimized pricing regulations based on ability to pay and volume, as well as more efficient use of infrastructure, could help address some of these challenges.

The industry would also get a boost from continued infrastructure development, especially in the Eastern Islands, which rely on costly fuel oil for their energy. Transmission infrastructure in Java and Sumatra is under development, though last-mile networks are lagging, and the Eastern Islands have seen almost no natural-gas development. Initiatives such as small-scale LNG shipping, greater deployment of intermodal containers—which can be transferred easily from ship to truck—and growth in renewal sources would go a long way toward moving the Eastern Islands from oil to less expensive energy sources.

Efforts to complete last-mile connections would also support a shift to natural gas in the country's more developed regions. Strategic deployment of regasification plants, which convert LNG into usable natural gas, in demand centers such as Java would encourage greater use.

[15] *Global energy perspective 2019*, January 2019, McKinsey.com.

Oil remains a much higher priority in Indonesia than natural gas. This policy bias needs to be overcome before natural gas can reach its potential—a move that will help widen the scope of economic recovery after COVID-19. To reverse the decline in domestic production and prevent an eventual shortfall, Indonesian companies could be encouraged to invest in exploration and new production and to monetize stranded assets. Incentives and supportive regulations in areas such as LNG for trucking, bunkering, and urban gas networks would also support sustained domestic demand, underpinning the economics behind upstream investments.

As a further measure, Indonesia can develop its global LNG portfolio. Along with uncertain domestic demand, limited local LNG trading and portfolio management capabilities have kept Indonesia from taking full advantage of low global LNG prices. Global markets are expected to rebalance by the mid-2020s and turn to surplus between 2025 and 2030. To lock in prices for long-term deliveries and mitigate domestic demand uncertainties, Indonesian companies can develop their trading capabilities and make strategic investments in regasification and natural-gas power plants in growth markets like Bangladesh and Myanmar.

**Small-scale LNG shipping, greater deployment of intermodal containers and growth in renewal sources would go a long way toward moving the Eastern Islands from oil to less expensive energy sources.**

# 8 Deliver refineries and petrochemical plants and infrastructure

The COVID-19 crisis has caused a drop in demand for domestic gasoline, diesel, and jet fuel, but the market could recover by 2022. The projected long-term increase of domestic demand for oil will continue to put pressure on the country's energy system. To help reduce imports, Indonesia could seek ways to revitalize its refineries and build new petrochemical plants.

Before the pandemic, Indonesia's dependency on fuel imports was expected to increase even as renewable energy sources and electric vehicles gained ground. The same prepandemic projection estimated that demand for diesel fuel in Indonesia could grow by about 0.75 percent a year through 2030, bringing use to more than 421,000 barrels per day, and that demand for gasoline could grow by about 2 percent a year, bringing use to about 780,000 barrels per day.[16] While the COVID-19 crisis has caused oil demand to dip in 2020, it should have limited long-term impact on the fundamental growth of energy demand in Indonesia.

Indonesia is also projected to be one of the few growth markets for petrochemicals. Before the pandemic, demand was expected to grow more than threefold over the next two decades, from 33 million tons a year to about 100 million by 2040.[17] Without additional domestic capacity, Indonesia will have to import crucial products, such as polypropylene, high- and low-density polyethylene, linear low-density polyethylene, and para-xylene.

In addition, refineries in Indonesia are becoming antiquated. On the Nelson Complexity Index (NCI), a measure of refinery sophistication, Indonesia scores about 5.7, below Thailand, the Philippines, and Malaysia. Refineries will also have to be upgraded to accommodate sour crude, which is cheaper. In another sign of imminent investment needs, Indonesia still maintains Euro II fuel standards while much of the rest of the world is moving toward more environmentally friendly Euro V standards.

Indonesia's energy companies are not ignoring these signs. Pertamina is planning to invest in a refinery development master plan and grass-roots refineries programs. Billed as one of the largest investment projects in Indonesia, the effort includes upgrading four refineries and opening two new refinery and petrochemical complexes. The projects would increase the country's capacity to produce fuel at Euro V standards, double the country's refinery capacity, triple fuel production, and increase Pertamina's petrochemical capacity 13-fold. It would also make the country substantially more competitive in the region (Exhibit 3).

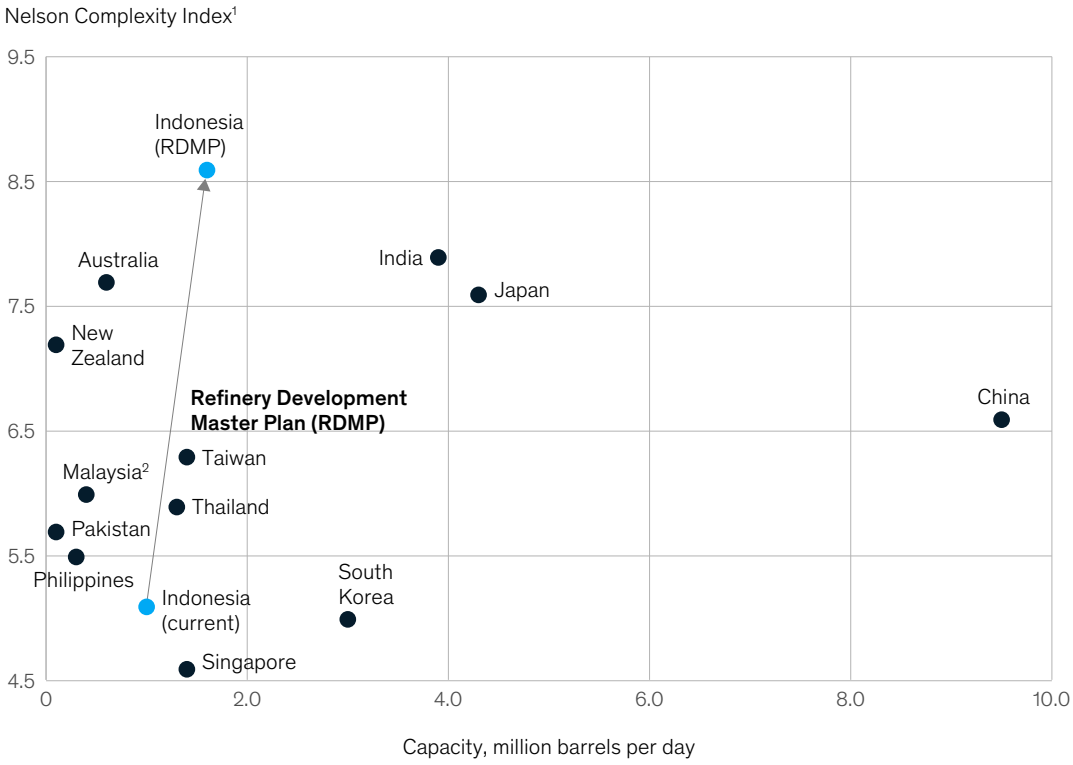
Before the virus hit, private companies including Chandra Asri and Lotte had made plans to increase their petrochemicals production capacity in Indonesia in the next five years. The crisis has caused temporary delays in these projects, but Indonesia remains one of the most attractive markets for petrochemical investors.

[16] *Global energy perspective 2019*, January 2019, McKinsey.com.
[17] McKinsey analysis of ICIS data.

Exhibit 3

## Refinery upgrades will make Indonesia more competitive in Asia–Pacific.

**Impact of Pertamina upgrades on Nelson Complexity Index ratings (preliminary)**




[1]A measure of a refinery's degree of complexity and sophistication, on a scale of 1-20 where 20 is the highest.
[2]Excluding Refinery and Petrochemical Integrated Development (RAPID).

To maximize the impact of these needed investments, companies could take the following measures:

— Build refineries and petrochemical plants at a competitive scale, ensure that products can adjust to evolving industrial demand, and make sure that inbuilt technology will remain relevant for the next three to four decades.

— Embed a long-term biofuel strategy into overall development plans. In particular, build production capacity using domestically produced crude palm oil. Previous mandates in Indonesia required biodiesel to contain 20 percent palm oil by 2019. The government is now raising the standard to 30 percent palm oil.

— Implement transparent policies and processes to attract global partners. Foreign interest in investing in Indonesia's downstream oil and natural gas sectors is often dampened by unreliable business plans and uncertain targets.

— Follow global best practices for megaproject execution to guard against time and cost overruns. For example, modern digital technologies for planning, engineering, and construction can deliver 15 to 20 percent in savings through lower costs and faster completion.

The government also plays a critical role in supporting these projects by issuing consistent regulations, easing land-acquisition processes, and providing appropriate financial incentives for investors. This support will be critical for Indonesian oil and gas companies when economic recovery begins after the crisis.

# 9 Create incentives for electric vehicles

In reviewing its energy strategy, Indonesia cannot ignore electric vehicles. Two- and four-wheeled electric vehicles are making inroads around the globe, helped in many countries by a growing number of recharging stations and other improvements in necessary infrastructure. In Indonesia, electric vehicles are not only good for the environment but would also help decrease the country's reliance on oil. Our estimates suggest that oil imports could be cut by $100 million a year for every one million electric cars on Indonesia's roads.

In Indonesia, the growth of electric vehicles is the most important component of what is seen globally as the ACES shift in mobility—autonomous, connectivity, electrification, and shared mobility—which in combination could become a $1.5 trillion global market by 2030. The introduction of electric vehicles has reached a tipping point, with global sales hitting 35 million units in 2018 and China claiming more than 50 percent of the market. In Indonesia, the value pool for electric vehicles could reach more than $15 billion by 2030, supported by favorable regulations that the government is anticipated to put in place.

Many governments have encouraged the adoption of electric vehicles as a step toward reaching decarbonization targets. For instance, electric vehicles are essential in meeting the European Union's goal of reducing carbon emissions from heavy-duty trucks by 35 percent and by 37.5 percent from passenger cars and light commercial vehicles by 2030. Governments are also using financial incentives to push adoption of electric vehicles; for instance, Norway is waiving value-added tax and one-time purchase fees for consumers who buy one.

The total cost of owning electric vehicles in Indonesia has also dropped significantly, coming closer to that of traditional vehicles and creating greater interest among consumers (Exhibit 4). While four-wheeled electric cars remain a luxury market, the total cost of owning an electric two-wheeled vehicle is expected to drop below that of its traditional counterpart by 2025.

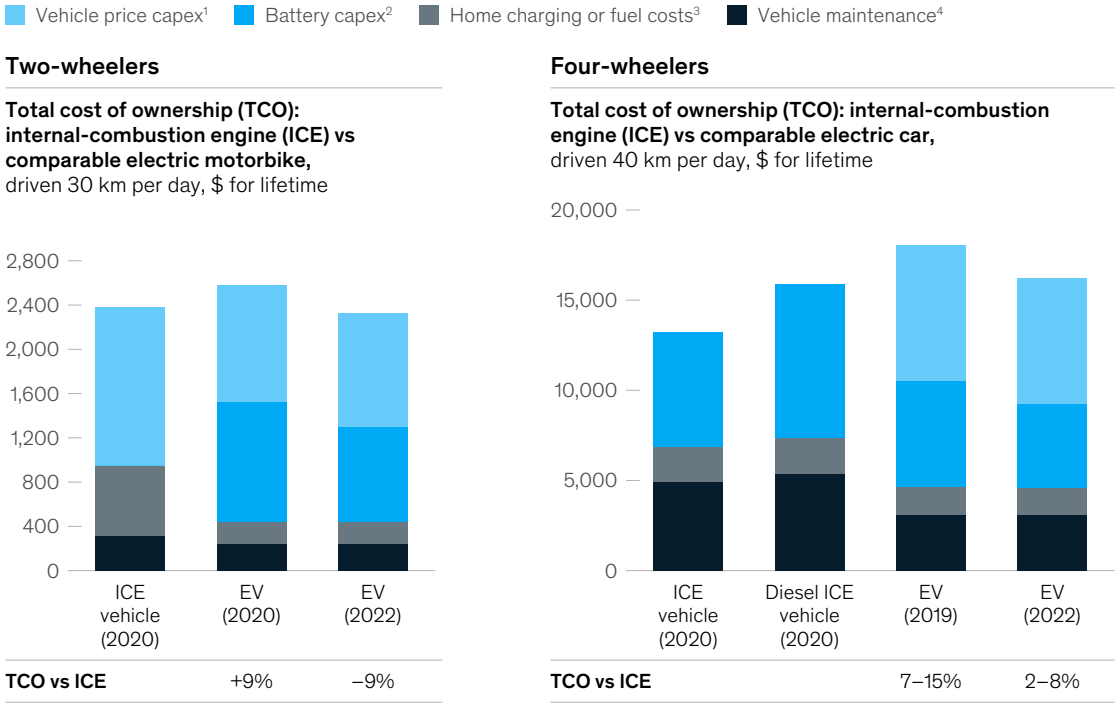
Increased convenience is also sparking interest among buyers globally. Charging times have dropped considerably; many electric vehicles can be fully charged in only 60 to 90 minutes. And once charged, most commercial two-wheeled electric vehicles can run for up to 70 kilometers, while four-wheelers can run for up to 250 kilometers. Charging infrastructure is also visibly expanding, thanks in part to programs such as a European initiative to bring utilities, car makers, and charging-point operators into partnership. Globally, utilities and oil and natural gas companies are positioning themselves all along the value chain—battery manufacturing, charging stations, retail electricity, and elsewhere—to secure a spot in the growing market.

Indonesia has one of the world's highest-potential markets for electric vehicles, especially for two-wheelers. By 2030, Indonesia is expected to have annual sales of 1.2 million electric two-wheelers and 3.7 million two- and three-wheeled electric vehicles on the road, compared with 1.5 million four-wheeled electric vehicles.

Although Indonesia is well placed to become a leading market for electric vehicles, the government has not done enough to encourage their adoption. Without incentives, the gap in total cost of ownership between electric two-wheelers and those with internal combustion engines remains too wide for most customers today.

Exhibit 4

## The total cost of owning an electric two-wheeler in Indonesia is approaching that of a traditional vehicle, but electric four-wheelers continue to be uneconomical.




[1]2W: ICE: 125 cc: 20 Mn IDR, E2W price without battery: 30 Mn IDR; 4W: ICE gasoline: 343 Mn, diesel: 372 Mn IDR EV: 462 Mn IDR: 1 USD: 14,500 IDR.
[2]ICE: Not applicable: EV: 214 USD/kWh reducing to 176 USD/kWh; lifetime: xx years for E2W (one charge per day) and y years for E4W.
[3]Fuel price: 2W: 6450 IDR/l, 4W diesel: 9,500 IDE/l, 4W gasoline: 7,650 IDR/L; electricity price for private consumption ~1350 IDR/kWh purely home charging; bike range: 70 km/charge of 2.5 kWh car range: 180 km/charge of 28 kWh.
[4]2W: Opex for ICE is xx USD/km and that of E2W is 25% less at y USD/km; 4W: Opex for ICE is x USD/km and that of E2W is y USD/km.

Still, the electric vehicle market in Indonesia has started to take root; a handful of manufacturers offer electric two-wheelers, and utilities have begun opening charging stations. Ride-hailing services are also working with utilities and car makers to switch to electric vehicles.

These efforts could stall, though, unless the government plays a more active role. Regulators could consider incentives for buyers and car makers to push faster adoption. They could also look for ways to foster more domestic R&D for the electric-vehicle sector and to attract global investors at all points on the value chain. The switch to electric vehicles will undoubtedly play a part in boosting economic growth in the wake of the coronavirus crisis.

# 10 Develop local capabilities and talent

In the 1970s, Indonesia built the world's largest LNG export facilities, and for almost five decades the country produced enough oil to maintain a seat on OPEC. The country's leadership in energy has faded since those glory days, however, and with it the sector's capacity for innovation and development. Regaining cutting-edge capabilities, especially in a postpandemic world in which digitization is crucial, is an essential step toward reinvigorating Indonesia's energy industry.

For example, Indonesia will need new technologies and technical experts to maintain production from maturing fields and to help new operators deploy the latest oil-recovery technologies during handovers of expiring PSCs. In addition, refinery upgrades require project-execution and engineering capabilities on a scale not yet seen in Indonesia.

Unfortunately, Indonesia begins in a weak position. The country has few world-class oil and natural gas R&D centers to explore the potential of modern technologies, and too few university graduates are ready to become energy-industry professionals. While some Indonesian companies have started using digital technologies for innovative processes, for example in mining, the overall pace of adoption in the country's energy sector lags behind the global standard.

Several efforts can help Indonesia develop needed capabilities as quickly as possible:

— Establish world-class institutions to develop local talent. Universities could bring in top foreign lecturers and cooperate closely with industry leaders; for instance, they could create certification programs for engineering professionals as part of the career path in local energy companies. They could also jointly open digital-capability centers to drive innovation and share experiences.

— Develop incentives for international operators and service companies to establish R&D hubs in Indonesia that focus on technologies most relevant to the region.

— Encourage top Indonesian companies to hire foreign experts in operations and elsewhere and to partner with global leaders, assuring that capabilities are transferred to local staff.

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As nations rebuild their economies in a postpandemic world, Indonesia has an opportunity to revitalize its energy sector. New technologies and a trend toward renewable energy sources offer a chance for Indonesia to return to global leadership, while continued low oil prices will make needed reforms more palatable. But bold, decisive leadership is required to deliver the substantial benefits inherent in a thriving energy industry.

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